

# CMD 25-H9.REF5 CNSC Staff Submission

## Reference Package 5 for CMD 25-H9 CNSC Staff Submission on Denison Mines Licence Application to Prepare Site and Construct the Wheeler River Project

<b>Classification</b>	Unclassified
<b>Type of CMD</b>	References
<b>CMD Number</b>	CMD 25-H9.REF5
<b>Original CMD</b>	CMD 25-H9
<b>Public hearing date</b>	08 December 2025
<b>PDF e-DOC #</b>	7605558
<b>Summary</b>	This document contains documents related to the Environmental Assessment process, as posted to the Canadian Impact Assessment Registry, to be placed on the Record for the proceeding.
<b>Actions required</b>	There are no actions requested of the Commission. This CMD is in support of the actions and recommendations set out in CNSC staff CMD 25-H9.



# CMD 25-H9.REF5 Soumission par le personnel de la CCSN

Références liées 5 au CMD 25-H9 Soumission par le personnel de la CCSN la demande de Denison Mines visant à préparer le site du projet de Wheeler River et à entamer les activités de construction

<b>Classification</b>	Choisir un niveau de classification
<b>Type de CMD</b>	Références
<b>Numéro de CMD</b>	CMD 25-H9.REF5
<b>CMD Original</b>	CMD 25-H9
<b>Date de l'audience</b>	08 décembre 2025
<b>Numéro e-Doc du PDF</b>	7605558
<b>Résumé</b>	Ce document contient des documents liés au processus d'évaluation environnementale, tels que publiés dans le Registre canadien d'évaluation d'impact, à verser au dossier de l'instance.
<b>Mesures requises</b>	Aucune mesure n'est requise de la Commission. Le présent CMD appuie les mesures et les recommandations énoncées dans le CMD CMD 25-H9 du personnel de la CCSN.





## **CMD 25-H9.REF5**

# **Reference Package 5 for CMD 25-H9 CNSC Staff Submission on Denison Mines Licence Application to Prepare Site and Construct the Wheeler River Project**

**Signed by:**

**X**

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Dana Beaton  
Director General, DERPA

Written Submission from  
Ya'thi Néné Land and Resource Office

In the Matter of;  
Denison Mines Corp. Wheeler River Project Description



Garrett Schmidt  
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## **Introduction**

The Ya'thi Néné Land and Resource Office (Ya'thi Néné), on behalf of the Athabasca First Nations of Black Lake, Fond du Lac and Hatchet Lake, and the municipalities of Camsell Portage, Stony Rapids, Uranium City, and Wollaston Lake, have reviewed the *Wheeler River Project Description*, as submitted by Denison Mines Corp. A summary of comments pertaining to the *Project Description* is contained within the document below. By participating in the *Project Description* review, Ya'thi Néné expects to begin building a positive and long-lasting relationship with Denison Mines Corp. and looks forward to collaborating throughout the lifecycle of this project.

Ya'thi Néné is well informed regarding resource extraction and energy projects located throughout our Traditional Territory in the Athabasca Basin. The organization is mandated to be the interface between industry and community. We interact with various stakeholders and industries to understand and participate in a multitude of current and future projects occurring throughout the Athabasca Basin.

## **Comments**

### **Section 2.0      Project Information**

#### **2.3.6    Water Management and Treatment**

The sustainable and responsible use of water resources should be a top priority for the Wheeler River Project. Residents use the multiple lakes, ponds, and rivers located in proximity to the Project site for a variety of purposes and highly value the environmental protection of water. Community members will want to be assured that water resources are safe and respected. All efforts should be made to engineer a water management system for the project site that minimizes fresh water intake by reusing and recycling water on-site whenever possible.

The proposed ISR mining method and associated on-site processing have the potential to reduce water requirements when compared to other forms of mining. The reduced consumption of water resources helps to minimize the project's impact on the surrounding environment and ecosystems.

Any water that is released in the form of effluent must be closely monitored to ensure it's in a suitable condition to be returned to the surrounding water systems. All water related monitoring results should be made available for review on a regular basis, and easily accessible.

Ya'thi Néné looks forward to learning more details about the proposed treated effluent discharge location, the pipeline, release point, and modelled results of changes to the aquatic environment. Ya'thi Néné will review this information when the EIA is published.

#### **2.3.7    Waste Management**

The Project as currently identified includes an on-site domestic landfill planned for non-hazardous materials such as wood and plastics. Ya'thi Néné is interested in reviewing the proposed waste management plan that will detail how each type of waste generated on-site will be managed. Due to the remoteness of the site, it is encouraged that Denison recycle and reuse as many materials as possible

during all phases of the operation. Waste management programs will decrease the amount of materials being sent to the domestic landfill, while also decreasing the environmental footprint of the Project.

Ya'thi Néné recommends that Denison consider composting food scraps and other organic material instead of the proposed incineration option.

## **2.4 Project Activities and Schedule**

Ya'thi Néné requests to remain updated on project schedules and timelines in order to keep community leadership and member's informed regarding development.

### **2.4.3 Decommissioning**

In order to achieve effective decommissioning and closure of the Wheeler River Project, the end state conditions must be reflective of pre-disturbance conditions and meet designated land use objectives. This process will only occur through proactive engagement and communication with local land users, and the development of the decommissioning plan that has been written in collaboration with all potentially impacted groups. Traditional land users from the Athabasca Basin will have valuable insights when developing a plan to return the site to a state free of access restrictions and suitable for recreational and traditional land use.

#### **2.4.3.1 Mining Chamber Remediation**

The decommissioning and remediation of the mining chamber will be a topic of interest for community members, as remediation methods of ISR Projects are thus far untested within Canada. Ya'thi Néné looks forward to learning more about the proposed decommissioning and remediation of the mining chamber at the Wheeler River Project.

#### **2.4.4 Post-Decommissioning**

Ya'thi Néné believes it is important to be engaged on the topic of decommissioning as it directly relates to restoring natural process and traditional ways of life to the land, water, air, and ecosystems. Ya'thi Néné is of the opinion that the successful decommissioning of the Wheeler River Project site will only be achieved through a collaborative approach with industry and community groups working together with the shared goal of returning the land back to a pre-development state.

## **Section 3.0 Project Location**

### **3.0 Project Location**

The Wheeler River Project is located within Treaty 10 Territory, as demonstrated in Figure 3.1: *Wheeler Location within the Treaty 10 Boundary*. Due to the location of the Project, Denison Mine's should be more actively communicating and engaging with Ya'thi Néné given the proximity of the communities to the project site.

## **Section 5.0 Existing Environment**

### **5.4 Aquatic Environment**

Residents of the Athabasca Basin are traditional land users that rely on hunting, fishing and trapping to support both their families and communities with traditional and country foods. Protection of the ecological systems that support traditional land use activities are of critical importance. Protection of the aquatic environment and its associated fish species will continue to be critically important to community members throughout the duration of the Wheeler River Project. The aquatic environment and its associated ecosystem support an important food source to all people in the Athabasca Basin.

### **5.5 Terrestrial Environment**

It is recommended that Denison proactively plan to optimize the footprint of the Wheeler River Project site to reduce its impact on the terrestrial environment. Efficient planning to optimize the movement of heavy vehicles and equipment will help in reducing the footprint of the site. Ya'thi Néné realizes that the planned size of the Wheeler River Project site is relatively small in comparison to other mine sites in the region, however there is always opportunities to find planning efficiencies to minimize all potential terrestrial impacts.

### **5.6 Species at Risk and Sensitive Species**

Traditional land use maps and local accounts of trap lines and hunting areas should be considered when surveying areas for potential sensitive species, and species at risk. A collaborative surveying approach between Denison and local traditional land users has the potential to yield the most accurate results regarding areas of sensitive and at-risk species.

### **5.7 Human Environment**

The human environment and its associated economy in northern Saskatchewan is dominated either directly or indirectly by natural resources. A community's ability to meaningfully participate in the socio-economic benefits of a new mine site development will play a critical role in the development of that community's human environment and economic growth. Denison should contract local and community owned businesses for site related services and employ residents from Athabasca Basin with defined employment objectives. There are many positive socio-economic opportunities that come with a new uranium mine site development, and Ya'thi Néné anticipates to see as many of these benefits made available to Basin owned businesses and residents as possible.

#### **5.7.3 Current Traditional Land Use by Indigenous Communities**

Ya'thi Néné is in the process of reviewing our traditional land use maps that will demonstrate land use activities around the Wheeler River Project site.

## **Section 6.0 Environmental Effects**

### **6.1.2.2 Traditional Land Use**

Denison has committed to, “Continue engagement with Indigenous groups currently practicing traditional land use activities in the Project area throughout the EIA, feasibility and design stages” (Denison Mines Corp., 2019). Ya’thi Néné wants to ensure there is meaningful participation from Basin communities in the EIA, feasibility, and detailed design stage of the project. These communities are located in proximity to the Project site, and the residents of these communities use the land surrounding the Project site for various traditional purposes. Ya’thi Néné requests that Denison engage with Basin communities to ensure they are meaningfully informed of the Project plans, and have an opportunity to inform Denison of any land use activities that may be occurring near the Project site.

### **6.1.2.5 Socio-Economics**

It is highly recommended that Denison make a proactive commitment of hiring a certain percentage of its workforce from the Athabasca Basin communities during all phases of the project lifecycle. The economy in northern Saskatchewan is dominated directly or indirectly by natural resources and mining. Therefore, these industries generate economic opportunities for the people of the region and are critical to the overall financial sustainability of the area. The creation of effective training and education programs would positively benefit all organizations involved in the Wheeler River Project.

### **6.1.2.6 Indigenous Peoples**

The Wheeler River Project site is located within the Traditional Treaty 10 territory of the Hatchet Lake First Nation and adjacent to the Treaty 8 territory of Black Lake First Nation and Fond du Lac First Nation. As part of a Collaboration Agreement, Ya’thi Néné works with both Hatchet Lake and Wollaston Lake, Fond du Lac and Black Lake as well as the northern communities Uranium City, Camsell Portage and Stony Rapids, on a variety of environmental and socio-economic projects. As such, Ya’thi Néné requests to be formally engaged on all aspects of the Wheeler River Project as there will be direct impacts to communities located within the Athabasca Basin.

Ya’thi Néné requests that Denison review cultural programs in place at other mine sites throughout the region in order to develop an effective and inclusive cultural program that can be adopted at the Wheeler River Project site.

## **6.2 Cumulative Effects**

A cumulative effects assessment is required in both the federal and provincial environmental assessment processes. The potential cumulative effects of the Project are wide reaching and complex. There is a vast amount of information and data to review in order to be meaningfully informed of the potential impacts and adaptation methods required to understand and respond to the cumulative effects of the Wheeler River site.

Ya’thi Néné looks forward to reviewing the full report outlining the cumulative effects of the Wheeler River Project in the EIS report.

### **6.3 Monitoring**

It should be noted that the Wheeler River Project site will be subject to the CNSC's Independent Environmental Monitoring Program. The information obtained from these monitoring programs help Ya'thi Néné inform community members of environmental activity and associated monitoring at various Project sites. Traditional land users will want to participate in the environmental monitoring programs and community members will want to be informed of results. The Independent Environmental Monitoring Program is a critical step in developing trust and a meaningful understanding of Project activities for community members. Ya'thi Néné highly values its relationship with the CNSC and communicates with them regularly on a variety of initiatives.

## **Section 7.0 Stakeholder Engagement**

### **7.4 Socio-Economics**

Early engagement and relationship building is critical in the development of a beneficial, and collaborative working arrangement between Denison and the communities. However, in order for these conversations to continue throughout the lifecycle of the Project there needs to be adequate funding opportunities available to facilitate meetings, workshops, environmental monitoring, and training. Funding opportunities need to be clearly communicated and widely promoted, particularly to impacted communities. Additionally, there should be a relatively flexible period of time to accept applications and funding proposals.

The availability of funding to support land use studies, technical reviews, community workshops, and continued engagement will be beneficial for supporting a long lasting, and positive relationship between Denison, industry regulators and the Athabasca Basin communities.

## **Section 8.0 Engagement with Indigenous Communities**

### **8.1 Identified Communities and Supporting Criteria**

Denison Mines have developed a list of Indigenous Stakeholder Groups identified for engagement throughout the project. This list is outlined in 'Table 8.1: Indigenous Communities' (Denison Mines Corp., 2019). The communities on this list have been engaged with in some aspect and have expressed interest in continual follow-up. Ya'thi Néné requests to be added to the list of Indigenous Stakeholder Groups.

The environmental, social, and economical impacts of this Project are wide reaching and will impact numerous communities throughout Northern Saskatchewan, with particular emphasis on the Athabasca Basin. For this reason, Ya'thi Néné expects Denison Mines to develop a presence and relationship with Athabasca Basin communities, and to increase engagement efforts with these communities.

As mentioned in Section 8.1 Indigenous Organizations, "Denison recognizes that these communities may have an interest in the Project and therefore, Denison intends to engage with the YTNLRO in order to better understand contemporary traditional land use activities that are currently being undertaken in

the Project area by the member Indigenous communities of the YTNLRO” (Denison Mines Corp., 2019). Ya’thi Néné looks forward to many meaningful discussions with Denison Mines.

### **8.3 Planned Indigenous Engagement Activities**

As previously identified, Ya’thi Néné requests to be engaged and informed regarding aspects of the Wheeler River Project.

When planning Indigenous engagement activities, Ya’thi Néné would recommend that a high degree of flexibility be maintained throughout the duration of the engagement process, as timelines and deliverables may change depending on feedback and insights provided from community leadership and members.

Ya’thi Néné hopes that Denison will uphold its commitment to respond to enquires to meet and/or deliver presentations on the Project to informal or formalized groups. The sharing of information and details regarding the Wheeler River Project with Ya’thi Néné and the communities will help community members understand the Project and build support.

### **Closing Remarks**

The Wheeler River Project is located within the Athabasca Basin and the Traditional Territory of the Athabasca Denesuline First Nations. Ya’thi Néné looks forward to building and maintaining a positive relationship with Denison Mines Corp. as the Project continues to develop. We appreciate the opportunity to review and provide comments on the Wheeler River Project Description and request to participate in the Environmental Assessment development and Indigenous engagement process. Such engagement opportunities are critical to ensure the consistent and timely flow of information from proponents to communities. Ya’thi Néné highly values knowledge sharing and meaningful engagement as it is essential to ensure our community members are meaningfully informed.

We request to remain informed with regards to the in-situ process, and look forward to learning more about the process in the EIA. We believe community members will have a wide variety of questions regarding both the in-situ process and engagement practices, and we would like to be able to deliver to them the most accurate and updated information.

### **Works Cited**

Denison Mines Corp. (2019). *Wheeler River Project*. Saskatoon : Denison Mines Corp.





## Directorate of Environmental and Radiation Protection and Assessment

e-Doc: 5980793

File: 80178

August 29, 2019

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**Subject: Changes to Federal Legislation and Implications for the Wheeler River Project**

Dear Ms. Bennett,

The purpose of this letter is to inform your organization of recent changes to federal legislation, particularly transition provisions relevant to the Wheeler River Project (the Project), and next steps.

On August 28, 2019, the *Impact Assessment Act* (IAA) came into force, repealing the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The IAA contains transitional provisions for EAs of designated projects commenced under CEAA 2012 and for which the Canadian Nuclear Safety Commission (CNSC) is the Responsible Authority.

The Wheeler River Project has been subject to an EA commenced under CEAA 2012, since May 31<sup>st</sup>, 2019. As per the transition provision described in subsection 182 of the IAA: “*Any environmental assessment of a designated project by the Canadian Nuclear Safety Commission or the National Energy Board commenced under the 2012 Act, in respect of which a decision statement has not been issued under section 54 of the 2012 Act before the day on which this Act comes into force, is continued under the 2012 Act as if that Act had not been repealed.*”

As outlined in subsection 182, given that the Project was commenced under CEAA 2012 and a decision statement has not yet been issued, and therefore will continue and be completed under its current process.

The “Assessment Type” on the project-specific page of the Public Registry website, Reference Number: [80178](#), has been updated to indicate “Environmental Assessment under CEAA 2012”. In addition, this letter will be posted on the Public Registry website as the official record of notification.

If you have any questions, do not hesitate to contact Marcelle Phaneuf, Environmental Assessment Officer responsible for the Project, by phone 613-947-3209 or email *Marcelle.Phaneuf@canada.ca*.

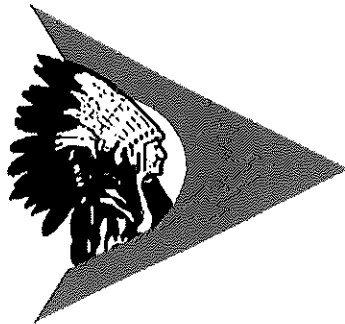
Sincerely,

<Personal Information Redacted>

Candida Cianci  
Director, Environmental Assessment Division  
Canadian Nuclear Safety Commission

c.c.: P. Fundarek (CNSC); C. Cattryse (CNSC); S. Akhter (CNSC); M. Phaneuf (CNSC)

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# Lac La Ronge Indian Band

**February 9, 2023**

Jessica Way  
Environmental Assessment Officer  
Canadian Nuclear Safety Commission

**RE: Denison Mines – Wheeler River Environmental Impact Statement**

Dear Ms. Way;

The Lac La Ronge Indian Band received notification from Canadian Nuclear Safety Commission requesting comments on the Wheeler River Impact Statement by February 18<sup>th</sup>, 2023. LLRIB is concerned about potential adverse impacts to the ability to hunt, fish and trap for food and/or carry out traditional uses including cultural, spiritual or other important sites near the proposed project area.

Resource Development in the Traditional Territory of LLRIB is known to have significant impact to community members and their traditional way of life. The TLRAC strongly encourages Denison Mines to set up a meeting in the near future to discuss the project and to ensure proper engagement occurs with LLRIB membership and impacted land users.

Furthermore, to encourage and support community members, the Committee has set up the Heritage Fund which is financed through contributions received from forestry and resource development companies. The Fund is an application-based program administered by the Committee to support and encourage community members to practice traditional activities. We encourage your Denison Mines to contribute to the Fund to assist us in protecting and supporting community members impacted by resource development activities.

LLRIB has extensive experience in providing services to the resource sector through our economic development company, Kitsaki Management. Kitsaki currently holds ownership in 10 operating companies in a variety of services including Transportation, Hospitality, Insurance, Environmental services, Engineering, Vegetation management, Technology, and mining services. More details can be found on their website (<https://kitsaki.com/>). The Traditional Lands & Resources Committee strongly encourages you to reach out to Kitsaki and its group of companies to ensure your project has appropriate local and Indigenous involvement.

If you have any further questions please contact me at 1-306-425-2183 or email [ty.roberts@llrib.ca](mailto:ty.roberts@llrib.ca)

Respectfully,

Signature Redacted

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Ty Roberts, B.S.A., Pag.  
Lands Manager  
LAC LA RONGE INDIAN BAND

Jes Way  
Environmental Assessment Officer  
Canadian Nuclear Safety Commission  
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**RE: Canadian Nuclear Association comments on the draft environmental impact statement for the proposed Wheeler River Project.**

The Canadian Nuclear Association (CNA) is pleased to have the opportunity to provide comments on the draft environmental impact statement (EIS) for the proposed Wheeler River project submitted by the Denison Mines Corporation.

The CNA has approximately 100 members, representing over 76,000 Canadians employed directly or indirectly in exploring and mining uranium, generating electricity, advancing nuclear medicine, and promoting Canada's worldwide leadership in science and technology innovation. All human activities have some form of environmental impact and Canada's nuclear industry is committed to minimizing those impacts as much as possible in all aspects of our operations and as such we are supportive of the comprehensive approach outlined in the Wheeler River EIS.

Nuclear energy is a safe, reliable, non-emitting source of energy that not only helps Canada and indeed, the world meet its electricity needs but it is also a critical element in the world's fight against climate change. It is increasingly acknowledged that without a significant increase in the use of nuclear energy the world cannot meet the Paris agreement targets. Uranium mining is the first step in the nuclear fuel cycle and not only is Canada blessed with an abundance of uranium, we have decades of experience safely mining and processing uranium. Presently, the annual global uranium supply is less than global demand and the Phoenix deposit has the ability to power millions of homes and businesses with carbon free energy for decades.

The Wheeler River Project is a proposed In Situ Recovery (ISR) uranium mine and processing plant located in the Athabasca Basin region of northern Saskatchewan. The project falls within the boundaries of Treaty 10 in the Nuhtsiye-kwi Benéné (Ancestral lands) of the English River First Nation, in the land and occupancy area of the Kineepik Métis Local #9, in the homeland of the Métis, and within Nuhenéné.

For this project the federal and provincial environmental assessment processes will be conducted in parallel, and the draft EIS has been prepared to meet the requirements outlined in both the government of Saskatchewan Environmental Assessment Act and the Canadian Environmental Assessment Act. To ensure a thorough and comprehensive EA, Denison Mines put together a very comprehensive project team comprised of individuals with extensive experience in the Canadian uranium mining industry with specific expertise in exploration, development, licensing, environmental

management, operations and decommissioning. To support this team, Denison Mines contract several companies with additional technical knowledge including:

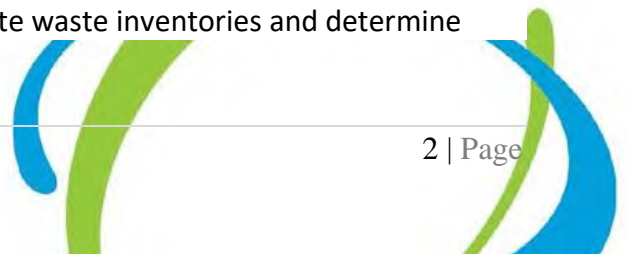
- Ecometrix – world class expertise in hydrogeology, geochemistry, ecological risk assessment, and accidents and malfunctions
- Environmental Dynamics Inc. - recognized as experts in biological studies including the development of wildlife management plans, environmental assessments, and cumulative effects assessments,
- Independent Environmental Consultants - proven expertise in air quality and meteorological assessments across Canada and Globally,
- InterGroup – expert technical services related to socio-economic impact assessment and public engagement and the incorporation of Indigenous and Traditional Knowledge within the assessment framework.

As part of the EIS, Denison undertook a systematic assessment of alternative means to implement project components and activities. These preferred activities ultimately became the basis from which project related effects were evaluated. As an example, five mining methods were evaluated and ultimately the ISR method was selected because the alternative assessment results showed ISR had advantages over the other methods including fewer environmental effects, lower cost, fewer technical risks, fewer safety risks for workers and positive feedback from interested parties.

CNA believes it is important that innovative solutions to ensure sustainable resource development within Canada is fostered within a robust regulatory regime. The ISR method proposed by Denison is supported by many years of international experience. In fact, over half the world's uranium supply is provided through ISR mining. The ISR methodology minimizes land disturbance requirements creating no long-term waste rock piles, tailings management areas or open pits thus allowing a more rapid remediation and return of the land to natural conditions. Through field testing and modelling, Denison has demonstrated that this low environmental impact technology can be safely deployed in the high-grade uranium deposits in Canada's Athabasca Basin.

Canada is blessed with an abundance of fresh water and the use of fresh water is an important consideration in any project. Water management for the project involves the distribution of freshwater, collection of runoff water, recycling and treatment of process water and the collection and treatment of industrial and domestic wastewater. Denison plans to recycle process water to the greatest extent possible, thereby reducing the demand for fresh water supply and reducing the volume of treated effluent released.

All activities produce waste and like all members of Canada's nuclear industry, Denison is committed to minimizing and carefully managing the waste that is produced. Denison is committed to stringent waste management and containment throughout the life of the project including physical, radiological, and chemical characterization to maintain accurate waste inventories and determine



how wastes will be dispositioned either through re-use, recycling, temporary storage, or permanent disposal (on or off site).

Canada's nuclear industry is a cradle to grave industry and decommissioning and monitoring is an important element of any nuclear project. The draft EIS includes preliminary information on monitoring and follow-up programs that will be further developed as project designs are finalized. Input from regulatory agencies, the public and Indigenous peoples will be considered in the final program designs.

Like all CNA members, Denison Mines is committed to the principle of reconciliation. In 2021 Denison's Board approved an Indigenous Peoples Policy, which outlines its commitments in a number of areas, including the environment and engagement. Denison is committed to conducting meaningful engagement and relationship development with Indigenous communities and organizations a throughout the life of the project. CNA notes that various participation and funding agreements have been reached to provide capacity for Indigenous communities to actively participate in the environmental assessment process, including providing advanced review on various elements of the EIS prior to the draft being finalized and submitted to the regulators.

Denison has also conducted a comprehensive engagement process with the public including non-Indigenous Communities of Interest which are located along the existing infrastructure used by the project and nearby land users such as commercial trappers or fishers, cabin/lease owners or commercially operated lodges in the vicinity of the project. Engagement activities with these parties included information sharing, in-person and virtual meetings, workshops and site visits and provided interested parties an opportunity to be meaningfully informed about the Project to share their feedback with Denison.

The CNA reviewed the EIS executive summary and feel confident, based on the comprehensive engagement efforts that Denison has conducted, as well as the outstanding technical teams Denison put together both internally and with outside experts. The CNA supports Denison's conclusion that the project can be constructed, operated, and decommissioned in a manner where effects to the biophysical and human environments are not anticipated to be significant.

Thank you for the opportunity to provide our input. If you have questions or require further information, please contact Steve Coupland at [scoupland.sgcresearch@gmail.com](mailto:scoupland.sgcresearch@gmail.com)

Sincerely,

Signature Redacted

Jill Baker  
Vice President, Operations  
Canadian Nuclear Association



# Kineepik Response to the Denison Wheeler River Project Environmental Impact Statement

Submitted by Kineepik Metis Local #9 and the Northern Village of Pinehouse





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## KML Metis Local

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### Glossary

**Prevention Planning Meetings** – These Monday morning meetings are a weekly community check up. Each community organization is expected to come and share what is they are experiencing and to contribute to any community issues. What is currently occurring in the community and what if any are mitigation measures could the collective community resources provide to manage those situations.

**Collateral Effect** – The colonial response and subsequent effect on an Indigenous community as Industry develops operation on historical traditional territories. The community is required to adjust the current culture to respond to the needs of industrial culture. For KML and NVP people this has occurred several times in our shared history. The first during the fur trade, the second during the Natural Resources Transfer Agreement process, the third when Commercial Fishing came into the community, the fourth, when the Northern Administrative District Act came into force. The most recent came when the Uranium mining and Forest industries came into our territory. Each of these events created significant changes in the culture of the community with no consideration for the effect or any meaningful support to adjust to the change for the people of KML and NVP. The Indigenous community has no recourse to prevent the effect.

**Cumulative Effects** - The term “cumulative effects” generally refers to the combined effects from past, present, and reasonably foreseeable future activities, and natural processes. Specific definitions vary among different parties and under different legislation and policies, but the term generally refers to effects that may be individually minor, but collectively significant. Effects can be adverse (e.g., decreased water quality in a regional river) or positive (e.g., socioeconomic benefits like jobs and business for a local community).

Kineepik considers the entire cumulative effect of Industry which currently include forestry, mineral exploration, and mining operations. The effect on our community as this continues to grow in our traditional territories. This effect is exacerbated by historical relationships where Kineepik land users are largely excluded for the economy of this Industry.

**Community Engagement Sessions** – KML Metis Local host a variety of community engagement sessions. The longest running community engagement session is the Monday Morning Prevention Planning Meetings, hosted each Monday morning at 9:30 a.m. This is followed by the Reclaiming Our Community Meeting which are hosted the first Thursday of each month. Additionally, we host two large community gatherings to highlight progress and the state of the community. For Duty to Consult we host specific proponent community meeting sessions where we meet to discuss projects to determine impacts these projects will have on our section Indigenous rights.

**Duty to Consult and Accommodate** – The legal requirement for governments of Canada and provinces to meaningfully consult with rights bearing Indigenous people for project occurring on

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## KML Metis Local

their traditional territories. When there are proven impacts from the projects than accommodation must be negotiated.

**End of Line Community** – Pinehouse has no other communities by road beyond the road and this means anyone traveling this road is specifically coming to Pinehouse or travelling through to the mining operations.

**Indigenous Economic Leakage** – The lack of capacity within Indigenous communities like Pinehouse prior to massive development projects like uranium mining operations. No ability in existing community development to capitalize on industrial activity in their areas because of historic colonization and racism. Limited businesses, stores, materials and infrastructure within community to support and build upon.

**Indigenous Centre of Excellence** – An institution to develop a legacy of information developed in partnership between uranium mining and exploration companies with the Indigenous right bearing community of Kineepik, to be located in Pinehouse to create Indigenous centric knowledge to better understand and accommodate the significant impacts created by the entirety of the mining activity within the region.

**Land User Consultation** – These are data gathering meeting hosted for community land users actively engaged in harvesting and collected resources from the KML Traditional Territory.

**Lixiviant** - A liquid medium used to selectively extract (or leach) uranium from ore bodies where they are normally found underground (in other words, in situ). This liquid medium, which typically contains an oxidant such as oxygen and/or hydrogen peroxide mixed with sodium carbonate or carbon dioxide, is injected through wells into the ore body in a confined aquifer to dissolve the uranium. The resulting solution is then pumped via other wells to the surface, where the uranium is recovered from it in a concentrated form for processing.

**Loss of Use** – KML and NVP land users cannot practice traditional activities in the areas around the mines with the growing number of operations and projects that are cumulating in a dense formation in a large area. The area now is several thousand square kilometers. This area now included the transportation routes including roads and air travel routes. This causes our community to adjust our land use activities and stay away or severely limit ourselves from area and therefore we have no access to the area for these activities.

**Métis Nation–Saskatchewan (MN-S)** - represents the province's Métis citizens. The Métis Nation Legislative Assembly is the governing authority of the Métis Nation–Saskatchewan (MN-S) and has the authority to enact legislation, regulation, rules and resolutions governing the affairs and conduct of the Métis in Saskatchewan.

**Own Source Revenue and Resources** – the use of our own revenue and resources to protect our identity and an Indigenous community. To continue to have an Indigenous language and culture



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means we must create revenue to support these societal needs, which are not been being supported to a material need by the province or country.

**Reclaiming Our Community Monthly Meeting- (ROC)** This meeting is hosted on the first Thursday of each month and is a multiuse meeting where we provide summary of the weekly meeting, plan significant community events and at times provide training for the ROC membership, which is open to the public, but any community organization has a mandatory membership and role. This is where long term community strategies are created.

**Traditional Territory** – KML traditional territory is the geographic area that we identified in a methodical collection of information from our community land users and families. The land we and/or our ancestors traditionally occupied and used. We have yet to fully complete this process and are working with our community elders on this ongoing process.

**Triggered Response Capacity** - This is the respond required by the Indigenous people of KML to meet the need of industry. The community is required to change focus away from Indigenous community needs to focus on the needs of Industry. This includes time to respond to the industrial education, safety protocols, regulatory responses. The need as a community to participate in the Duty to Consult on exploration requests, feasibility studies, Environmental impact studies, negotiate agreements, industry training requirements. All of this removes the community ability for practicing Indigenous cultural activities, less time of Cree language retention. This response increases as the Collateral Effect increases.

**Usufructuary Rights** - The concept of 'usufructuary right in land', or the right to use property belonging to another, has been used repeatedly by the Supreme Court of Canada to explain how Aboriginal title can remain unextinguished and alive under the weight of Crown sovereignty.



## **Primary Concerns from Document**

- 1) A need for funding for education and training to reach a standard of knowledge in mining, science and math required to understand the impacts of uranium mining industry that is expected for an Indigenous community to be able to make free and prior informed decision on impact and expectation of that industry.
- 2) Development of a centre of Excellence in Pinehouse to organically develop the knowledge transference required for Indigenous community to understand the uranium mining industry including regulations, materials used, transportation, end use of products, education required mitigation efforts etc.
- 3) Support for training and education to support KML and Pinehouse on uses of artificial intelligence in the mining projects and to what level this activity can be managed by and in the community. A strategy to build capacity for matriculation graduates with the following classes English 30A 30B Chemistry 30, Physics 30, Math 30.
- 4) Begin training and education support for community to prepare for employment at the mining operations with a focus on females, youth, and previously marginalized land users. Effort to increase employment in trades and drilling related work.
- 5) Immediate efforts to build and increase emergency response capacity with community people from KML and NVP to support capacity for road incidents.
- 6) Immediate efforts to build capacity in a regional waste management operation within or near the community. To build current and future expertise in domestic waste, special waste, recycling, and the development of a transfer station in Pinehouse to support all mining activity including current operation and exploration.
- 7) Systemic increases in the use of services in Pinehouse including COOP store and PBNLP, Pinehouse Housing Corporation, Pinehouse Fishing COOP and Wild Rice, and KML Metis Local to prevent the continuation of Indigenous economic leakage.
- 8) Consideration to build industry supporting infrastructure such as warehousing, hotels, bulk fuels parts and mining necessities in Pinehouse to support community development and to stop the Indigenous economic leakage which has occurred over the last 50 years of development.
- 9) Significant improvements to the road to an industrial grade from Highway 2 to the Key Lake gatehouse to support the massive increase in heavy traffic from Industry.



## **KML Metis Local - Valued Ecosystem Components**

### **1.0 Introduction**

KML Metis Local #9 (KML) and Northern Village of Pinehouse (NVP) response to the Wheeler River Project Draft Environmental Impact Statement. KML has a right and responsibility to promote stewardship in their unceded and mapped traditional territory. Pinehouse is the first community south of this project and the most impacted community for Uranium mining operations in Saskatchewan in general.

### **1.1 Purpose of this document**

KML and NVP are presenting this written statement to ensure that their constitutionally protected rights to use the land as they have always used is considered as the Wheeler River project moves through the CNSC and Saskatchewan Environmental regulatory processes for Canada and the Province of Saskatchewan. We are measuring this Environmental Impact Statement for the Denison Wheeler River project to our own community responses to the following reports: United Declaration on the Rights of Indigenous People, Truth, and Reconciliation report, The Missing and Murdered Indigenous Women and Girls.

### **1.2 Authorship**

This document has been authored by Walter Smith a member of the Kineepik community of Pinehouse with support from KML Metis Local, Denison Mines Inc, CNSC Participant Funding and the Saskatchewan Aboriginal Relations branch. The information within is gathered from an organic community consultation program which include, weekly meetings, duty to consult public meeting, ongoing Denison consultation and CNSC regulatory monthly meetings. Additional data is also gathered from community interviews, data from the occupational and land use study and internal KML Metis Local staff and managers meetings.

### **1.3 Denison and Wheeler River Project**

The Wheeler River Project (Wheeler River) is a proposed uranium mine and processing plant in northern Saskatchewan, Canada. It is in a relatively undisturbed area of the Boreal Forest about 4 km off Highway 914 and approximately 35 km north-northeast of the Key Lake uranium operation. This project will be hosted 6 kilometers upstream from Wheeler River and Russel Lake.

Wheeler is a joint venture project owned by Denison Mines Corp. (Denison) and JCU (Canada) Exploration Company Ltd. (JCU). Denison owns 90% of Wheeler and is the operator, while JCU owns 10%.

This project is located in KML mapped territory with the Pinehouse being the first community south of the project and the most impacted Indigenous community by this project.



### 1.4 Community Awareness of Climate Change

KML and NVP is aware of the global effort to reduce the processes involved in climate change. We understand that nuclear energy provides base load energy with minimal addition to the CO<sub>2</sub> emissions. We are actively monitoring the effects of climate change in our territory, from collecting historical data through interviews with elders and land users. We are recording changes with weather patterns, ice thickness and muskeg freezing patterns and we also recording temperature changes. We do this to keep our land user safe and aware of how these changes may affect land use activities. Currently the impact of climate change is loss of life due to changes in weather in winter earlier ice melts.

“Denison estimates that the uranium produced from Wheeler can be used to power 1 million modern homes for approximately 160 years with minimal greenhouse gas emissions. This highlights the importance of the Project at a time when reducing global greenhouse gas emissions are of the utmost importance in the battle against climate change.”

We also record world weather patterns with increase intensity of hurricanes, floods and winds in other parts of the world. We will continue to study climate change and how that effects the growing need to find resources in our territories. It is imperative that we continue to do our part in these studies and find the supports to increase this knowledge.

### 1.5 Water Security

Water is extremely important part of KML culture. Water is sacred and a human right for the people the of KML. On the surface we use water to travel to our homesteads to gather food and resources as we struggle to continue our way of life. We listen to world events of water shortages, and catastrophic flooding, with the most concerning that of our nearest neighbours in the United States of America. We have historically have not concerned ourselves with water quality as we did not cause any pollution. It is now necessary to monitor water quality with industry such as uranium mining in cases where uranium mining interacts with water. Most uranium contaminants occur when drilling occurs and can be dissolved in water.

“Criticism of international ISR operations largely involves the containment of mining solution and the interaction of the mining solution with groundwater. At Wheeler, in order to contain the solution within the uranium deposit and maximize recovery as well as prevent interaction of the mining solution with surrounding groundwater, Denison will create an isolated mining chamber using conventional ground freezing technology. Ground freezing will establish an impermeable barrier above and on all sides of the mining chamber, with the existing impermeable basement rock acting as a bottom barrier.”

We need to understand how water protection processes such as reverse osmosis and water treatment are used in the mining operations. KML understands that reverse osmosis removes large molecule impurities such as dissolved uranium. We also need to understand the exact molecular compound are part of the “Lixiviant” solution. We as a community need to





understand the how this chemical compound interacts with water and at what concentrations that is becomes toxic. In general, we need to increase the community western education levels so that we are able to be knowledgeable and have the capacity to protect ourselves and the environment. We collect foods and medicines from the areas being altered. If these processes are not well understood by our communities, how can we state that we are prior informed and offer consensus to the process.

### **1.6 Denison Engagement with Pinehouse:**

Denison is currently engaging Pinehouse in what we perceive as a best practice process for community engagement. This engagement process has surpassed any previous engagement protocols we have experienced as an Indigenous community. Denison is engaging the community for this project with an exploration agreement signed in June 2022. We are currently negotiating a collaboration agreement with Pinehouse and KML. As a rights bearing Indigenous community we are recognized and treated with respect. We recognize that Denison has created an Indigenous people's policy. We are optimistic that Denison will be a great community partner on the evolution of this engagement process and working collaboratively through any concerns and issues.

### **2.0 KML & NVP: Social, Cultural, and Historical context**

The office of KML is located within the boundaries set out by the Northern Administrative District and is further supported by the Metis Nation of Saskatchewan. KML is responsible for all proponent and industrial activity that occur on our traditional territory.

The municipality of the Northern Village of Pinehouse is approximately 114 km north by northwest of La Ronge and are accessed from secondary grid roads from Highway 165N to 914 N and is currently an end of the line community.

The municipality of Pinehouse consists of ~11 km<sup>2</sup>, currently the KML Metis Local Traditional mapped territory consists of ~11,000 km<sup>2</sup>.

We are developing the concepts and the capacity to collect our cultural and heritage information, which will evolve over time to capture our full history for the land use territory. Due to historical colonised practiced including the Natural Resource Transfer Act (NRTA) and the Northern Administrative District ACT (NAD) the Indigenous people of KML unceded lands are not recognized as land entitlement. KML land users have practiced governance on these lands since time immemorial and through usufructuary rights do claim this territory as our own. We are currently engaged in land claim process which includes the land at Wheeler River project. This land claim process is managed through the Metis Nation of Saskatchewan (MNS).

### **2.1 Indigenous Traditional Knowledge and Land Users**

KML peoples are considered Woodland Cree, Woodland Dene, and Woodland Metis, although historical documents indicate that members of KML came from a diverse range of Metis, First





Nations, and other backgrounds. The Northern Village of Pinehouse is located within the traditional territory of Indigenous people of KML Métis Local. We have used these lands surrounding Missinippi (Churchill River) watershed for gathering food, shelter, and material supplies since time immemorial.

### **2.2 Language and Culture Restitution**

Being the proven most impacted Indigenous community south of the Uranium mining operations, projects, and activities. We hunt and gather resources in all our areas for food, cultural, language and identity purposes. We have worked with and for the uranium mining industry for over 50 years, formalizing our partnership with Cameco Corporation (Cameco) and Orano Canada in 2012 with a collaboration agreement (CA).

As we review our lived experience over the past 50 years, we have determined a significant change in our behaviour from our interaction with industry. An evolution of change for which we have no recourse. We must conform to western education norms while making attempts to preserve our cultural identity and language. This reality has proven difficult as the wave of western expansion and colonisation grows. We struggle to verbalize this reality for the policies and systems are designed by western education systems. These policies are meant to support western systems and are represented in the English language.

As more understanding of our rights as an Indigenous people evolve, our ability to support more culture and language activities manifested into a more Indigenous community focused strategy. Our community members are demanding restitution of the collective colonization practices that are decimating our cultural practices and language capacity. We are starting to define the process that is responsible for the current extinction events of our Indigenous culture and languages. KML attributes this cultural and language extinction event from the effects of industry development supported by government colonization and institutional racism.

This racism and colonization create privileges for governments, industry, and education institutions, which cause marginalization and harms the health and wellness to the existing Indigenous culture and language of Kineepik people. We now know that the extinction momentum of our language and cultural is rooted in the current and historical privilege stemming from the laws and policies of agencies that govern our territory. We wonder as a people how Pinehouse would have benefitted, if we were a western community over the same 50 year period of industry.

Should one review the loss of language and the magnitude of that loss from the advent of the Uranium Industry. Prior to the industry development, Pinehouse was among the most fluent speaking communities in northern Saskatchewan. All children in Pinehouse spoke Cree with limited English and French capacity. Since the collateral effect of industry became the prominent community discourse the support for Cree language was diminished and marginalized by industry as English is the primary language used by industry. There are no children that can



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speak the Cree language fluently under the age of 35 in our community. We attribute this reality explicitly to the industry and the policies that are in place. We are not to speak our language on the mining operations and that the language of the mining operations is English. This is further exacerbated by the regulators who only recognize English and French for official languages of Canada. Creating regulatory writing document in Cree using roman orthography is more of a novelty when you consider levels of education does not allow for those documents to be read by the majority of fluent speaking members.

Over the 50 years we were told that safety and respect to the industry accepted language trumped our needs to converse in our first language on the mining operations. When one considers that the Cree language is the first language of the land where these mining operation occur, we must question the integrity or the respect of these policies. There are superficial attempts by industry to create some changes recently but no concerted effort to show respect of the culture and language of the mining operations and on the lands in which they operate.

We question whether global Environment Social Governance (ESG) principles or are being followed. One truth is the UNDRIP principles are not being respected by either the mining operations or the regulators. We know that there are no regulators or senior mining managers or executives that have a capacity to speak the Cree language to a level that where they could hold a conversation in fluent Cree with community elders. We also question the Resident of Saskatchewan North (RSN) personnel how many of those individuals are currently filled by fluent speakers of the language. When you consider this transference has occurred over 50 years one can clearly see that the transference is limited to western culture and language and only in English.

These western laws and policies and their effect on Indigenous people are well defined within the TRC and MMIWG inquiries. Currently United Nations conversations are moving towards recognizing that these past practices must be changed if true reconciliation is to occur. The UNDRIP principles are now recognizing the importance of diversity and human rights. Our own self reflection and community conversations are evolving to include these changes as we strive to regain what was lost. We must now demand efforts of western society, industry to support language and culture for this is the only path forward for healthier Indigenous communities. We expect this will lead to more sustainable yet culturally intact Indigenous models that will evolve organically over time.

KML and NVP strategy is activity determining how to stop the current language extinction process with strategies around creating more resources for culture and language. KML is leading the process for recovering from this loss. We are using our own source revenue and resources to bring pride in the language and culture for community members of KML. We will continue to bring this attention to all proponent activities that occur on the KML territory for we are all responsible to remove the effects of colonisation and institutional racism.



This loss of language causes the loss of cultural understanding – as we lose our language, we lose our connection to the land. We lose our ability to communicate with our elders, our knowledge keepers. This manifest is a severe loss of cultural transference between our youth and knowledge keepers. The known and current effects of this degradation are health and wellness issues of Indigenous populations, which increase costs to the healthcare and justice.

Once the connection to the land is lost, then the spirit of Indigenous conservation and concern for how the ecosystems as they are defined by our elders is also lost. This is the very nature of diversity; we the Indigenous peoples have known, for the land since time immemorial. The connection is irreplaceable, authentic, and inherent. By having opportunities to immerse and transmit and transfer the language to our young people, we can stop the current extinction process and to begin the revitalization our languages and cultural practices and the pride required for a healthy community.

**2.3 Collateral Effect** - We have experienced a sharp decline in Cree language and indigenous cultural capacity as we continue to engage with Industry. We have coined this Collateral Effect, where we experience pressure from western culture to conform or suffer lack of opportunity at the industrial operations on our lands. Collateral Effect is compounded by a lack of support for culturally sensitive training for senior managers and regulators and within the populations in our community. We have been and are still pressured to limit Cree Language use at the mining operations. There is no reciprocal pressure to external employees to learn the culture or begin to understand the language, which only exist here in our territory.

When our community members arrive at current mining operations there is no recognition of the Indigenous lands that they are on. There is no programming for current staff to engage in the language of the land. There is extreme pressure to conform to the needs of industry and to increase employee capacity in western education process. This is transferred to the communities as they react to this pressure by increasing their children's capacity in western education. This over time is severing Indigenous cultural transference. In truth the level of western education offered in the community is limited to the lowest level acceptable, so members can only benefit superficially to western processes. Our children cannot matriculate from our school systems for the programming in not offered here. Yet it is the minimum requirement for preparing to train for white collar occupations at the mining operations.

In public poles every member of our community has been impacted by industry. While our contention is not to analyse this phenomenon but to bring this truth to agencies that this change was caused by industry as it pursues profits from the resources that they are mining. We are stating loudly that the support needed to transition from our previous cultures have not been effectively supported. While we agree that some community people have transitioned into industrial expectation, one only has to review employment levels to see that this transition is still limited to blue collar employment. One would expect that after 50 years of industry, a



community with proximity to uranium development, such as Pinehouse would have greater numbers in white collar positions. We are stating that this reality will affect the safety and environmental impacts of the Denison Wheeler River project for community members of KML and Pinehouse.

### **2.4 Cultural Revival**

We are providing opportunities to reconnect with Indigenous Identity in what we have currently coined Reclaiming Our Community (ROC) model. This model is now in its 12th year and has created significant momentum in the community. This community engagement process is evolving into a community consciousness and moving towards an organic beginnings of self governance.

We have also developed our cultural calendar, which is comprised of our current annual traditional activities. This process is awakening the system of family groups and clans and how we support each other using the resources available on our land. This process includes the seasonal changes and adjustments of cultural activities within those changes. We include the celebrations of cultural events that bring pride to our community including the Souris River, Elders gathering, Kilometer 67 gathering, Costigan Lake Fall Hunt among others.

### **3.0 Valued Ecosystem Components (VEC) Methodology**

KML and NVP are determining what is valuable to the retention of the culture and the language as we consider the Wheeler River project. As a Indigenous people we cannot separate specific westernized concepts of environment and safety concerns for we follow a practice of the wholistic approach and follow a circular model. Everything is connected and all actions impact other actions. We are trying to manage the western paradigms and how we can integrate into our world view. We are looking for the balance between the two divergent philosophies.

Concepts of environment and ecology are animate in Cree culture, and both are alive. Water and plants, trees and even the wind are animate objects and spirits inter alia. This understanding is changing in our community, and we are losing these culturally historical concepts and are starting to practice western ways. We are aware that the loss of this ideology is bringing harm, yet we have limited recourse to prevent the occurrence. We would like to develop a blended western Indigenous model back onto our education models as these beliefs are linked to environmental protection.

### **3.1 Mining Methods and Education**

Pinehouse understands the intention for Denison Mines to build the Wheeler River project. Our community managers are following and watching the information coming from the Pre-feasibility Study (PFS) and the Environmental Impact Statement (EIS). In reviewing the documents, we have determined that this mining project will use a new method of mining not done in the northern Saskatchewan previously. The method is known as In Situ Recovery or (ISR). The community has yet to understand the mining methods used at McArthur River and the



technology behind those methods which include raised bore. While we have some interaction with Cameco with occasional visits to the community, there is no sustained education to prepare the community for the transference required to engage in the type of education that is needed to meet the requirements of transference.

KML and NVP must be educated on all aspects of the Denison project to remove limited understanding of the processes that occurred within our traditional territories. We cannot learn how to protect the land if we can understand the math and science involved in mining and environmental protection. KML people require higher education levels because of the collateral effect, on our population caused by industry. We must understand the technological advantages being employed in the Denison Wheeler River Project. This transference of knowledge can occur through a sustained and supported education program.

As a community we need to create better understanding that these new mining methods and advanced technology if we are ever to fully participate in the economy of the future that requires the Uranium from our territory. We also need the improved education to make assurance that stated environmental policies will preform as indicated in the study and subsequent test applications. The community will also require confidence that any environmental incidents are managed in a way that is fully understood by the community.

A long term plan would be to develop and build that capacity in the community to manage the incidents and monitor any environmental cleanup processes. We must be assured that the standards being followed and that as a community, we are able to action a response to mitigate potential environmental impact. This knowledge must become an integral part of the community knowledge and capacity for this project and for uranium exploration and mining in general.

### **3.2 Selection of ISR mining method for high-grade Phoenix deposit**

KML and NVP expect as the Wheeler River project moves through, the regulatory cycle that it will become another uranium operation. This has been our experience for the following projects in northern Saskatchewan; Uranium City, Gunnar, Lorado, Rabbit Lake, Cluff Lake, Key Lake, and McArthur River. Each operation had different mining approaches and environment processes that evolved over time. Wheeler River proposes the ISR method, which we believe will be accepted by the regulators. As such this mining process will evolve and gain knowledge from incidents as others have in the past. It will become a standard for similar type deposits in our territory. We can no longer accept minimal knowledge of this mining method and others at a basic level. We need to understand implicitly with a high general community knowledge of this mining process so that we can meaningfully engage.

“The suitability of ISR mining for Phoenix has been confirmed by significant work completed in the field and laboratory – including drill hole injection, permeability, metallurgical leach, agitation, and column tests. Results demonstrate high rates of recovery in both extraction (+90%) and processing (98.5%) following a simplified flow sheet that precipitates uranium directly from





the uranium bearing solution (“UBS”) without the added costs associated with ion exchange or solvent extraction circuits.”

### **3.3 Environmental advantages of ISR mining at Phoenix**

“The Company’s evaluation of the ISR mining method for Phoenix has also identified several significant environmental and permitting advantages, namely the absence of tailings generation, the potential for no water discharge to surface water bodies, and the potential to use the existing Provincial power grid to operate on a near zero carbon emissions basis. In addition, the use of a freeze wall, to encapsulate the ore zone and contain the mining solution used in an ISR operation, eliminates common environmental concerns associated with ISR mining and facilitates a controlled reclamation of the site. Taken together, the Phoenix operation has the potential to be one of the most environmentally friendly mining operations in the world. Owing largely to these benefits, consultation with regulatory agencies and stakeholder and *rights bearing communities*, to date, has been encouraging regarding the use of ISR mining.”

### **3.4 Education of In-Situ Recovery and Freeze Wall Technology**

Pinehouse as a community will need to learn and understand what these new mining methods are and how they will perform. Members of the community will require a higher level of education to truly gain understanding on these new mining methods. Community will require this knowledge to have confidence in the continued success of the new mining application on our traditional territories. We will also require confidence as a community that any environmental incidents are managed in a way that is understood by the community, ideally as a service provider for environmental incidents. As an example, new terminology and materials are being considered to extract the uranium such as Lixiviant. We need to understand the component of this product. What are the potential effects to the aquifers and waters around Denison and Wheeler River?

### **3.5 Current KML Engagement**

Our community have hosted many community meetings over the years focusing on the mining of Uranium operations since the 1970’s. Most recently we have hosted 24 public land user community information sessions since September 2021. We have gathered the historical information in the region along with current information in preparing for this preliminary document. KML is being funding for this document by Denison and received funding to host public meetings by the Saskatchewan provincial government. We are planning several more engagement sessions to continue to educate ourselves for this project.

Our need to bring a strong educational understanding will be ongoing as momentum for the Wheeler River project increases. This will cause additional community personnel to ask questions about aspects for the project. This will require trusted community process beyond proponent or regulator public postings, intermitted radio announcements, public documentation and required community visit. Community members need to hear from other community



members whom they have trust, that the systems being used to build, mine, mill and operate this project will not cause further harm to the environment and community. We as a community must understand this new knowledge and how this can integrate into our current culture. We must consider the collateral effects this will have to this generation and future generations. This is part of the development request of an Indigenous center of excellence for Uranium Mining.

### **3.6 Cumulative Effects of Uranium Mining to Pinehouse – Center of Excellence**

This information we are collecting needs support to creation of a body of knowledge that other communities can follow. We need to create a historical collection of the variety of information collected by and given to our community. We need to develop an Indigenous centre of excellence because we are the most impacted and first community south of the uranium mining operations. We need to create, collate and make this information available for our people to reference and learn from in a method that works for an Indigenous community.

The institution in Pinehouse, can have a mandate to develop models and processes that will not harm the people of Pinehouse culturally or linguistically. Create a systemic process of building education in the schools and the community. One that can influence how the community members are to engage in the effects of industry on the community. This will also be a research and data storage centre for historical information for the uranium industry and Indigenous community in northern Saskatchewan.

### **4.0 Indigenous Economic Leakage**

KML Metis Local and the Northern Village of Pinehouse perceptions and goals regarding the development of the Wheeler River Project and subsequent regional economic development that will arise will evolve very quickly for our community. We understand that we will not have the capacity to capture much of the economical activity and will lose substantial opportunities through Indigenous economic leakage. We will work in earnest to mitigate this leakage which is prevalent since the start of the uranium mining activity in northern Saskatchewan.

There must be a concerted efforts by Industry, governments and regulators in partnership with the community to create opportunities for community organizations and members to build businesses that can assist industry. This can be accomplished by creating an incubator program for business support for start ups to evolve capacity.

### **4.1 Development of the Denison Wheeler River Mine:**

Notwithstanding the current western societal effects of colonization and ongoing racism against Indigenous people and the ongoing targeted distraction campaign on Pinehouse through the Freedom of Information request. There is a consensus among community members that development of this mining and milling project will benefit the community of Pinehouse. The community appreciates that Denison is materially trying to evolve the engagement process with Indigenous communities with a focus on Indigenous right bearing communities such as Pinehouse and KML.



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Our community owned businesses are part of the procurement process. We have also been given capacity to be involved pre-emptively in the Environmental Engagement process. Denison personnel are in constant contact with every component of our community. Denison participated at every significant cultural activity and were materially present at those events, a process that is not lost in by community members.

### **4.2 Historical Treatment from Mining Operations:**

Pinehouse is currently working through colonialism trauma in part caused by historical treatment from mining operation for rights bearing community members. The recent recognition of Metis as Indigenous and as Metis community with protected rights is still not completely understood by the community. Much has been lost throughout our historical connection with the uranium mining on our territory and external agency effects on our community. The ability for the community to recover and evolve as a culturally intact bicultural community with protection for our Indigenous culture and language is paramount to the community support for this project. KML cannot be complicit in the current and future protection of our language and culture. KML understands that this responsibility must be shared with agencies responsible for the degradation of the language and culture and that includes industry. There is opportunity for Denison to be an ally is critical to gaining support for this project.

### **4.3 Modern Technology and Artificial Intelligence:**

Modern technology which includes the use of artificial intelligence will be integral to the success of this new mining method. Our community needs to build and understand what these new technological processes are. We need to fully participate in the education that will be required for this technology for this project. Beyond understanding KML could envision opportunity to work on this project site from the comforts of our community through data links to operate parts of the mill process and to monitor the mining process inter alia. We also envision an ability to provide services such as storage and warehousing services for material required at our community junction that could be transported just in time to the mining operation. These discussion items are not exhaustive but are listed as potential examples that are currently being considered by community. There is an expected dialogue for good faith communication for integrated services for Pinehouse that is constant and meaningful from Denison Mines. This would also alleviate the Indigenous economic leakage and build infrastructure for future development.

**5.0 Road Safety Concerns:** When determining community safety with respect to need for increased transportation for a new operation, we the Indigenous people of KML have the following concerns. We are concerned with state of the existing road from 165 to 914. The road has received upgrades up to the kilometer 75 on highway 165. From Kilometer 75 to Kilometer 112 where Highway 165 ends and Highway 914 begins there is a need for an immediate road upgrade. Highway 914 needs an upgrade in width all the way to Pinehouse to create a more





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industrialized road. We are not looking forward to the spring road conditions with just the current industry activity.

Every community member has reported near miss incidents with the increased traffic caused by the general resurgence of the Uranium Industry using semi truck and heavy hauls to transport material to the operations and project sites. We are all aware that with the increase in incidents and near misses the opportunity for a major incident is inevitable, with the current road conditions. Adding the development of a new Denison mining operation will only increase this potential for incidents for people using this road.

We (KML) travel on this road for a variety of purposes with the most significant use for land use as we hunt and gather our food. We also use the road for both goods and services which are not currently available in Pinehouse. This includes medical trips and furthering our education to meet industry requirement for opportunities. We also need to shop for large tickets items such as vehicles and land use equipment like boats snowmobiles, quads that are able to withstand the wear and tear on gravel roads.

KML community members are a very young demographic with stats Canada reporting over 70% under the age of 29. Each year we have many new inexperienced drivers using these roads for the first time. Most recently we have another 50 community people interested in obtaining licenses for vehicles. The width of the road is an issue when you are meeting with a regular sized semi truck. We are starting to meet many heavy haul trucks which take significant road width to transport materials. Road width limitations are more pronounced in the winter when the snow further limits the roads width at the road edges.

The writer has experienced routinely the need to stop or slow down to a minimal speed of around 20 kilometers to allow for the heavy hauls to pass safely. When you add the rough road conditions, visibility reduction in the winter and summer with dust and snow flurry from large vehicles. This causes unsafe conditions and increases the potential for incidents. The road must be developed to an industrial rating to allow for the increase in industrial use so that members of KML do not experience safety issues. KML is requesting that the Transport Canada, Ministry of Highways respond to the concerns of Pinehouse and inform the community of the plans for road infrastructure development. We would request the road be developed to the standard that the Key Lake and McArthur River road is managed all the way to Junction of Highway 165 and Highway 2.

There is consensus from community that further maintenance of the road from 914 that roadways including the potential for 914 extension which will not only provide assurance to Denison Mines for the Wheeler River project. Early engagement of road management and development for the highway 165 and highway 914 is required to assure the safety of the residence of KML and Pinehouse to prevent any significant incidents.



### **5.1 Emergency Response Services**

Pinehouse will inherit significant impacts from the transportation of goods and services to the mining operations. Safety of our community member is a paramount concern for the community. We will be impacted from increased heavy haul traffic and this will impede our ability to hunt for food. We will also bear the effects of needed emergency services from our community first from the increased need for emergency response, which could dilute the limited emergency response services we currently are provided. We will also inherit any future security emergency requirement and expanded exploration and developmental impacts. We recognize that road development will offer greater opportunity for future development. This consensus does not mean that roadways developments are viewed as risk free. The expectation is that within the life of the mine the community and industry will co-develop capacity to engage in emergency response including environmental spills, traffic incidents, air traffic incidents, emergency road security, search and rescue, fire fighting, and water rescue.

### **5.2 Maintenance of 914 road with 914 Extension:**

KML community members use the road more than any other agency including industry. As such we report to each other any incidents that we experience. We assert that the current road condition on Highway 165 and Highway 914 are not designed for the increased industry traffic and are currently eroding the current condition of the road. NVP and KML are concerned that current capacity for road maintenance from the community members of Pinehouse are not prepared for the additional maintenance requirements for the road becoming a connected road. KML and NVP request further capacity to develop road management capacity so we can provide the support necessary to manage the integrity of the road.

### **6.0 KML NVP Issues and Concerns:**

The idea that we can work together with industry is important if we are to truly achieve reconciliation. KML and NVP work well on what we see as an imbalanced playing field. Yet we understand we must continue to work within this paradigm. We also understand that our community's support can greatly help Denison reach corporate and operational goals. With each concern we ask that Denison review our perspective and approach with solutions to either mitigate impact, find a work around, or ensure remediation or compensation. Our preference is always to ensure an impacts to the land and resources we value are either nil or minimal. Where we have proposed solutions, we want to know the role Denison can play and resources that can be allocated for KML to develop the capacity to exercise those solutions. This must be communicated thoroughly to KML and our community.

### **6.1 Waste Management New Development, Historical Issues**

We have issues on cumulative impacts from historical legacy exploration and mining practices. Not specific to Denison, Cameco or Orano, our land users have often found remnants of past poor exploration practices which are now affecting our continued land use. The abandoned camps and industrial and domestic waste left with no known program for clean up are the most



significant of these remnants. We would like the EIS to host in partnership with provincial government regulators to host a conversation on progressive reclamation of these legacy sites.

This conversation should prioritise the community capacity and an environmental agent for process that occur on our traditional territories. This conversation could include changing the policies of waste (future waste) being brought into the NAD. Our contention is that waste that is brought into the region should be removed entirely from the region. The need for a regional waste management facility or a transfer station must be developed in partnership with KML.

### **6.2 Loss of Use and Access to Traditional Lands and Resources**

While one project or mining operation does not materially affect our land use practices. The substantial and growing projects and mineral exploration activity severely limits our ability to practice land use for the region north of Haultain River. KML land users' limitation are now experiencing loss of use with some areas leading to complete exclusion for food sovereignty and traditional activities. As an example of this our hunting practices currently use high powered rifles to engage with big game including moose, bear, deer, and caribou in the area. With the significant and growing numbers of projects we do not know how we can continue to practice this method of food gathering in a safe method.

### **6.3 UNDRIP and TRC Protocols:**

KML sees limited mention that this project has respected the intent of the United Nations Declaration on the Rights of Indigenous People or the Recommendations of the Truth and Reconciliation Commission. There is limited opportunity for this project to review the implications of UNDRIP and TRC and how this project will cause to effect for the Indigenous rights bearing members of Pinehouse. This is not case for other agencies providing information for this project. KML request advocacy to increase education for external agencies on the need to develop greater understanding of UNDRIP and TRC calls to actions. These agencies can be contractors, regulators, and managers within the companies. This process could be developed if the agencies co develop a centre of excellence in Pinehouse.

### **6.4 Co-Management, Food Sovereignty and Metis Land Access:**

Other potential KML impacts is from increased development and access to our territory. Current provincial regulation of hunting, fishing, tourism, resources development and increase human traffic will affect and limit our ability to practice our protected rights. Western business with greater acumen may displace economic activity as we are still evolving our understanding of the industry business practices. KML request further study on how current provincial regulations including opportunity for co-management so lessen the impacts from this project and from increased encroachment.

### **6.5 Waste Management Plan:**

Waste generated from the operation, construction and maintenance of mines and exploration projects need to be better understood by the community. KML is of the view that waste



## **KML Metis Local**

management may represent the greatest source of environmental liability arising from this project and the mining industry in northern Saskatchewan in general. KML request that planning for waste management including capacity for Pinehouse to host a waste management company and a transfer station in Pinehouse to be considered. As a community that uses this land for food, shelter and culture we want the capacity and responsibility to manage waste for this project and the industry in general and prepare for future development.

### **7.0 Closure**

KML and NVP would like to thank the proponent Denison Mines Inc., for the opportunity to participate in the preliminary comments while creating the EIS. We look forward to working with the proponent in a respectful and constructive manner. We are extremely pleased by Denison proactive and best in class engagement practices and look forward to meeting at a mutually benefit reality for this project that exceeds all our expectation and combined efforts.



## KML Metis Local

### 8.0 References

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### 9.0 Signature Page

Signature Redacted

Mike Natomagan, President

Signature Redacted

Walter Smith, Writer





# **Denison Mines Corp. Wheeler River Uranium Project Draft Environmental Impact Statement**

## **Technical Review**

**February 28, 2023**

**Submitted by:  
Birch Narrows Dene Nation**



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# 1.0 Introduction

Denison Mines Ltd (Denison; the Proponent) has proposed a new uranium mining and processing operation called the Wheeler River Project (the Project). The Project is located next to Saskatchewan Highway 914 between the McArthur River and Key Lake operations, about 230 km as the crow flies east northeast of Turnor Lake (Figure 1). The Project is located within the Ancestral Lands of Birch Narrows Dene Nation (BNDN).

The Project is currently undergoing a joint Federal and Provincial environmental assessment under the *Canadian Environmental Assessment Act 2012* (CEAA 2012) legislation. Through the CEAA 2012 process, Denison must prepare an Environmental Impact Statement (EIS) which documents the expected environmental, social and cultural impacts of the Project. BNDN has been provided funding by the Canadian Nuclear Safety Commission (CNSC) to review the draft EIS to assess the potential impacts of the Project on BNDN Treaty and Aboriginal rights and interests.

In this report, BNDN has prepared comments on the draft EIS. Each comment includes recommendations to the CNSC and Denison on how to avoid, mitigate, accommodate or compensate for potential adverse impacts to BNDN Treaty and Aboriginal rights and interests.

## 1.1 Acknowledgement

Birch Narrows Dene Nation would like to acknowledge that the Wheeler River Project is located in an area of extensive traditional land use by English River First Nation (ERFN) and other Indigenous groups. While the Wheeler River Project is located within BNDN's Ancestral and Treaty Lands and BNDN has historic and current land use and cultural sites near the Project site, BNDN recognizes the direct impacts of the Project upon ERFN. As such, BNDN would like to work collaboratively with Denison to develop an agreement that contains environmental protection and accommodation measures commensurate with the magnitude of impacts on our Treaty and Aboriginal rights to mitigate any potential impacts related to the Wheeler River Project.

## 1.2 Birch Narrows Dene Nation

Birch Narrows Dene Nation is a Denesųliné First Nation band within the meaning of the Indian Act (Canada) and an Aboriginal people within the meaning of Section 35(1) of the Constitution Act, 1982 (Canada). BNDN members have occupied the lands of Dene Nene or "Land of the People" in northern Saskatchewan since time immemorial in accordance with our own laws and system of government. Today, BNDN is a diverse and vibrant community of Dene, Cree and Métis citizens with 812 registered members. BNDN has 3 reserves, one at Turnor Lake (IR 193B) adjoins the village of Turnor Lake Saskatchewan and is the main reserve for BNDN. Churchill Lake (IR 193A) is at the junction of Churchill Lake and Frobisher Lake, and Turnor Lake (IR 194) is on Peter Pond Lake east of Dillon, SK. BNDN's vision is a healthy, self-reliant, educated, and united community. BNDN's mission is to provide good governance and create opportunities for the wellbeing of all members.



As a signatory of Treaty 10, BNDN asserts that Treaty 10 was not an agreement to surrender lands and resources. As such BNDN laws, customs and jurisdiction still apply to our Ancestral Lands. There are cultural sites and artifacts left throughout the region that are significant for our members. Our community members continue to hunt, fish, gather and trap on the lands throughout our Ancestral Lands. Any direct or cumulative impacts from development could negatively affect our ability to exercise Aboriginal and Treaty rights, including the livelihoods of those who live off the land. The lands, waters and resources throughout our Ancestral Lands are essential to the well-being and survival of our First Nation.

The BNDN Traditional Use Study Specific to Nexgen's Proposed Rook 1 Project (Firelight Research Inc., 2019) reports the following BNDN historical context:

*Chief Raphael Redshilldkze signed Treaty 10 on behalf of the Clear Lake Band on August 28, 1906. Treaty 10 was based on other numbered treaties, and included the following standard hunting, trapping, and fishing rights clause:*

*And His Majesty the King hereby agrees with the said Indians that they shall have the right to pursue their usual vocations of hunting, trapping and fishing throughout the territory surrendered as heretofore described, subject to such regulations as may from time to time be made by the government of the country acting under the authority of His Majesty and saving and excepting such tracts as may be required or as may be taken up from time to time for settlement, mining, lumbering, trading or other purposes. (Indian Claims Commission 1995, p.56)*

*The Clear Lake Band later came to be known as the Peter Pond Band. This Band was separated in 1972 into the Buffalo River Band and Turnor Lake Band; today, they are known as the Buffalo River Dene Nation and the Birch Narrows Dene Nation (Indian Claims Commission 1995).*

BNDN members continue to exercise our Treaty and Aboriginal rights including hunting, trapping, fishing, plant gathering and cultural/spiritual practices in the immediate area of the Wheeler River Project and throughout our Ancestral Lands.

BNDN has constitutionally protected Treaty rights, inherent Aboriginal rights, Aboriginal title and interests in and to Dene Nene. BNDN must be consulted and accommodated by the Crown with respect to potential impacts on our rights.

## **2.0 Denison Mines Wheeler River Project**

Denison Mines Ltd has proposed to construct, operate and decommission the Wheeler River uranium Project. Denison is the 95% owner of the Wheeler River Project and is advancing the Project through concurrent Federal and Provincial Environmental Assessments under the Canadian Environmental Assessment Act 2012 (CEAA 2012). The Canadian Nuclear Safety Commission (CNSC) is the Federal Agency responsible for the Federal approval of the environmental assessment of the Project. The

Saskatchewan Ministry of Environment is the Provincial Agency responsible for the Provincial environmental assessment approval.

Denison expects to produce approximately 70.2 million pounds of  $U_3O_8$  over a 20 year mine life. The Wheeler River Project has 2 uranium deposits, the Phoenix and the Gryphon deposits. The Phoenix deposit is very high grade (19%  $U_3O_8$ ) and contains about 70.2 million lbs of  $U_3O_8$ . The Gryphon deposit is lower grade (but still high grade by global standards) at 1.8%  $U_3O_8$  and contains 49.9 million pounds of  $U_3O_8$ . While the Gryphon deposit is described on Denison's website, the Phoenix deposit is the only deposit considered in the environmental assessment. The Gryphon deposit is not suitable for in situ recovery mining (the mining method proposed for the Phoenix deposit) and would require conventional long hole mining similar to other mines in the Athabasca Basin. Denison has not stated publicly whether they intend to proceed with developing the Gryphon deposit.

The Project is located in the eastern Athabasca Basin next to Saskatchewan Highway 914 between the McArthur River and Key Lake operations, about 230 km as the crow flies east northeast of Turnor Lake (Figure 1). The Wheeler River Project is unique in that it will be the first uranium mining project in Canada to employ the in situ recovery (ISR) method of extracting uranium from the ore body. ISR mining is very different from conventional mining operations including other uranium mining operations in the Athabasca Basin. Instead of an open pit or underground mining operation where ore is blasted and hauled to the processing facility on site, the ISR method injects an acidic liquid (called a lixiviant) into the ore body through groundwater wells. The lixiviant dissolves the uranium in the ore body, and a different groundwater well pumps the lixiviant back up to the surface once it is impregnated with dissolved uranium (Figure 2). When the lixiviant is pumped back up to surface with the dissolved uranium in it, it is called a uranium bearing solution (UBS). The UBS is then sent to the processing facility on site where the uranium is removed from the UBS and converted into yellowcake (Figure 4). Yellowcake is a solid uranium concentrate that is the final product from the mine that will be sent for further processing off site.

Denison selected the ISR method of mining after considering 32 alternate mining methods in their preliminary economic assessment (PEA) the PEA found that the orebodies at the Wheeler River Project are well-suited for ISR mining because the ore body is very porous (the lixiviant can flow through the ore body very easily but the rock right below the ore body is not porous (water moves through it very slowly). To ensure that the lixiviant used to dissolve the uranium does not contaminate the surrounding groundwater, Denison proposes to construct a freeze wall around the mining area. The freeze wall will be built by drilling holes around the ore body that will be cased and then have a freeze brine pumped through the drill hole. The freeze brine will freeze the surrounding bedrock so that the ISR mining does not contaminate the surrounding groundwater. Freeze walls have been used extensively at other mines in Saskatchewan including at McArthur River and Cigar Lake to prevent groundwater from entering the mines. Denison is planning to install 300 freeze wells around the ore bodies to create a continuous freeze wall all the way around the deposits.

Once the UBS is brought to surface, radon will be purged from the UBS prior to storage in the UBS holding area. The UBS will then go through a multi-step precipitation circuit which will use chemicals to separate out the yellowcake. The leftover liquid from the processing circuit will be treated in a water treatment plant before being discharged into Whitefish Lake or recycled into the ore deposit as lixiviant. Solid wastes will be stored in a precipitate storage area, with the intention of processing the precipitates at the McArthur or Key Lake mills towards the end of mine life to remove the remaining uranium in the precipitates.

Because the Project will be mined using the ISR method, decommissioning and closure of the Wheeler River Project will be different from other mines. In particular, Denison plans to flush out the ore zone to remove any residual contamination from the ISR before they decommission the freeze wall.



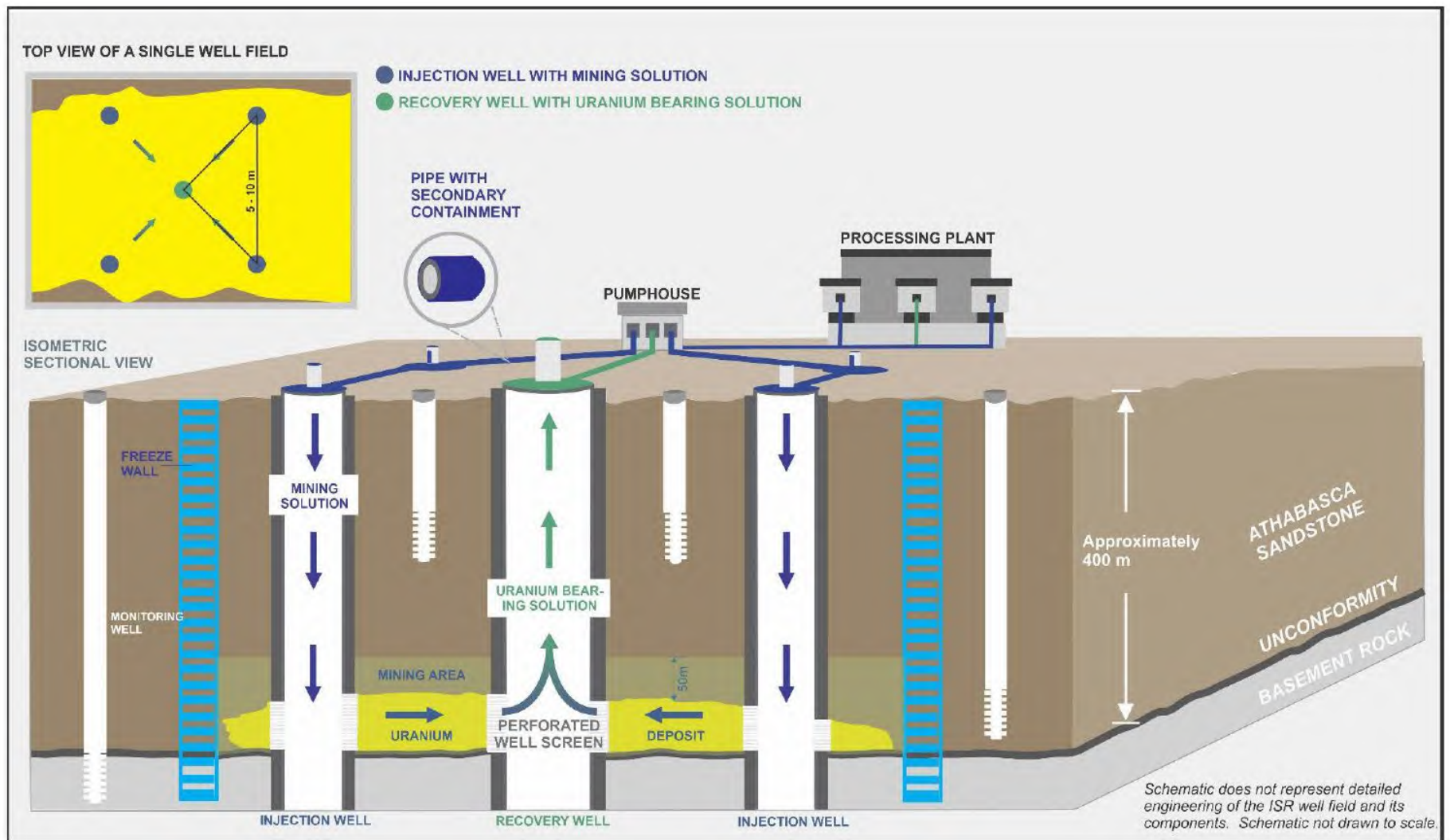
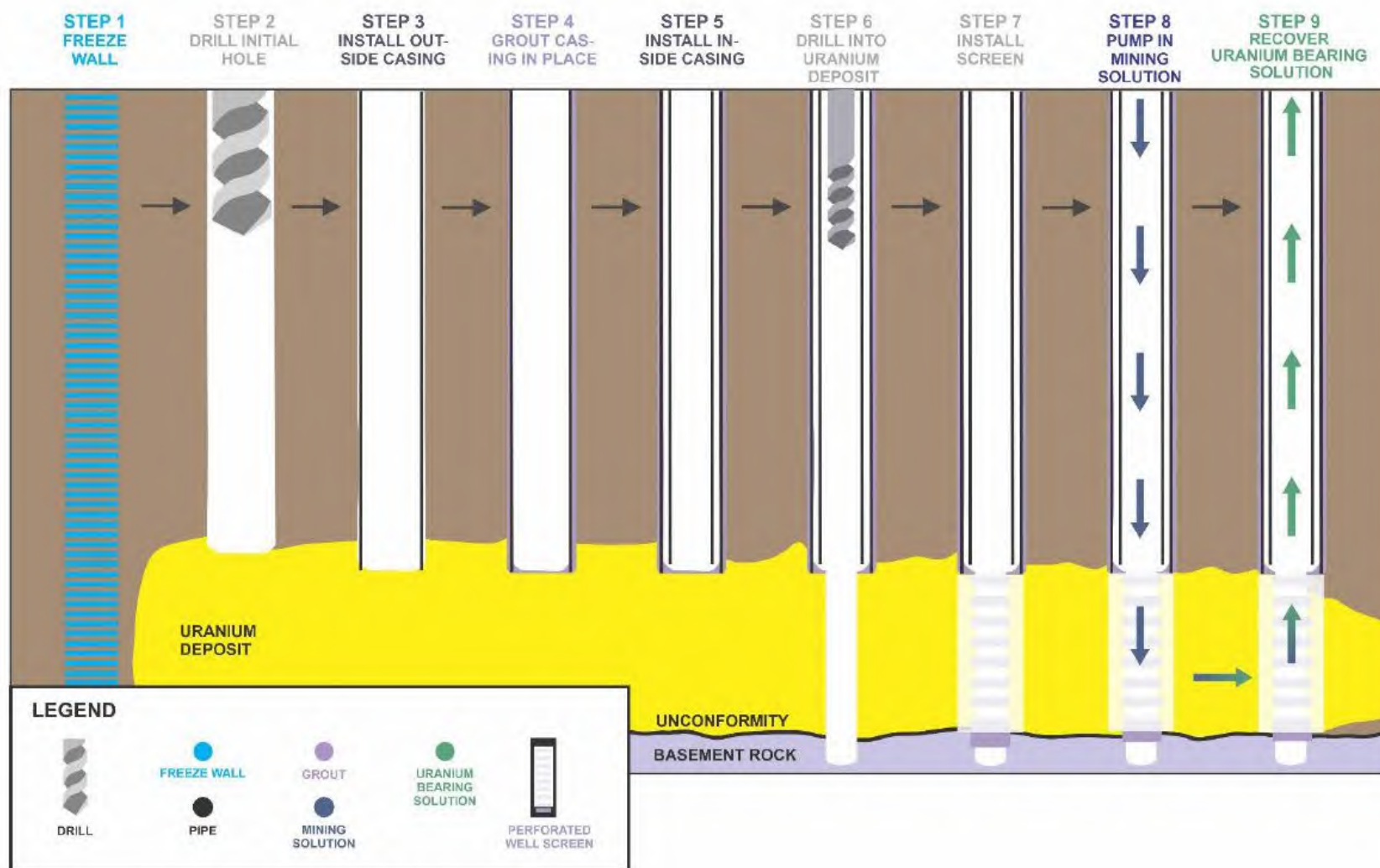


Figure 2: Overview of the In Situ Recovery Process (Wheeler River EIS Executive Summary page 14)





Schematic represents injection and recovery well installation concept at the prefeasibility stage. Details of well design, installation, and dimensions may be refined. Schematic not drawn to scale.

Figure 3: Proposed installation sequence (Denison, 2022)

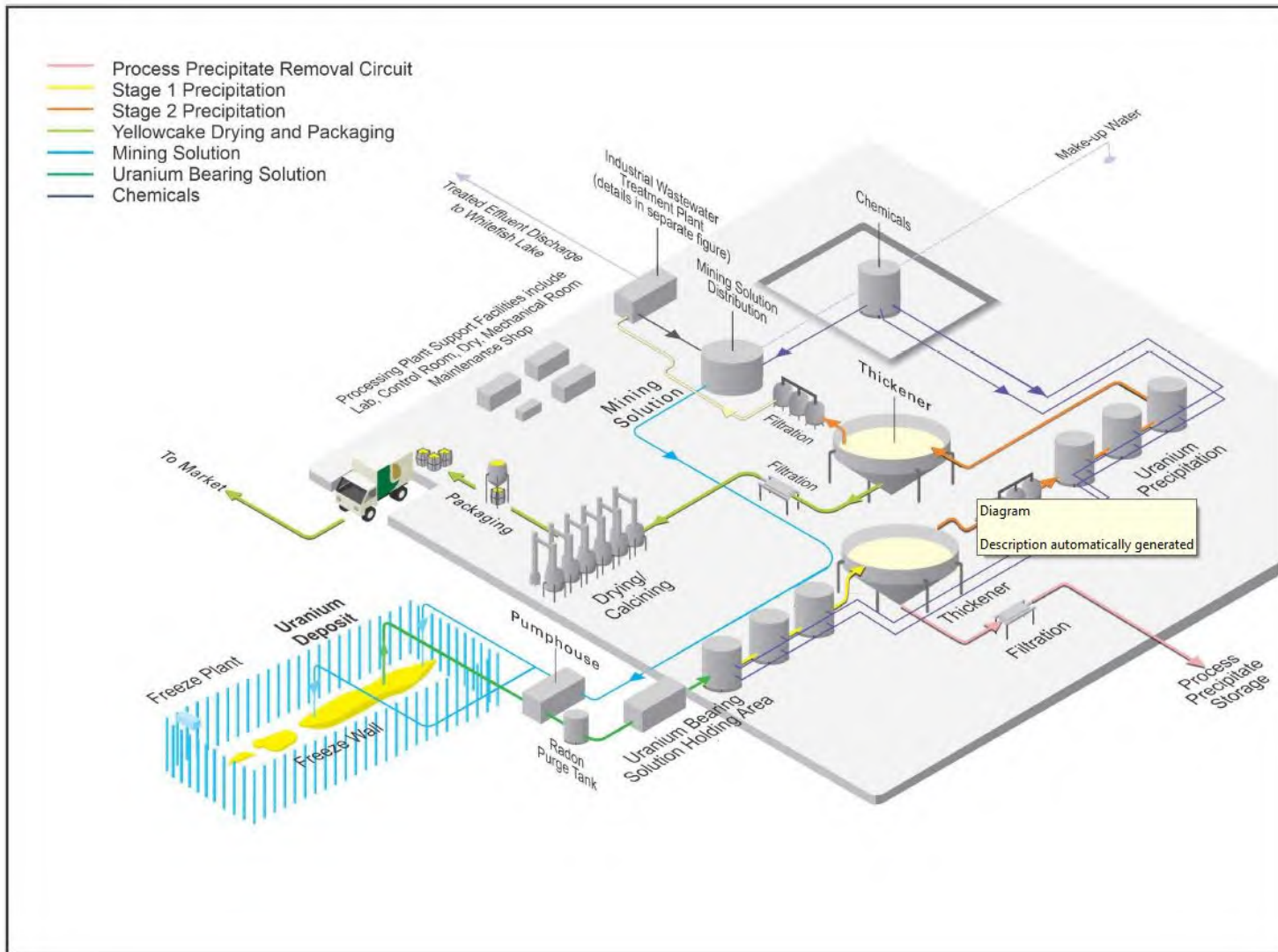


Figure 4: Overview of the Processing facilities at Wheeler River (Wheeler River EIS Executive Summary page 17)

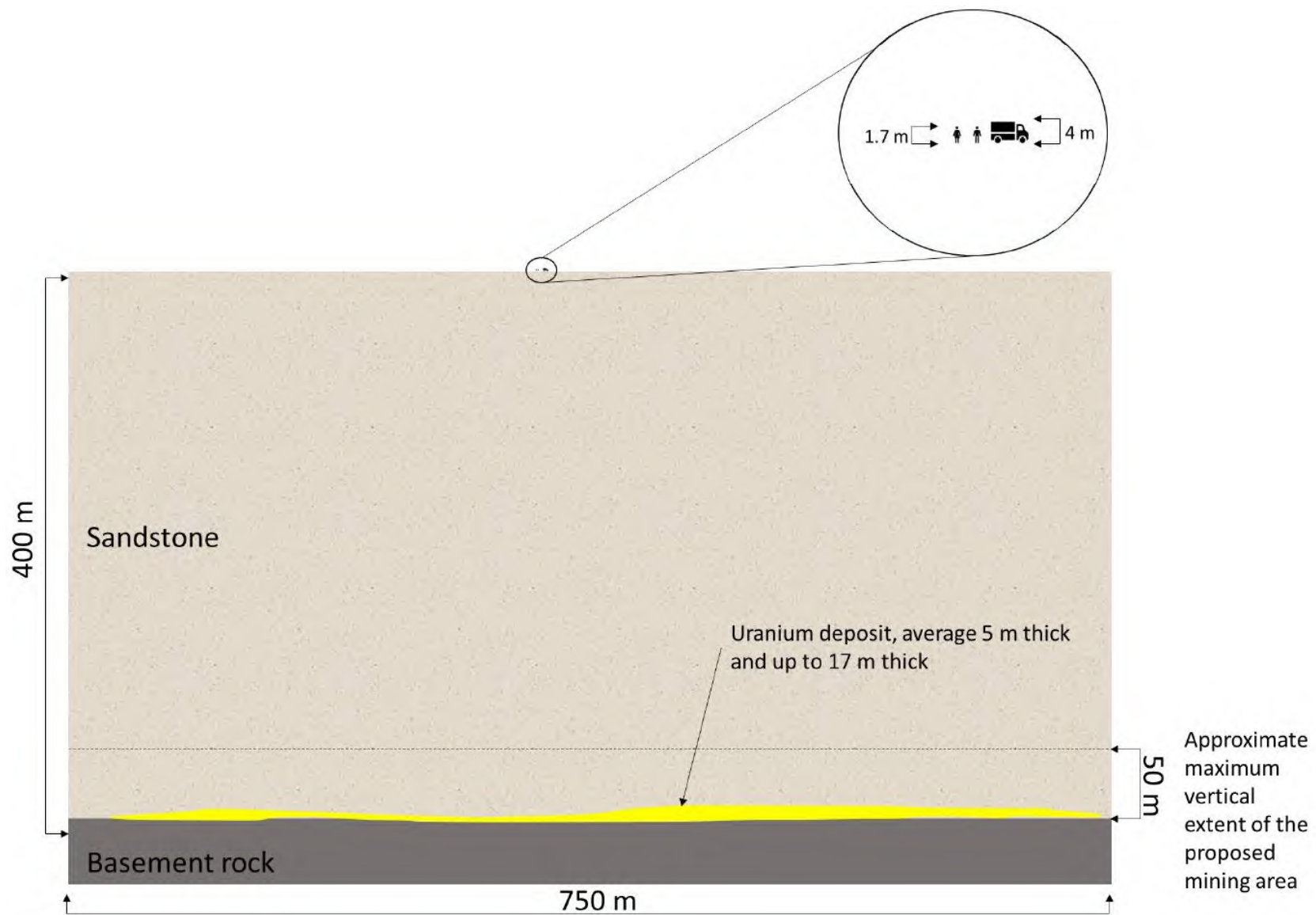


Figure 5: Figure showing scale of ore body and overlying sandstone in comparison to a person on surface (Denison, 2022)



### **3.0 Community Engagement on the Draft EIS**

BNDN council members and lands department staff met with Denison on February 14, 2023 in Saskatoon for an introduction to the Wheeler River Project. As of the time of submission of this review, BNDN has not yet held a community meeting on the Wheeler River project. BNDN anticipates holding a community meeting on the Project in March or April 2023.

## **4.0 Technical Review of the Draft EIS**

BNDN has undertaken a technical review of the license revocation application for the Project, including the baseline documents and technical appendices. This technical review is divided by discipline in Sections 4.1 through 4.7 and is focused on information gaps, deficiencies in data, underrepresentation of potential effects, inadequate monitoring, and lack of involvement of BNDN. All of these priorities for BNDN comments are discussed through the lens of potential impacts of the Project on BNDN Treaty and Aboriginal rights, interests and claims.

### **4.1 Indigenous Knowledge and Land Use and Cultural Heritage**

#### **Indigenous Knowledge and Land Use**

Denison has included the consideration of Indigenous Knowledge and Land Use in its development of the EIS. Communities that have shared Indigenous Knowledge reports include English River First Nation, Kineepik Metis Local #9 and the Ya'thi Néné Lands and Resources Office for the Athabasca Denesųliné First Nations.

In addition, Denison is in the process of supporting several activities to aid in community-led collection of additional Indigenous Knowledge and Land Use, which Denison intends to integrate into its EIS process.

Denison's assessment of Indigenous Knowledge and Land Use included the consideration of "Indigenous Land and Resource Use" (ILRU), "Other Land and Resource Use" (OLRU), and "Cultural Expression." ILRU considered traditional practices of land use including gathering materials for non-commercial purposes by Indigenous peoples, while OLRU considered recreational and commercial use of resources by both Indigenous and non-Indigenous peoples. Cultural expression considered activities Indigenous peoples take part in that support cultural continuity – specifically knowledge transmission and traditional diet.

For ILRU, the key indicators of resource availability, land and waters available for traditional practices and perceived suitability of land and resources for aesthetics were not carried forward to residual effects assessment as Denison perceives they can be managed through mitigation measures. With mitigation measures, Denison notes that residual effects of the Project and cumulative impacts may result in increased competition in the area, which could impact community perceptions of using the area. Denison proposes monitoring activities related to the biophysical environment to monitor these activities.

For OLRU, the Project is similarly anticipated to have an impact on the perceived suitability of the lands and resources close to the Project Area. Denison proposes to deal with residual issues through the development of management plans, emergency response programs, and by minimizing the amount of land disturbed. Denison also proposes to enter into a relationship with any commercial land users impacted by the Project. While the Project may result in increased competition for commercial

resources, Denison notes that resource use activities are regulated by the Province, which may mitigate this issue. Monitoring for biophysical elements is proposed for OLRU.

Finally, for cultural expression, Denison notes that the Project may change the location of cultural practices that support knowledge transmission. Denison notes that the anticipated lack of impact to cultural camps, a small Project footprint and likely persistence of ILRU activities may minimize this impact, however. Denison also intends to have a worker rotation system, which will ensure Project employees can participate in traditional land use activities. Impacts to traditional food are anticipated to be low in magnitude.

The current footprint of the Project is located within the treaty and ancestral lands of BNDN. The proposed location retains both current and historical significance to the community; however, BNDN Indigenous Knowledge and Land Use has not yet been included or considered in Denison's EIS. A fulsome consideration of BNDN's Indigenous Knowledge and Land Use is required to assess the impacts the Project may have on BNDN's rights and interests and contribute to a baseline of ecological knowledge and cultural use in the area. The negotiation of the Study should be part of a broader process agreement. The information BNDN provides should be considered within the EIS process and may result in a different effects assessment.

### **Cultural Heritage**

The Project is situated within a region the Government of Saskatchewan's Heritage and Conservation Branch classified as being sensitive for heritage resources. Denison conducted two Heritage Resource Assessments during baseline studies and identified two archaeological sites within the Project Area. Both sites contained a single artifact. The Heritage and Conservation Branch assessed the sites as retaining low interpretive value and advised that the Project continue as planned.

Notwithstanding, Denison has also developed a Heritage Resource Management Plan to account for artifacts that may be unintentionally discovered during development activities. The Plan includes the requirement for any archaeological site to be assessed by a qualified archaeologist, local discussions with Indigenous leadership, and working with the Heritage Conservation Branch to identify appropriate mitigation measures.

Given the above findings and measures to address unidentified sites, the effects assessment determined any residual effects to heritage resources to be not significant.

The cultural heritage work does not currently include any Indigenous Knowledge, Land Use and Occupancy information from BNDN; this information should be considered to strengthen the assessment given the location of the Project in the traditional and treaty lands of BNDN. Some of the methodology used by the archaeologists to conduct the assessment may not have been the most rigorous; however, consideration of any potential additional sites by BNDN may alleviate this. The Heritage Resource Management Plan is likewise a positive addition to account for any unidentified sites;

however, this Plan would be strengthened with more robust language around commitments to the involvement of Indigenous communities.

## Key Issues

- BNDN Indigenous Knowledge and Land Use has not yet been included or considered in Denison's EIS. A fulsome consideration of BNDN's Indigenous Knowledge and Land Use is required to assess the impacts the Project may have on BNDN's rights and interests and contribute to a baseline of ecological knowledge and cultural use in the area.
- The cultural heritage work does not currently include any Indigenous Knowledge, Land Use and Occupancy information from BNDN; this information should be considered to strengthen the assessment given the location of the Project in the traditional and treaty lands of BNDN.

*Table 1. Comments and recommendations for the Wheeler River EIS related to cultural heritage, Indigenous knowledge and land use*

#	Document Reference	Comment	Request/Recommendation
1.	Wheeler River Project Draft EIS – 5.7; 5.8.1	The Project is located within the treaty and ancestral lands of BNDN and maintains both current and historical significance to the community. BNDN Indigenous Knowledge, Land Use and Occupancy are not currently considered within the EIS. Should the Project proceed without the consideration of BNDN's Knowledge, Land Use and Occupancy, it may cause irreparable loss of culturally significant sites and access to resources that the community depends upon. It may also contribute to a loss in cultural transmission.	<p>a) Denison should provide BNDN with funds to conduct a community-led Indigenous Knowledge, Land Use and Occupancy Study for consideration within the EIS process. At minimum, the Study should consider BNDN's Indigenous Ecological Knowledge, commercial and non-commercial harvesting practices, and cultural occupation of the region (including historical sites). The Study should also consider cultural transmission, information about the history of the area and BNDN community members' perspectives on the Project.</p> <p>b) The community-led Indigenous Knowledge, Land Use and Occupancy Study should be a component of a broader process agreement between BNDN and Denison that serves as a pathway for obtaining BNDN's consent for the Project.</p>

			<p>c) Denison should work with BNDN to consider the appropriate integration of the results into all aspects of the EIS and management/monitoring plans, as well as any additional appropriate mitigation and/or accommodation measures.</p>
2.	<p>Heritage Baseline Study 2017 (Golder); Heritage Resource Impact Assessment 2020 (Golder); Heritage Resources Management Plan 2022 (Canada North)</p>	<p>Archaeology as a profession has been dominated in North America by non-Indigenous researchers, despite most sites being Indigenous in origin. It is positive that Golder Associates made efforts to engage and involve Indigenous communities (by including an ERFN representative in fieldwork and by considering ERFN and Pinehouse Kineepik Metis land use maps) in their 2017 heritage baseline study and 2020 heritage resource impact assessment. Notwithstanding, the proposed Project area is within BNDN's treaty and ancestral lands and there may be heritage sites that the community is aware of. BNDN was not involved in either of these studies and BNDN may have Indigenous Knowledge of important heritage sites within the Study Area that should be considered.</p>	<p>a) Denison should provide BNDN with funds to conduct a community-led Indigenous Knowledge, Land Use and Occupancy Study for consideration within the EIS process.</p> <p>b) The Heritage Resources Management Plan should be updated following the consideration of Indigenous Knowledge, Land Use and Occupancy provided by BNDN. This may result in the requirement for further assessment and/or mitigation measures, which should be developed in consultation with BNDN.</p> <p>c) Denison should facilitate BNDN involvement in any additional archaeological fieldwork that takes place, including providing BNDN with capacity funding for members who participate. Terms to facilitate BNDN involvement in future archaeological work should be a component of a broader process agreement between BNDN and Denison.</p>
3.	<p>Heritage Baseline Study 2017 (Golder) – methods; Heritage Resource Impact Assessment 2020 (Golder) – methods</p>	<p>The methodology within both the 2017 and 2020 heritage studies included 'judgmental' shovel probing and initial troweling through soil to identify cultural heritage material. While the discretion of a professional archaeologist needs to be taken into account, relying subjectively on which areas to shovel test and not employing</p>	<p>a. BNDN recommends that Denison undertake further archaeological investigations based on the results of the BNDN TKLU study prior to construction of the project.</p> <p>b. Future archaeological assessment programs should be designed</p>

		<p>a systematic approach is not reproduceable and may result in sites being missed; this is of particular concern given that large sections of the areas retaining potential were not subject to shovel testing. Further, troweling through soil rather than subjecting all excavated soil to sifting through 6mm mesh means that artifacts/ecofacts may easily be overlooked. Given that the north of Saskatchewan has not been thoroughly investigated archaeologically, and given that 76 sites and nine find areas were recorded just 35 km south of the Project area as part of Dr. David Meyer's multi-year archaeological investigation, the results of these assessments do not seem rigorous.</p>	<p>collaboratively with BNDN and other Impacted Indigenous Nations.</p>
4.	<p>Heritage Baseline Study 2017 (Golder) – methods; Heritage Resource Impact Assessment 2020 (Golder) – methods</p>	<p>The presence of strandlines are noted as being an indicator of archaeological potential; however, it is unclear within the reports whether any strandlines are present within the Study Area. Most of the investigations and shovel probes that took place were around existing waterbodies.</p>	<p>Please indicate whether strandlines are present anywhere in the Study Area.</p>
5.	<p>Heritage Baseline Study 2017 (Golder) – methods; Heritage Resource Impact Assessment 2020 (Golder) – methods</p>	<p>It is unclear whether the locations identified by other Indigenous communities in their Land Use maps were investigated archaeologically and subject where appropriate to shovel testing. Knowing this will give confidence to BNDN that areas they may identify as retaining potential may undergo further assessment if necessary.</p>	<p>Please indicate whether the areas identified by other Indigenous communities in their Land Use maps were investigated archaeologically.</p>

6.	Heritage Resources Management Plan 2022 (Canada North) – 4.0	The archaeological context provided is very Western/Scientific. Denison must also include historical/pre-historical accounts of Indigenous communities to provide an appropriate and comprehensive assessment of the archaeological context of the region.	Denison must include a write-up of Indigenous historical and prehistorical accounts in consultation with relevant Indigenous communities. This write up must include historic context provided through oral history interviews as part of BNDN's community-led Indigenous Knowledge, Land Use and Occupancy Study for the Project.
7.	Heritage Resources Management Plan 2022 (Canada North) – 5.1 1e & 1f	BNDN notes that there has been limited engagement of our Nation as part of the archaeological baseline studies undertaken at the site. The Wheeler River Project is within our Treaty and Ancestral Lands where our members have deep ancestral ties and continue to exercise our rights to this day. As stewards of the land since time immemorial and holders of both Treaty and Aboriginal rights in the Project area, Denison must engage with us as partners on their activities on our lands. This includes their planning and decision-making related to archaeological materials to which our members have ancestral and spiritual ties.	Indigenous communities should be consulted and engaged in decision making rather than merely informed if the archaeological material is expected to be Indigenous in origin.
8.	Heritage Resources Management Plan 2022 (Canada North) – 5.1 7	Given the Ancestral and Treaty ties our members have to the project area, our members have valuable knowledge and context to inform the Heritage Resource Impact Assessment (HRIA) for the Project that must be considered prior to being reviewed or approved by any regulatory body.	The draft HRIA should be reviewed by BNDN and other impacted Indigenous Nations prior to being submitted for regulatory approval.
9.	Heritage Resources Management Plan 2022	Discerning archaeological artifacts/ecofacts is difficult at times even to the trained eye; consequently, it is important to undergo training to	a) Staff should undergo training regarding the cultural material they may encounter while on site

	(Canada North) – 5.1.1	understand what you could be looking for.	b) BNDN and other Indigenous communities should be invited to attend this training
<b>10.</b>	Heritage Resources Management Plan 2022 (Canada North) – 5.3	In numerous instances the Heritage Resources Management Plan (HRMP), Denison has used noncommittal language to describe future Indigenous engagement related to heritage resources. BNDN notes that engagement of impacted Nations is essential for proper heritage resource management and as such the language in the HRMP should reflect the necessity of this engagement.	Throughout the HRMP, Denison must change the language of “should” to “will” where appropriate. For example: management options <i>will</i> be presented to the applicable Indigenous communities for feedback and <i>will</i> include consultation.
<b>11.</b>	Heritage Resources Management Plan 2022 (Canada North) – 5.3.1	BNDN notes that Section 5.3.1 does not confirm that impacted Indigenous Nations will have the opportunity to participate in future archaeological fieldwork. While BNDN understands that many impacted Nations will have arrangements directly with Denison to facilitate member participation, this should additionally be made available to all impacted Indigenous Nations as part of best practices at the Project.	In addition to any provisions developed in a Project Agreement between BNDN and Denison for the Wheeler River Project, Denison should include a clause that confirms that all impacted Indigenous communities will be invited to have monitors participate in any additional fieldwork and that Denison will provide capacity funding for Nations that wish to participate.



## 4.2 Quality of Life & Economics

This section provides the outcome BNDN's review pertaining to Denison's assessment of the Project's impacts on Quality of Life (Section 12) and Economics (Section 13) in the EIS. A summary of EIS content and key issues follows, with comments and recommendations set out in the table below.

Despite these sections being separate in the EIS, it is appropriate that BNDN has considered them together in this review given the interconnectedness of their impacts and their interconnectedness in BNDN's objectives related to the Project. **Given the impacts and risks BNDN will experience during the life of the Project, it is necessary in the context of the Duty to Consult and Accommodate that BNDN experience corresponding economic benefits, including the provision of jobs for BNDN members, contracts for BNDN businesses, and training and capacity building to support BNDN's participation in all aspects of the Project. However, it is also essential that BNDN realizes these benefits in a culturally appropriate way, and in a way that holistically upholds community well-being, by protecting traditional land use and cultural practices and preventing potential negative impacts such as exacerbating mental health and substance abuse issues, or the issues associated with a transient workforce.** The area described as the "Local Study Area" and "Regional Study Area" in the EIS is BNDN's home, and BNDN will remain living here long after the Project's life cycle is complete. It is therefore of utmost importance that Denison considers the long-term well-being and way of life of BNDN in a holistic way with the Project's potential economic benefits.

Section 12 of the EIS assesses the impact of the Project on Quality of Life. Denison has split the section into three distinct subsections:

1. **Cultural Expression** – potential project impacts on land use, knowledge transfer and traditional diet
2. **Community Well-being** – potential project impacts on population, demographics, employment, education, and community cohesion
3. **Infrastructure and Services** – project impacts related to traffic, community infrastructure and services, and emergency services capacity.

Section 13.0 of the Wheeler River Project EIS discusses the economic impact of the Project. A review was completed in collaboration with BNDN to comment, identify potential concerns/deficiencies, and provide recommendations to reduce the impact of the Project on BNDN and enhance community benefits. Economy selected as a VC because the Project will alter the local and regional economy positively and negatively. Denison uses the following key indicators to assess the economic impact of the Project.

1. **Employment & Training** – jobs (direct and indirect) and mine related training programs
2. **Increase Income** – Provide higher paying employment for local residents, priority hiring for local people
3. **Business Opportunities** – contract opportunities for local and regional businesses including Indigenous Businesses
4. **Government Revenues** – tax revenue and royalties for provincial and federal governments

**5. Traditional Economy** – Potential impacts on participants in the traditional economy (e.g., harvesting, arts & crafts, guiding)

Denison expects the Project to employ a workforce of three hundred during the Construction phase and 180 during the Operations phase. Denison has committed to provide residents and communities in the Local Study Area (LSA) priority for employment and training and business opportunities, followed by Indigenous and/or other communities in the RSA. Denison expects the total capital costs for the Project to be approximately \$387 million. Denison expects the total annual operating costs for the Project to be approximately \$39 million per year to cover administration, camp operations, labour, and maintenance costs (Denison, 2022).

Section 12 and 13 of the EIS present demographic and labour market statistics on each key indicator from Statistics Canada and provincial data. The EIS also include results of engagement with other local First Nation and Metis groups including Health and Socio-Economy Studies and Indigenous Knowledge Studies. There was extensive discussion on the perspectives and impacts of neighbouring First Nations and Metis groups, but no discussion on the Project's impact on BNDN from an economic or quality of life perspective. Denison did not conduct any primary research with BNDN to assess the Project's impact.

The EIS discusses the potential negative impacts of the Project on the Traditional Economy and Community well-being. Members of local Indigenous communities including BNDN rely on a subsistence-based economy where the harvesting of wild food and other materials from the lands and waters is an essential element of the economy and culture. Local community members depend on the water, land, and animals for their livelihood and income. The Project has the potential to disrupt the Traditional Economy through increased human industrial activity and alterations to how community members use the land in the LSA. The physical presence of the Project and its activities, including participation in the Project may limit some traditional land and resource activity for some members.

While Denison has considered some of the effects of population changes and increased income caused by the Project and its transient workforce, such as an increased demand for services and housing, the full range of impacts associated with these dynamics of a remote mining project on community well-being have not been considered and proposed mitigation measures are also not sufficient. BNDN has recommended that Denison revise the EIS to include an assessment of all potential effects of a transient workforce and changes to population dynamics, including those disproportionately experienced by Indigenous women and girls, and other segments of the population.

Denison concludes that the Project will have a net benefit to the economy and quality of life. Denison states that the negative effects of the Project can be mitigated and that residual impacts are not significant. Denison will implement mitigation and enhancement measures to ensure the positive effects of the Project on the economy and quality of life including:

- Human Resource Development Plan to prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities. Denison will develop hiring practices, and providing supports to individual workers and, in some cases, their families.
  - Supports could include providing transportation for workers; establishing health and wellness programming; establishing life skills programming; implementing a no drug and alcohol policy on site; and offering culturally sensitive employment policies (e.g., providing a space for an on-site elder counsellor for culturally relevant programming).
- Establishment of a procurement approach through all phases of the Project, focusing on businesses based within the LSA communities, followed by Indigenous and / or businesses in the RSA.

(Denison, 2022)

#### Key Issues:

- Denison does not consider Birch Narrows a LSA Community and thus is not eligible for priority employment, training or contracting opportunities related to the Project.
- Denison did not gather or incorporate any BNDN specific Indigenous Knowledge or community wellbeing data in the EIS.
- Denison does not have a plan to monitor the socio-economic impacts of the Project.

*Table 2. Comments and recommendations for the Wheeler River EIS related to socioeconomics, employment, and contracting*

#	Document Reference	Comment	Request/Recommendation
12.	EIS Section 13.1.3	BNDN is not included as a Local Study Area (LSA) Community despite being closer to the Project than other LSA Communities. The Project is situated on BNDN's ancestral lands. BNDN members currently and historically use the LSA for harvesting (commercial and personal) and ceremonial purposes.	<p>BNDN must be identified as a LSA Community. BNDN members and businesses must be eligible for LSA priority status for employment, training, and business opportunities. The EIS should be revised accordingly.</p> <p>A formal agreement between BNDN and Denison is required to outline socioeconomic offsetting measures and benefits should the Project move forward.</p>
13.	EIS Section 12.0 & 13.0	There is no BNDN specific Indigenous Knowledge or socioeconomic data presented in the EIS.	Denison must conduct Indigenous Knowledge and Community well-being Study (or similar) to gather BNDN specific information.

			<p>These studies will allow for a more fulsome assessment of the Project on BNDN rights and interests. Additionally, BNDN specific data will enhance Denison's baseline data and help to inform mitigation and monitoring measures.</p>
14.	EIS Section 13.0	<p>Denison does not classify BNDN as a LSA community. As such, members are not entitled to priority training and employment provisions from Denison on the Project.</p> <p>Without the LSA Community designation, BNDN members are less likely to be employed or trained through the Project.</p> <p>Denison references a Human Resource Development Plan (HRDP) as a mitigation measure to ensure local and regional community members are hired in priority. However, Denison does not provide sufficient details to allow Birch to assess the adequacy of the HRDP.</p>	<p>BNDN must be identified as a LSA Community. BNDN businesses and member owned businesses must be eligible for LSA priority status for business and contracting opportunities. The EIS should be revised accordingly.</p> <p>A formal agreement between BNDN and Denison is required to outline socioeconomic offsetting measures and benefits should the Project move forward. This must include ways for BNDN businesses and member owned businesses to participate in the Project.</p> <p>BNDN requests the ability to review and comment on Denison's Human Resource Development Plan to provide input and recommendations to encourage community participation and employment in the Project.</p>
15.	EIS Section 13.3.2.4	<p>Denison does not classify BNDN as a LSA community. As such, BNDN businesses and partnerships are not entitled to priority procurement provisions from Denison on the Project.</p> <p>Denison states that it will strive to "sustain similar participation targets for the Project as experienced across other mining industries in northern Saskatchewan." Denison states it has "established an internal procurement approach that requires the</p>	<p>BNDN must be identified as a LSA Community. BNDN businesses and member owned businesses must be eligible for LSA priority status for contracting opportunities. The EIS should be revised accordingly.</p> <p>A formal agreement between BNDN and Denison is required to outline socioeconomic offsetting measures and benefits should the Project move forward.</p>

		<p>procurement of all goods and services for the Project to first consider businesses based within the LSA communities prior to looking elsewhere.”</p> <p>Without the LSA Community designation BNDN businesses are unlikely to benefit from the Project.</p>	
16.	EIS Section 12.0	<p>While EIS does consider the effects of population changes related to the Project on social adaptability, demand for services and housing, it does not address the full range of potential impacts associated with a transient workforce.</p> <p>Significant research has been conducted to demonstrate the negative impacts of remote workers and work camps on Indigenous women and girls. This must be considered in the EIS.</p>	<p>The EIS must include an assessment of all potential effects of a transient workforce and changes to population dynamics, including those disproportionately experienced by Indigenous women and girls, and other segments of the population. This must incorporate findings of research like the 2017 study completed by Lake Babine Nation and Nak’azdli Whut’en (Indigenous Communities and Industrial Camps), and/or related research in the context of the LSA.</p>
17.	EIS Section 12.0 and 13.0	<p>BNDN notes that no specific management or monitoring plan has been included in the EIS documentation related to the verification of residual socio-economic impacts, both positive and negative, for the local economy.</p>	<p>a) Denison must develop a Socio-Economic Monitoring Plan for the life of the Project to verify the effects assessment included in the EIS and to be included in the Project’s approach to adaptive management. This Plan would include an approach, co-developed with Indigenous groups in the LSA (including BNDN), to monitoring the realization of the benefits and impacts of the Project (e.g., employment and procurement targets, training and capacity building, community investments, etc.) as mitigation and enhancement measures are implemented. Monitoring and subsequent regular evaluation would allow for the real-time adjustment of</p>

			<p>targets and/or an approach to adjusting enhancement measures or identifying offsetting benefits where targets are not met.</p> <p>b) The Crown must include the development of a Socio-Economic Monitoring Plan as a condition of approval for the Project.</p>
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## 4.3 Water Resources

In their EIS for the Wheeler River Project, Denison has undertaken a variety of baseline studies to understand the current surface water and groundwater conditions in the Project area. Denison has also modelled the impacts to surface water and groundwater quantity and quality from the project based on their planned activities at the Project. Because the project is using in situ recovery (ISR) to extract the uranium from the ore body, the project is quite different from other uranium mines in Saskatchewan and has some distinct potential impacts to the environment.

Denison expects the impacts to surface water (lakes and rivers) to be extremely minimal compared to other mining operations as there will be substantially less contact water and groundwater for them to manage through treatment and discharge compared to a conventional underground or open pit mine. In the EIS Denison has assumed that they will not recycle any water from their processing plant even though they expect to be able to recycle process water through the ISR process. Even with this relatively conservative assumption, Denison expects the impacts to Whitefish Lake (where treated effluent will be discharged) to be minimal, with a mixing zone of about 5 m. Denison expects to treat all site water through the industrial wastewater treatment plant (IWWTP) prior to discharge to the environment.

Because they do not need to dewater the groundwater for the mine or overprint any significant water bodies, Denison expects to have very little or no (undetectable to the naked eye) impact on surface water levels in lakes and streams around the project.

With their planned mitigation measures, Denison intends for the groundwater in the mining area to be completely isolated from the surrounding natural groundwater during mining. If their mitigation measures are as effective as they expect, there will be no impacts on the surrounding groundwater during operations when they are using ISR to extract the uranium.

After the mine is decommissioned, the freeze wall around the mining area will thaw and groundwater from the ore body (which will have high concentrations of many metals) will interact naturally with the surrounding natural groundwater. To understand how the groundwater impacted by mining will migrate and evolve over time, Denison has undertaken a detailed analysis of how groundwater will flow (using software called FEFLOW) and how the chemistry of the groundwater will change over time (using a software called PHREEQC). Denison ran several different models to predict how groundwater chemistry will flow and evolve over time. Based on their modelling, they expect mine-contaminated groundwater to flow towards Whitefish Lake. Denison's model indicates that selenium and cobalt will be the only contaminants that reach Whitefish Lake in concentrations above water quality guidelines. They expect the peak contamination of selenium to occur 500 years post-decommissioning of the mine, and peak cobalt contamination to occur 30,000 years post-decommissioning of the mine. Based on their model, they expect the changes to Whitefish Lake from the groundwater migration to be essentially undetectable in Whitefish Lake.

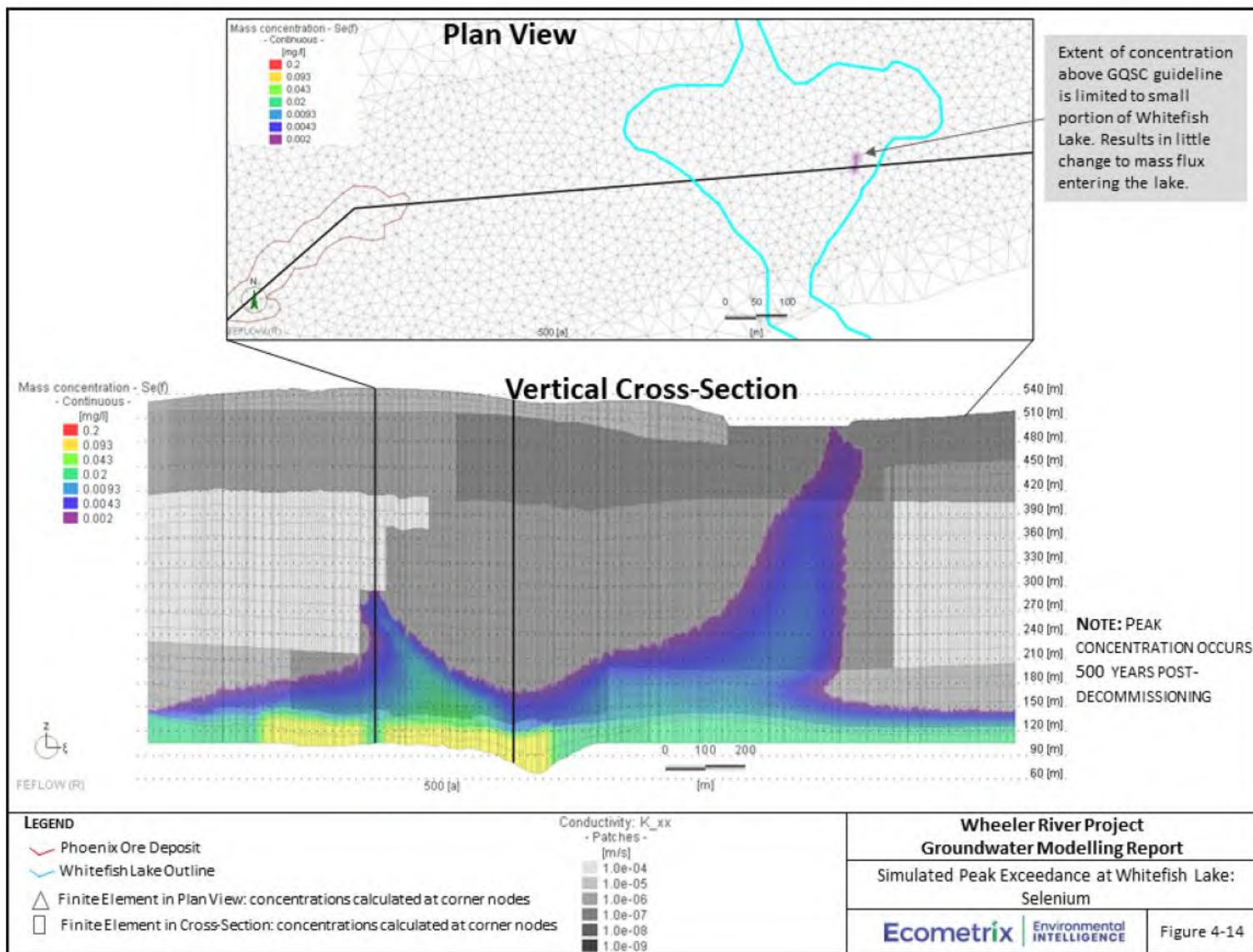


Figure 6: Modelled selenium migration from the ore body post-decommissioning (Ecometrix, 2022)



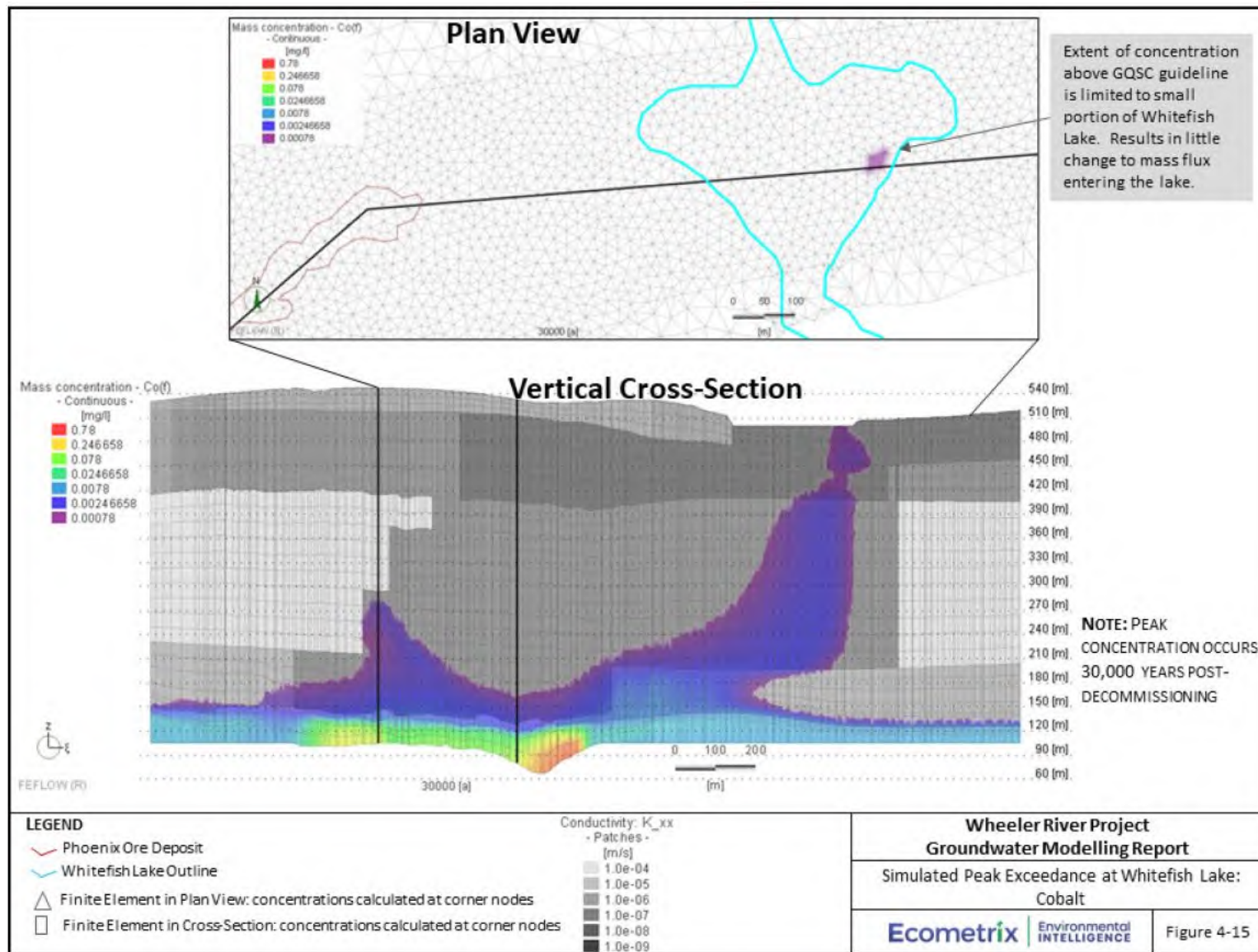


Figure 7: Modelled cobalt migration from the ore body post-decommissioning (Ecometrix, 2022)

### Key Issues:

- Denison has not done baseline work on the background concentrations of mercury in soils and wetlands. Denison notes that increases in nutrient and sulphate concentrations can dramatically alter mercury biogeochemical cycling yet they have done no work to assess the presence of mercury in soils or the potential for increased mercury biogeochemical cycling (including mercury methylation) in the downstream environment
- The groundwater modelling indicates that there will be limited or no significant effects on groundwater quality in the long term. This finding is dependent on assumptions in the model which have very limited research to validate the findings. As such the findings in the groundwater model could potentially underestimate the mobility of many metals (and potential for contamination of the environment) in the post-decommissioning phase of the mine.

*Table 3. Comments and recommendations for the Wheeler River EIS related to water resources*

#	Document Reference	Comment	Request/Recommendation
18.	Draft EIS Appendix 9b Section 2.5.1 and Appendix 8e Table 4	<p>In several instances in the draft EIS Denison has noted that Indigenous Nations are concerned with the possibility of mercury contamination from mining operations. BNDN shares these concerns with other Indigenous Nations. Due to the very low concentrations of mercury present in the Phoenix deposit, Denison has not meaningfully studied the potential impacts the Project may have on altering mercury biogeochemistry in the downstream environment.</p> <p>BNDN notes that background mercury concentrations can be elevated in many unexpected and remote locations due to atmospheric deposition (often due to coal plants) (Jackson, 1997). BNDN is very concerned that Denison has not analyzed for mercury as part of their baseline soil geochemistry assessments for the Project, especially in wetlands downstream of the</p>	<p>a) BNDN requests that Denison undertake baseline studies of mercury concentrations in soils, with a focus on baseline concentrations of mercury in organic wetland soils downstream of the project. Note that mercury sampling should sample total mercury and methylmercury in all analyses, as well as porewater total mercury and methylmercury. The study design and implementation should be undertaken collaboratively with BNDN.</p> <p>b) BNDN recommends that the CNSC requires Denison to undertake a baseline assessment of mercury in soils (with a focus on wetlands) prior to construction of the Project. This may be established as a condition of approval for the Project.</p> <p>c) Depending on the findings of the baseline mercury in soils and wetlands studies, the CNSC should include a condition of approval on the Project that</p>

		<p>Project. Mercury concentrations in wetland soils are sensitive to changes in water chemistry that can lead to increased mercury methylation. This is especially acute from increases in nutrients and sulphates which can active sulfate reducing microorganisms that methylate mercury (Liu, Li, &amp; Cai, 2012). Table 4 of Appendix 8e shows that the effluent discharged to Whitefish Lake will have mercury concentrations almost 5,700 times background concentrations. This dramatic increase in sulfate loading to Whitefish Lake may not exceed water quality objectives unto itself but may be sufficient to meaningfully change mercury biogeochemistry in downstream wetlands.</p> <p>BNDN is very concerned with the complete lack of assessment and analysis of baseline mercury concentrations and the potential changes to mercury cycling that could be induced by the Project.</p>	<p>requires Denison to monitor mercury biogeochemistry in the receiving environment over the life of mine.</p>
19.	<p>Draft EIS Appendix 7c Section 3.5.6.2.1 and Draft EIS Figures 7.6-10 and 7.6-11</p>	<p>Figure 7.6-10 and 7.6-11 of the draft EIS show the results of Denison's modelling of uranium mobility and adsorption from the ore body following the decommissioning of the mine. The figures show that the model indicates that all dissolved uranium will be effectively removed from solution within a short distance of the orebody via adsorption to clays present in the bedrock. In Section 3.5.6.2.1 of Appendix 7c of the draft EIS Denison notes that there is very limited literature available on uranium</p>	<p>a) Denison must develop a process agreement with BNDN to work through our concerns related to long-term groundwater contamination from the Project. This process agreement would lay out the pathway to obtaining BNDN consent for the Project through providing our Nation with confidence that the groundwater and surface water near to the project will not be irreparably contaminated. The process agreement will include additional studies and consultation activities with BNDN</p>

	<p>fate and transport, especially in similar environments to the Wheeler River Project. Denison's uranium speciation model relies almost entirely on a single academic article studying the partitioning of uranium in the alteration halo surrounding the Cigar Lake uranium deposit. Of very important note is that this paper is focused on the pre-mining environment at Cigar Lake and does not examine how uranium partitioning may be dramatically altered by ISR mining. Health Canada published a document on uranium in drinking water in 2017 literature review of uranium mobility, complexation and chemistry in groundwater which documents the widely varying behaviour of uranium in groundwater depending on redox conditions, pH, pressure, and other ions available for complexation which may increase or decrease uranium mobility (Health Canada, 2017).</p> <p>Uranium will be present in extremely high concentrations (100 mg/l) in the restoration solution. Many other anions and cations which uranium is known to form complexes with will also be present in the solution at very high concentrations. The limited literature upon which Denison has developed their models to predict uranium mobility post-decommissioning is insufficient to confidently assert that the very concentrated restoration solution will behave as predicted.</p>	<p>that Denison must undertake. The satisfaction of all terms in the process agreement would be defined by the signing of a Project Agreement between Denison and BNDN.</p> <p>b) BNDN recommends that Denison commit to funding bench-scale studies to validate the outputs from their FEFLOW and PHREEQC modelling. The bench-scale studies should be undertaken by an independent academic.</p>
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		requires substantially greater reassurance through dialogue with Denison and further studies to have confidence that the Project will not irreparably degrade the natural environment in our Ancestral Lands.	
<b>20.</b>	Draft EIS Section 7.6.2.1 and Appendix 7c Section 4.6	<p>In Section 7.6.2.1 of the draft EIS, Denison mentions that they anticipate the outward migration of lixiviant as is observed at other ISR operations globally, and has incorporated their assumed concentrations of metals and the extent of area affected by flare from the ISR operations. Section 4.6 of Appendix 7c states that the flare zone is expected to extend 11 to 13 m but have modelled with a “conservative 50 m flare zone.</p> <p>It is not clear how Denison derived their assessment that the flare zone would extend 11 to 13 m and that a 50 m flare zone is considered conservative for the purposes of modelling. BNDN requires further information to have confidence that the design is as conservative as the Proponent has suggested.</p>	<p>BNDN requests that Denison provide further information on how the size of the area above the deposit affected by flare was calculated and how they determined that 50% restoration solution was determined as the appropriate concentration to base water quality modelling.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN’s concerns related to long term groundwater contamination from the Project.</p>
<b>21.</b>	Draft EIS Appendix 7c Section 3.2.2.1	<p>Section 3.2.2.1 of Appendix 7c of the draft EIS describes the natural redox conditions in the ore zone as naturally reducing. The operation of the wellfield will result in the groundwater in the ore zone becoming oxidizing. Post decommissioning, the groundwater in the ore zone can be reasonably anticipated to return to baseline (reducing) redox conditions.</p>	<p>BNDN requests further information on how increasingly reducing groundwater conditions post decommissioning may impact adsorption kinetics of contaminants expected to adsorb to clays.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN’s concerns related to long term groundwater contamination from the Project.</p>

		<p>BNDN notes that as redox conditions becoming increasingly reducing post closure, adsorption kinetics of contaminants adsorbed to clays could shift so that contaminants desorb from clays and are remobilized into solution. It is not clear to BNDN that the evolution of redox geochemistry and its implication on adsorption kinetics has been adequately considered by Denison.</p>	
22.	Draft EIS Appendix 7c Section 3.4.	<p>In Section 3.4 of Appendix 7c, Denison reports that they have excluded colloids from their post-decommissioning geochemical modelling. Denison has also noted that colloids would serve to enhance mobility of contaminants and they could precipitate out of solution.</p> <p>BNDN is concerned that by excluding the precipitation of colloids with adsorbed contaminants as a pathway for contaminant transport, Denison has significantly underestimated the mobility of contaminants and the consequent risks to the receiving environment.</p>	<p>BNDN requests that Denison prepare an additional geochemical model that considers the roles that colloids could potentially contribute to contaminant transport. The findings of this additional model (along with the other models) should be reviewed with BNDN.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN's concerns related to long term groundwater contamination from the Project.</p>
23.	Draft EIS Appendix 7c Section 4.0	<p>In Section 4.0 of Appendix 7c of the draft EIS, Denison reports that the composition of restoration solution 1 and restoration solution 2 were derived from metallurgical testing. While this is likely the best</p> <p>BNDN notes that the initial solution used in the geochemical modelling is enormously consequential in the accuracy of the modelling and require further confirmation and confidence</p>	<p>BNDN requests that Denison provide further information on how the chemistry in restoration solution 1 and restoration solution 2 were derived and any evidence they can provide that gives them confidence that these solutions are an accurate reflection of what will be observed in the wellfield.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN's concerns</p>

		that the restoration solutions are accurate to within a reasonable margin of error for the geochemical modelling.	related to long term groundwater contamination from the Project.
<b>24.</b>	Draft EIS Appendix 7c	BNDN notes that Denison has not provided any discussion on the extent to which the lixiviant and the solution used to flush the wellfield at the end of operations will interact with the underlying paleoweathered bedrock. BNDN notes that it is possible that there are mineral phases within the paleoweathered bedrock that are also readily soluble when exposed to the lixiviant. While BNDN recognizes that the paleoweathered bedrock has a low permeability, it is unclear to BNDN as to whether the lixiviant will contribute to mobilization of contaminants from the paleoweathered bedrock that requires consideration in the post-decommissioning groundwater model.	<p>BNDN requests that Denison provide any available information on how the bedrock may be altered (through dissolution of soluble mineral phases) by the lixiviant and the flushing of the wellfield during decommissioning, and whether this has been factored into their post-decommissioning groundwater model.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN's concerns related to long term groundwater contamination from the Project.</p>
<b>25.</b>	Draft EIS Appendix 7c Section 5.2.2	In section 5.2.2 of Appendix 7c of the draft EIS Denison reports the assumptions built into their post-decommissioning groundwater modelling. BNDN notes that Denison has assumed that adsorption reaction sites are assumed to be available uniformly throughout the subsurface parameter zones. The presence of sufficient adsorption sites is a primary variable which determines the outcomes of the groundwater modelling, as adsorption of ions out of solution is the primary means by which contaminant transport is attenuated in Denison's modelling.	<p>BNDN requests that Denison provide justification for the assumption that adsorption sites will be uniformly available throughout the sub-surface parameter zones. BNDN requests that Denison provide information on how they estimated the extent to which adsorption sites are already saturated prior to mining.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN's concerns related to long term groundwater contamination from the Project.</p>



		<p>BNDN is concerned that the presence of a variable that is so consequential to the findings of the model is based primarily on assumptions with limited information to base the assumptions upon.</p>	
26.	<p>Draft EIS Appendix 7c Table 3-10</p>	<p>Table 3-10 of Appendix 7c of the draft EIS shows the expected adsorbing mineral properties of the mineral phases to which contaminants are expected to adsorb out of solution. BNDN notes that the lixiviant and restoration solution could affect the ability of. In particular, the clays immediately surrounding the orebody are within the freeze wall and will be directly exposed to the lixiviant during operations, which may impact the clays ability to adsorb contaminants out of solution.</p> <p>BNDN notes that the clays immediately surrounding the orebody may be soluble in the presence of the lixiviant or may be altered to have a lower capacity to adsorb metals. BNDN requires further information from Denison to have confidence that the clay phases which play a crucial role in contaminant attenuation will not have their adsorptive capacity impacted by the operation of the wellfield.</p>	<p>BNDN requests that Denison provide available information on whether clay mineral phases are anticipated to dissolve through the ISR mining process, and whether the restoration solution will impact the ability of clays to effectively adsorb contaminants.</p> <p>This item would be best addressed and resolved with BNDN through the process agreement to address BNDN's concerns related to long term groundwater contamination from the Project.</p>
27.	<p>Draft EIS Section 1.1.1</p>	<p>In Section 1.1.1 of the Draft EIS, Denison notes that "the Gryphon deposit is not amenable to ISR mining and, accordingly, is not included in the EIS". Denison has previously reported that the Gryphon deposit has nearly as much uranium as the Phoenix deposit.</p>	<p>Given the potential longer term mining activities at the Wheeler River project beyond the Phoenix deposit, BNDN requests that any project agreement between BNDN and Denison include terms for ongoing dialogue related to future exploration and project development activities at the</p>

		<p>While the Gryphon deposit is not amenable to ISR, it is potentially still an economic resource which Denison may wish to mine.</p> <p>While the Gryphon deposit is not in scope for this environmental assessment, BNDN expects to be kept informed of future potential mining activities on the Wheeler River Project which Denison may be considering, including additional exploration on the Property, as future activities on the Property will also have impacts on our Treaty and aboriginal rights and interests.</p>	<p>Wheeler River Project and at all Denison Projects on BNDN Ancestral Lands.</p>
<b>28.</b>	Draft EIS Section 2.3.3.1.3	<p>In Section 2.3.3.1.3 of the draft EIS Denison describes the proposed decontamination, demolition and disposal activities at the Project. BNDN notes that Denison has described a detailed process for decommissioning the injection and recovery wells but has not described how the freeze wells will be decommissioned. BNDN notes that the freeze well holes may serve as preferential pathways for contaminated groundwater movement. Given the proximity of freeze wells to the orebody and the number of freeze wells proposed to be drilled, proper closure of freeze wells is also important for protection water quality long term.</p>	<p>a) BNDN request that Denison clarify the process by which they will decommission the freeze wells.</p> <p>b) BNDN requests that Denison decommission the freeze wells using the same process as is proposed for the decommissioning of the injection and recovery wells.</p>
<b>29.</b>	Draft EIS Section 2.3.3.1.3	<p>In Section 2.3.3.1.3 of the draft EIS Denison describes the thawing of the freeze wall as part of the decommissioning of the mine. BNDN notes that water expands when frozen</p>	<p>BNDN request that Denison provide evidence from academic literature or other mine sites employing freeze wall technology to determine the extent the freeze wall could expands joints and fractures within the</p>

		and could potentially be capable of expanding pre-existing joints and fractures within the host rock. BNDN is concerned that the thawing of the freeze wall could lead to expanded joints and fractures which would allow for far more rapid contaminant transport away from the ore body and restoration solution than is modelled in the post-decommissioning groundwater model.	rock once thawed, including at unconformities or other pre-existing structural weaknesses within the host rock.
<b>30.</b>	Draft EIS Figure 2.2-15 and Section 2.2.3	<p>In Section 2.2.3 of the draft EIS, Denison notes that they have made the conservative assumption that no water would be recycled as mining solution as part of their water balance calculations. BNDN agrees that this conservative assumption is appropriate for assessment of potential impacts of the Project.</p> <p>While this assumption is appropriate for the environmental assessment, BNDN wishes to understand the proportion of industrial wastewater that may be recycled on site and any commitments Denison is willing to make regarding continual refinement of the water treatment process to increase the proportion of water that is recycled.</p>	<p>a) BNDN requests that Denison commit to continual refinement of the Industrial Waste Water Treatment Plant (IWWTP) treatment process to maximize the amount of water that is recycled to the deposit.</p> <p>b) BNDN recommends that the Crown include a condition of approval for the project regarding continual improvement of water treatment to maximize recycling.</p> <p>c) BNDN requests that Denison share available information on the proportion of water that they currently anticipate being able to recycle.</p>
<b>31.</b>	Draft EIS Figure 2.2-15 and Section 2.2.3.2	In Section 2.2.3.2 and Figure 2.2-15 of the draft EIS, Denison describes their water balance for the project and anticipated water needs to operate the ISR wellfield. BNDN notes that the EIS does not describe how Denison derived their estimate for the quantity of water required to operate the ISR wellfield. BNDN is concerned that the	<p>a) To demonstrate that Denison has not significantly underestimated the volume of water required to operate the wellfield, BNDN requests that Denison provide evidence that the volume of water required to operate the wellfield is accurate. This should include an assessment of their level of confidence</p>

		<p>volume of water required to operate the wellfield may be substantially greater than is estimated in the draft EIS. Utilizing greater volumes of water in the wellfield would have cascading effects throughout the water balance, including greater demand on the IWWTP, greater storage volumes required in the process water storage pond, greater UBS holding pond capacity and greater volumes of effluent discharge to Whitefish Lake. BNDN is concerned with the potential cascading risks associated with an inaccurate assessment of the volume of water required to operate the ISR wellfield.</p> <p>BNDN also wishes to understand whether it is possible that Denison will be required to operate the wellfields at a higher pressure, even if only temporarily. BNDN notes that operating wells at higher pressure come with additional workplace and environmental hazards, especially when dealing with a strongly acidic lixiviant.</p>	<p>they have in their estimated water consumption.</p> <ul style="list-style-type: none"> <li>b) BNDN requests that Denison provide BNDN with information on potential contingency measures (such as constructing additional process water pond capacity) should their estimated water consumption</li> <li>c) Denison must commit to updating their mixing zone assessment should they find it necessary to discharge greater quantities of effluent to Whitefish Lake than is estimated in the draft EIS.</li> <li>d) Denison must document the implications of operating the wellfield at a substantially higher pressure than currently expected.</li> </ul>
32.	Draft EIS Table 2.3-3	<p>Table 2.3-3 of the draft EIS shows Denison's proposed mining area decommissioning objectives, which are the groundwater quality objectives for the residual water in the ore zone following the flushing of the system during mine decommissioning. BNDN is surprised to see that relatively high concentrations of metals are expected to remain in the restoration solution as a final objective, such as 100 mg/l uranium</p>	<ul style="list-style-type: none"> <li>a) BNDN requests that Denison provide documentation that estimates the time, efforts and costs associated with reducing concentrations of metals in the restoration solution by 1 order of magnitude and 2 orders of magnitude. Note that these calculations should include costs that could be recovered by processing subeconomic UBS.</li> <li>b) BNDN requests that Denison work with BNDN through terms defined in a BNDN project agreement to establish</li> </ul>

		<p>and 2 mg/l cobalt, amongst many other metals.</p> <p>BNDN notes that potential risks to groundwater and surface water could be dramatically reduced through more stringent mining area decommissioning objectives. It is also feasible that processing efficiencies and high uranium prices may allow for substantially lower concentrations of uranium to be mined economically. The long-term contamination of groundwater from the high concentration of metals in the restoration solution is one of BNDN's primary concerns with the Wheeler River Project, and BNDN would strongly prefer that Denison strive to minimize the residual contamination remaining in groundwater following decommissioning to the greatest extent possible.</p>	<p>achievable decommissioning objectives that would be satisfactory to BNDN.</p> <p>c) BNDN requests that the Crown place a condition of approval upon the Wheeler River Project that Denison is required to work with BNDN to establish mutually agreeable mining area decommissioning objectives.</p> <p>d) BNDN requests that Denison undertake a study of ISR operations elsewhere in the world to determine the lowest concentrations of UBS that could be processed economically utilizing industry best practices and commit to exceeding global standards.</p>
33.	Draft EIS Section 2.2.2.2.2 and Figure 2.2-18	<p>In Figure 2.2-18 of the draft EIS, Denison shows the proposed design of the double composite liner system for the ponds on site and the UBS holding area. BNDN notes that the risks associated with temporary storage of UBS is much greater than other contact water on site which is proposed to be stored in a similar means. As such, BNDN is concerned that the proposed UBS holding area does not have adequate leak detection given the additional risk associated with the UBS relative to contact water on site. BNDN also notes that open air storage of UBS presents the risk of incidental interactions with wildlife near to the</p>	<p>a) BNDN requests that Denison commit to storing UBS in appropriate tanks as opposed to open air storage.</p> <p>b) BNDN requests that Denison include a leak detection pipe in the prepared subgrade below the secondary containment as well as between the primary and secondary containment layers. BNDN also requests that the prepared subgrade be engineered to facilitate maximum utility of the leak detection below the secondary containment.</p>

		<p>project (such as birds), which would potentially be acutely toxic.</p> <p>BNDN is also concerned that there is no leak detection system below the secondary HDPE geomembrane and geosynthetic clay liner. Should the secondary containment layers also become compromised, Denison does not have a system planned to detect this.</p>	
34.	Draft EIS Figure 2.3-1	<p>In draft EIS Figure 2.3-1, Denison shows an additional ore body to the Southwest of Phase 5. Denison has not included this additional ore body in the mine plan in the draft EIS and has not discussed whether they have intentions to mine this ore body or undertaking a project change at a later date to include this additional ore body.</p> <p>It is unclear whether this additional ore body has any implications for the long term groundwater quality modelling either through the additional orebody altering anticipated groundwater chemistry, or the restoration solution dissolving metals in the additional orebody increasing overall metal loading. Given the probable difference in groundwater and mineral geochemistry in the additional orebody relative to the overlying sandstone and underlying basement rock, there is likely to be interaction between the restored solution and the additional orebody post-closure.</p>	<p>a) BNDN requests that Denison clarify whether they are considering adding the additional orebody to the southwest of Phase 5 into the mine plan, including clarifying whether the additional ore body is amenable to ISR mining.</p> <p>b) BNDN requests that Denison clarify what the anticipated permitting associated with the additional ore body would be.</p> <p>c) BNDN requests that the post-decommissioning groundwater modelling for the Project include interactions between the additional ore body and the restoration solution to understand if the ore body poses a risk of additional metal loading to groundwater.</p>

35.	Draft EIS Section 2.2.1.3 and 7.6.2.1	<p>Denison intends to use a freeze wall as tertiary containment for the operation of the wellfield during operations. In general BNDN is supportive of this containment measure but requires further information to have confidence that the freeze walls will operate as designed. In particular, BNDN notes that while the freeze wall will be continuous from the ground surface all the way into the basement rocks underlying the orebody, the freeze wall is by far the most consequential immediately around the ore body itself. The orebody is approximately 400 m below the ground surface (where the earth would be significantly warmer) and the lixiviant is expected to be at least 10 degrees warmer than the surrounding groundwater would be. Considering that the cold brine will need to be injected nearly half a kilometer into the earth where warm lixiviant will be injected into the wellfield, BNDN is concerned that the freeze wall may be ineffective in and around the ore body where it is required. Furthermore BNDN is concerned that the monitoring system for assessing the stability of the freeze wall may not adequately detect the continuity of the freeze wall at depth. As such, BNDN is concerned that the freeze wall may be ineffective and in fact obscure our ability to recognize contamination of the surrounding groundwater from the freeze wall operating ineffectively.</p>	<ul style="list-style-type: none"> <li>a) BNDN requests that Denison provide information to demonstrate that the freeze wall will in fact be frozen in and around the ore body. If there is any doubt that the freeze wall will indeed be frozen around the ore body, Denison should describe further measures they can undertake to ensure that the freeze wall is frozen as intended around the ore body.</li> <li>b) Denison must provide BNDN with further information on how they will monitor the performance and continuity of the freeze wall.</li> <li>c) BNDN requests further information on the proposed groundwater monitoring program around the wellfield.</li> <li>d) BNDN requests the opportunity to review the groundwater monitoring plan and to review groundwater monitoring data as part of a BNDN-Denison environmental committee developed through a BNDN-Denison project agreement.</li> </ul>
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36.	Draft EIS Section 2.9.1.3.1	<p>In draft EIS Section 2.9.1.3.1 Denison documents their conceptual level environmental protection program, including several proposed management and monitoring plans which they will develop to manage operations on site.</p> <p>The environmental protection measures which Denison undertakes at the Project site are highly consequential to BNDN, and BNDN requires the opportunity to provide our knowledge and input into environmental protection measures developed for activities within our Ancestral Lands.</p>	<p>a) BNDN requests that Denison commit to involving BNDN in the development, review and approval of all environmental monitoring plans developed for the Project. Details of BNDN involvement in the development of environmental monitoring plans should be undertaken within an Environmental Committee, with specific terms defined within a BNDN-Denison Project Agreement for the Wheeler River Project</p> <p>b) BNDN requests that the CNSC impose a condition of approval on the project which states the requirement for Denison to consult with BNDN on all environmental management and monitoring plans for the project.</p>
37.	Draft EIS Section 7.6.2.3	<p>In Section 7.6.2.3 of the draft EIS and the geology and groundwater summary table in Appendix 16A, Denison states that they expect no residual effects to groundwater quality during the operations, decommissioning or future centuries period of the Project. Denison has also not placed a significance determination on the impacts to groundwater quality based on the findings of the draft EIS due to groundwater being considered an intermediate VC.</p> <p>BNDN disagrees with both the residual effects assessment and the fact that groundwater quality has been assessed solely as an intermediate VC. The protection of groundwater resources is highly important to BNDN. Our members place immense value on clean spring water and the</p>	<p>a) Denison must apply a significant determination to groundwater quality and quantity for all projects phases, <u>including the future centuries period</u>. The significance determination must be developed following consultation and engagement with BNDN.</p> <p>b) Denison must re-evaluate the residual effects of the project on groundwater quality <u>including the future centuries period</u>. This re-evaluation must be following consultation and engagement with BNDN.</p> <p>c) BNDN requests that the CNSC work with our Nation to understand the significant impacts that the permanent contamination of groundwater caused by the project will have on our Treaty and Aboriginal rights.</p>



		<p>protection of groundwater more generally. The advancement of the Wheeler River Project will <u>permanently</u> impair groundwater resources in and around the Wheeler River Project. The contamination of groundwater at the Project will have a significant impact on our members' connection to the land and ability to exercise our Treaty and Aboriginal rights. We see the limited interpretation of residual effects and the lack of inclusion of groundwater quality as a receptor VC as a significant oversight in the assessment of impacts of the Project on the environment and BNDN Treaty and Aboriginal rights. This must be corrected to properly assess the Project and thus ensure that project impacts are appropriately mitigated and accommodated.</p>	
38.	Draft EIS Section 7.8.2	<p>Section 7.8.2 of the draft EIS documents the groundwater monitoring proposed for the surface facilities and the ISR recovery area. It also describes a conceptual excursion contingency plan wherein Denison has proposed their plans to manage situations where groundwater contamination occurs beyond what is predicted in the EIS. BNDN notes that Section 7.8.2 lacks information on the involvement of Indigenous Nations related to groundwater monitoring.</p> <p>As stated previously, BNDN is highly concerned with the level of impact the Project will have on groundwater resources. As such BNDN requires Denison to communicate excursions of</p>	<p>a) BNDN requests that Denison revise Section 7.8.2 to include Indigenous engagement and input for groundwater monitoring results and the management of observed groundwater excursions. The manner in which Denison engages BNDN on groundwater monitoring and management will likely occur through an Environmental Committee, which should be defined in a BNDN-Denison Project Agreement.</p> <p>b) BNDN requests that the CNSC impose a condition of approval on the Project that clarifies that Denison is required to engage with impacted Indigenous Nations such as BNDN on groundwater monitoring and management.</p>

		groundwater and the consequent management of excursions to our Nation.	
39.	Draft EIS Appendix 8d	In Appendix 8d, Denison documents their baseline aquatics studies undertaken for the Wheeler River EIS. Denison has included some lakes and rivers upstream of the Project as background sites for understanding project impacts to the aquatic environment. BNDN notes that there are many additional sites throughout our Ancestral Lands which would benefit from ongoing aquatic monitoring and would be potentially suitable for the Project as background sampling sites.	BNDN requests that Denison work with our Nation to identify potential additional background sampling sites within our Ancestral Lands for aquatic monitoring for the life of Project. The details of such should be defined in the BNDN-Denison project agreement.
40.	Draft EIS Section 2.2.1.4.2	<p>In Section 2.2.1.4.2 of the Draft EIS Denison discusses the operation of the wellfield during the operations phase of the mine. BNDN notes that many of the details in this section are conceptual in nature and thus could require significant refinements in design to achieve the desired recovery consistently throughout the life of mine.</p> <p>Amongst other concerns related to operations of the ISR wellfield, BNDN is concerned that Denison may alter the chemical composition of the lixiviant used in the ISR wellfield which could cause inadequately understood changes in potential effects of the Project to the environment. These effects could include significant changes to the final restorative solution at the end of mine life or significant changes in the treatment</p>	<p>a) BNDN requests that Denison provide information on</p> <ul style="list-style-type: none"> <li>• The likelihood of the chemical composition of the lixiviant changing throughout the life of project</li> <li>• Potential changes to the lixiviant composition</li> <li>• The implications for long term groundwater quality and effluent treatment from changes in lixiviant chemistry</li> </ul> <p>b) BNDN requests that Denison commit to ongoing communications and engagement with BNDN regarding changes to the wellfield operation throughout the life of mine. The terms of engagement should be defined in a BNDN-Denison project Agreement.</p>

		requirements for the IWWTP that impact the ability of Denison to achieve effluent quality criteria for significant periods of time.	
<b>41.</b>	Draft EIS Appendix 8e Table 4	<p>Table 4 of Appendix 8e of the draft EIS shows the predicted site discharge concentrations of the contaminants of potential concern (COPCs). BNDN notes that the concentrations of a number of COPCs do not achieve water quality objectives that is the best available technology economically achievable (BATEA). Example COPCs include copper, molybdenum, selenium, uranium, vanadium, zinc and ammonia.</p> <p>BNDN requires proponents operating on our Ancestral Lands to, at a minimum, achieve BATEA standards for effluent treatment and discharge. This takes reasonable and appropriate precaution without imposing unreasonable costs on the operation.</p>	<p>a) BNDN requests that Denison commit to achieving BATEA criteria for all COPCs in their effluent.</p> <p>b) Denison must work with BNDN to identify mutually agreeable and appropriate effluent discharge criteria for their effluent. BNDN expects that identifying suitable effluent discharge criteria will be undertaken through an Environmental Committee with a terms of reference defined in a BNDN-Denison project agreement</p> <p>c) BNDN requests that the CNSC impose a condition of approval on the Project that BNDN</p>
<b>42.</b>	Draft EIS Appendix 8e Table 7	<p>Table 7 of draft EIS Appendix 8e shows the anticipated size of the mixing zone under 3 different flow conditions, including the calculated 7Q10 flow. While BNDN understands that Denison expects to discharge relatively small volumes of effluent to Whitefish Lake compared to a conventional open pit or underground mining operation, BNDN is concerned that the mixing zone assessment underestimates the magnitude of impact that the project will have on Whitefish Lake.</p>	<p>BNDN requests that Denison undertake a plume delineation study and provide BNDN the opportunity to review the findings of the study through the BNDN-Denison Environmental Committee for the Wheeler River Project.</p>

43.	Draft EIS Appendix 10a	<p>BNDN notes that the environmental risk assessment (draft EIS Appendix 10a) makes no mention of potential impacts the project may have on mercury biogeochemical cycling and the consequent risks to the environment and human health. This is unsurprising given the lack of baseline sampling of mercury in sediments and soils, especially wetland soils.</p> <p>The lack of baseline mercury sampling is a significant oversight given the significant impact that mining operations can have on mercury biogeochemistry, including mercury methylation, and mobility of mercury species within the environment.</p> <p>BNDN is very concerned with the complete lack of assessment of this important consideration for the project and the consequent inability for our members to adequately understand the potential risks to our Treaty and Aboriginal rights from these risks. Note that the absence of baseline information gathered can be reasonably considered an impact on our Treaty and Aboriginal rights as our members will avoid exercising our rights if we lack the information to have confidence that it is safe to do so.</p>	Denison must revise Appendix 10a of the draft EIS to incorporate findings from the mercury baseline studies in wetland soils and sediments requested by BNDN.
44.	Draft EIS Table 2.2-4	In Table 2.2-4 of the Draft EIS, Denison documents their planned chemical used for the project. BNDN notes that Denison intends to use zero-valent iron (ZVI) in the IWWTP, but not as part of the remediation solution for	BNDN requests that Denison investigate the suitability of using zero-valent iron to remediate the groundwater within the wellfield as part of the decommissioning process.

		<p>the mine. BNDN notes that ZVI is used to treat contaminants in groundwater around the world. Denison has not discussed whether they have investigated the possibility of utilizing ZVI to remediate the wellfield during decommissioning.</p> <p>Protection of groundwater is of exceptional importance to BNDN. BNDN is concerned that Denison has not made a complete or comprehensive effort to understand how to minimize negative impacts to groundwater from the project using proven technologies that may be suitable for remediating the restoration solution in the wellfield during the decommissioning phase of the mine.</p>	
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## 4.4 Aquatic Wildlife

BNDN has undertaken a review of the interactions between the Project and aquatic resources and the way that these resources may interact with BNDN's rights, values, and interests. This has included an investigation of how information has been collected, analyzed, and interpreted by the Proponent. Valued Components (VCs) considered as part of this section include:

- Surface water quantity
- Surface water quality
- Sediment quality
- Benthic invertebrates
- Fish and fish habitat
- Fish health

Information gaps, issues, and additional mitigation measures or accommodations related to aquatic resources are described in the comments in Table 4 below. A brief summary of relevant information is included below to support interpretation of these comments.

The proposed Wheeler River Mine occurs in the Icelander River watershed that drains into Russell Lake (Figure 8). Baseline water quality of lakes and streams within the RSA are generally below applicable guidelines for protection of aquatic life. However, concentrations of aluminum, lead, iron, and cadmium all showed some exceedances over guidelines. Sampling of benthic invertebrates in baseline studies of McGowan Lake, and Whitefish Lake found communities that are typical of depositional environments with species of chironomids, midges, water fleas, and worms. Sediments in these lakes are also typical of depositional environments, with primarily small particles such as clay dominating and lesser amounts of silt and sand in areas of higher water velocity. Background concentrations of metals and other contaminants in sediment are at or below applicable guidelines in most instances. Fish identified in the study area inhabit rivers, streams and lakes within the RSA. This includes lake trout, lake whitefish, northern pike, walleye, burbot, yellow perch, arctic grayling, and several suckers and small-bodied species (e.g. lake chub, spottail shiner, and ninespine stickleback).

Environmental management throughout the life of mine will occur to collect water that has been affected by the Project, minimize mobilization of sediment/soils, and reduce contaminants from effluent discharge or groundwater from entering surface water. Freshwater for all project requirements, including potable water, process water, wash water, fire suppression, drilling and batch plant will be sourced from Whitefish Lake or shallow groundwater.

Domestic wastewater, from sinks, showers, toilets, washing machines, and kitchens, will be treated on-site in the domestic wastewater treatment plant (DWWTP) and discharged to the process water pond. From there it will undergo additional treatment in the Industrial Wastewater Treatment Plant (IWWTP) before being recycled in the process plant or discharged to Whitefish Lake. Denison is planning to

maximize use of treated wastewater as make-up water for the processing plant, diminishing the volume of freshwater required and wastewater discharged.

Mine contact water and process water will be collected and treated. Denison proposes to direct treated wastewater from the IWWTP to three effluent monitoring and release ponds before being discharged to Whitefish Lake during operations (years 3-18) and decommissioning (years 18-23). Water will be held in these retention ponds until water quality meets regulatory discharge criteria.

**Key Issues:**

- Lack of storage capacity in Effluent Monitoring and Release Ponds may limit operational flexibility. In the event of poor water quality, the Proponent will have very limited ability to retain water for additional treatment prior to discharging to Whitefish Lake.
- The sampling effort for identifying the species diversity and relative abundance of the fish community is low. BNDN recommends that Denison undertake an additional round of spring and fall fish sampling.
- It is unclear how BNDN will be involved in ongoing environmental oversight for the Project and how results of environmental monitoring (e.g. surface water and fish tissue data) will be shared. BNDN requests that Denison discuss the development of an Environmental Committee (or similar mechanism) and communication strategies for sharing results with BNDN.



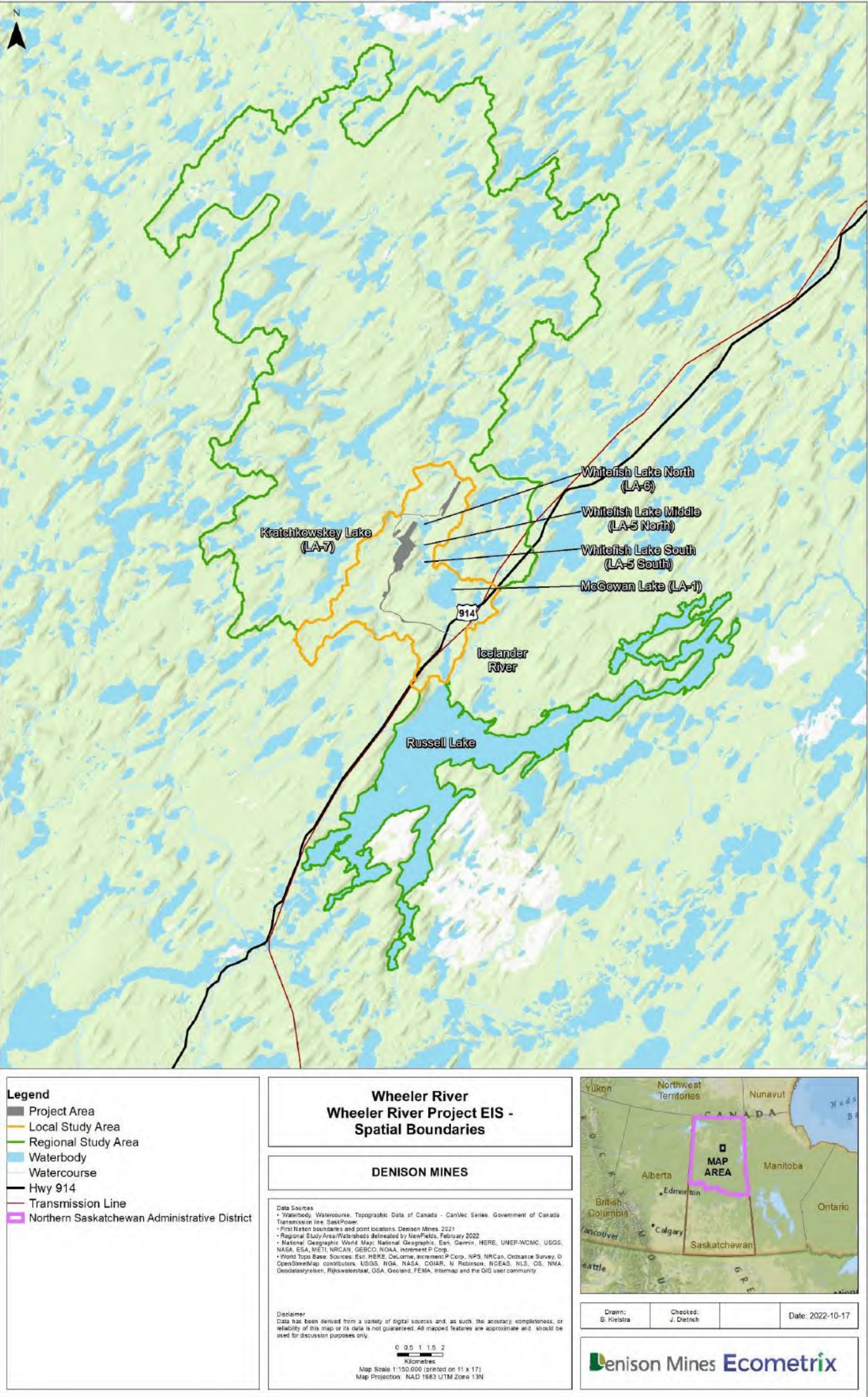


Figure 8. Study Area Boundaries for Fish and Fish Habitat of the Wheeler River Project (Denison, 2022)



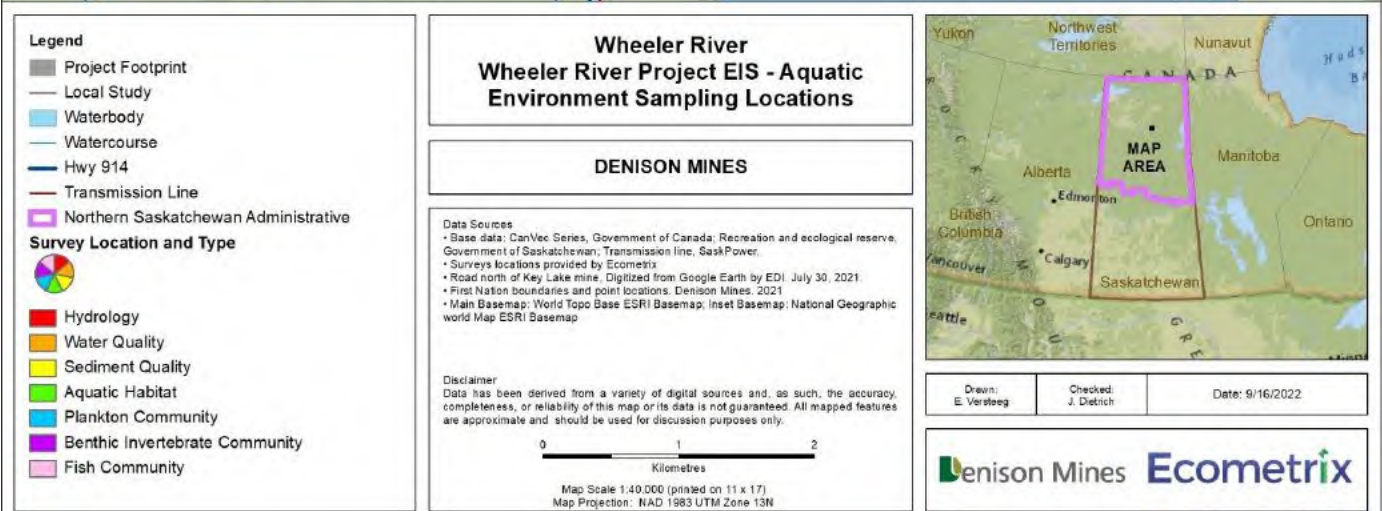
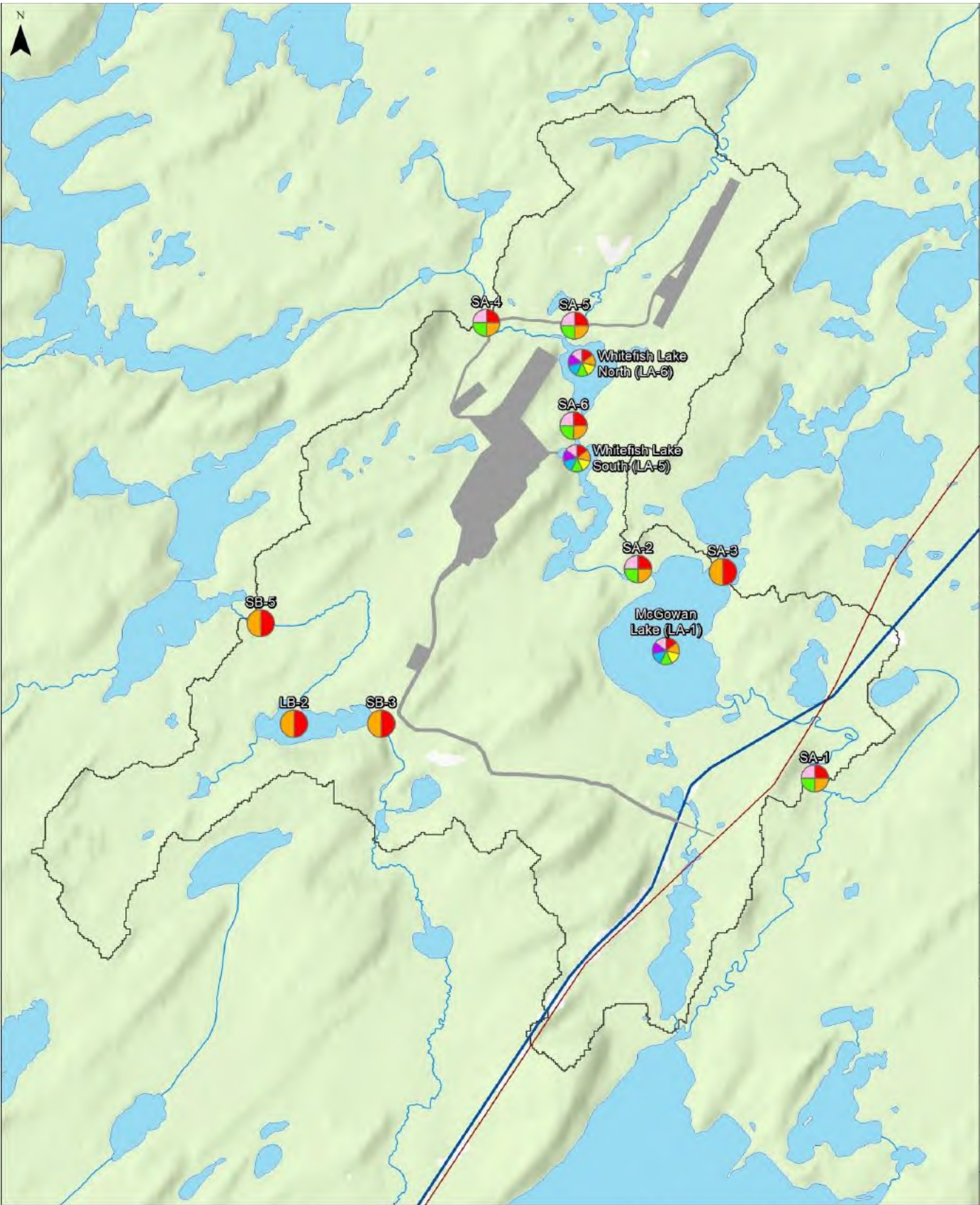


Figure 9. Aquatic Environment Sampling Locations for Wheeler River (Denison, 2022)

Table 4. Comments and recommendations for the Wheeler River EIS related to aquatic resources

#	Document Reference	Comment	Request/Recommendation
45.	8.2.4.1.1 Site Water Management	<p>BNDN is concerned that the small volume of Effluent Monitoring and Release Ponds may create a lack of operational flexibility. For example, in the EIS, it is state that:</p> <p><i>“Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m<sup>3</sup>). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment.”</i> – EIS, pp 723</p> <p>If water quality in these ponds exceeds discharge criteria then there may be a need to store water so that additional treatment and monitoring can occur prior to discharge. However, only having capacity for three days of storage means it is unlikely the Proponent would be able to adequately treat water prior to reaching storage capacity, resulting in a need for emergency release of poor-quality water.</p>	<p>a) BNDN requests that additional storage capacity be included as part of the design for water management system. This must include adequate storage capacity to ensure Denison has the ability to retain water for sufficient time to allow treatment, in the event that exceedances of water quality discharge criteria occur.</p> <p>Alternatively, Denison can commit to halting discharge (and operations if required) should water quality exceed discharge criteria. Discharge into Whitefish Lake would resume once water quality in the Effluent Monitoring and Release Ponds has been returned to below discharge criteria.</p> <p>b) BNDN requests that the CNSC impose a condition of approval for the Project that requires Denison to must meet effluent discharge criteria prior to discharge and must halt operations if treated effluent in the monitoring and release ponds does not meet effluent discharge criteria.</p>
46.	Appendix 8-D Aquatic Environment Baseline Study	<p>Fish community sampling is an important component of baseline studies for many reasons, including identifying species present (including any species at risk) and evaluating relative abundance (e.g. CPUE). A robust program should include multi-season and multi-year approach. This allows improved characterization of</p>	<p>a) BNDN requests that the Proponent build on the existing data for fish community sampling by collecting an additional round of spring and fall sampling.</p> <p>b) BNDN requests that an assessment of total effort, total catch, and CPUE be provided for each capture</p>

		<p>seasonal habitat use and accounts for natural variability.</p> <p>In the baseline aquatic assessments, the Proponent has focused fish community sampling in fall 2016, with some limited additional sampling of in spring 2017. This low level of effort will make it difficult to draw meaningful comparisons with monitoring work that will occur during the life of mine.</p> <p>Furthermore, CPUE has only been reported for electrofishing effort. As a result, there is very limited information available for relative abundance of fish in important waterbodies, including Whitefish Lake, McGowan Lake, and Russell Lake.</p> <p><b>**BNDN notes that a raw representation of total effort is provided in table A-13 of Appendix 8D but requests that an assessment of total effort, total catch, and CPUE be presented in the EIS for each capture method/location**</b></p>	<p>method/location where fish sampling has occurred.</p>
47.	8.2.5 Mitigation Measures	<p>The Proponent has identified one mitigation measure that includes sharing of monitoring results to assess performance of water management system (EIS, pp 8-90, 8.2.5 Mitigation Measures). BNDN is supportive of this type of information sharing and believes that it can be an important component of transparency and trust-building between the Proponent and other parties. However, it is important that information sharing be done in a</p>	<p>BNDN requests involvement in discussions with Denison about sharing of information related to water quality monitoring (and environmental monitoring more broadly). Some methods of communication that may support accessibility of data include:</p> <ul style="list-style-type: none"> <li>• Public-facing summary reports on a regular schedule (e.g. quarterly or annually)</li> <li>• Real-time access to environmental monitoring data through online database portals.</li> </ul>

		<p>way that is accessible to community members.</p>	<ul style="list-style-type: none"> <li>• Semi-regular community meetings hosted in Turnor Lake (e.g. every 12-18 months, as decided in conjunction with BNDN leadership within a Project Agreement with BNDN).</li> <li>• Presentations to BNDN staff, leadership, and/or community members by BNDN Environmental Monitors.</li> </ul> <p>The specific methods used for information sharing and appropriate levels of support from Denison can be determined through consultation with BNDN.</p>
48.	8.5 Fish Health	<p>The Proponent has completed predictive modelling for concentrations of contaminants in fish tissue. For example, results of modeling for selenium indicate that concentrations will fluctuate throughout operations but remain below the recommended criterion of 2.83 mg/kg wet weight (from the US EPA). Should the Project proceed, information on contaminants in fish tissues will be highly relevant for BNDN and land users who eat fish from the area.</p>	<p>BNDN requests that results of fish tissue monitoring (e.g. EEM studies) be shared in a publicly available and accessible way. This must include comparisons with guidelines and information on other contaminants of importance (e.g. mercury). Discussions regarding how this information can be shared with BNDN should occur alongside the discussions related to water quality monitoring results (see comment above).</p>
49.	8.3 Fish and Fish Habitat	<p>Increased fishing pressure in Whitefish Lake from employees working at the Project site and increased ability for visitors due to improved access could negatively impact fish populations. Preferred species, large-bodied fish, and older individuals are most likely to be targeted. This may have negative consequences on the population structure of fish in the lake as well as the ability of BNDN members to exercise fishing rights.</p>	<p>BNDN recommends that the policies Denison sets related to staff and contractors fishing while on site are determined collaboratively with BNDN through the Environmental Committee defined in a BNDN-Denison project agreement.</p>

50.	8.3.4 Assessment of Project-related Effects	The EIS provides very few details regarding how spills, leaks, and other accidents and malfunctions will be managed to mitigate the impacts on fish and fish habitat. Over the life of the mine there will inevitably be accidents and malfunctions. One of the most common environmental issues that will be encountered is leaks and spills. These can typically be managed through good monitoring and preparedness, though if they occur near water, the ability to clean them quickly is difficult and can result in harm to aquatic communities.	BNDN request additional information regarding the development of spill prevention programs, emergency management procedures, and monitoring and remediation programs for accidents and malfunctions. Representatives from BNDN need to be included in the planning and execution of monitoring and remediation activities to provide community perspectives in Project activities. One method through which BNDN can be involved in these discussions is through the development of an Environmental Committee (see comment below).
51.	8.3.8 Monitoring and Follow-up	There is no discussion on how Indigenous communities, such as BNDN, will be included in environmental management, emergency management, monitoring, and remediation. This includes issues related to ongoing permitting or specific remediation such as in the case of an accident or malfunction.	To support BNDN's ongoing participation in monitoring and oversight of the Project, we request the establishment of an Environmental Committee or similar oversight mechanism. The purpose of the committee will be to review monitoring data and monitoring reports produced during the life-of-mine to ensure that environmental protection is sufficient for all VCs. The committee can also participate in permitting throughout the life-of-mine for all relevant applications (e.g. Fisheries Act authorizations, water permits, Closure Plan updates etc.) and provide input to management plans (e.g. EPPs, Surface Water Management Plan, Environmental Monitoring Plans, etc.). The specific details of such a committee can be developed through consultation with BNDN and must be formalized through a BNDN-Denison project agreement.
52.	8.3.5 Mitigation Measures	Mitigation measures are an important component of Project management which are critical for environmental protection. Upon review of the	BNDN request that the following standard mitigation measures be included as part of the list described in Section 8.3.5:



		<p>suggested mitigation measures, BNDN has identified some opportunities for additional mitigation.</p>	<ul style="list-style-type: none"> <li>• Maintain vegetated buffers of at least 100m with all waterbodies wherever practical;</li> <li>• All equipment must be inspected prior to use on-site to ensure that they are clean and free of soil or other contaminants;</li> <li>• Maintain spill kits on all vehicles used on-site;</li> <li>• All machinery will be kept in good working order and inspected regularly for drips, leaks, and spills;</li> <li>• In the event of a spill, Denison will take all necessary actions, where it is safe to do so, to immediately stop the spill, contain contaminants, clean up and dispose of contaminated materials;</li> <li>• Denison will maintain a record of all spills and report upon each spill within 48 hours, including information on spill response, cleanup, and remediation;</li> <li>• Vehicle refueling will occur at a distance of at least 100m;</li> <li>• Fuel tanks will be located in areas that are lined and contained;</li> <li>• Fuel tanks will be located at least 500m from known waterbodies.</li> </ul>
53.	8.3 Fish and Fish Habitat	<p>Unfortunately, due to the nature of planning and licensing for complex projects such as the Wheeler River mine, there are many documents, plans, licenses and approvals which may not be available for review during the environmental assessment process or which will take place subsequent to completion of the assessment. For example, Denison will be preparing important</p>	<p>BNDN requests that Denison consult with our staff members and advisors on important environmental documentation/plans/licenses that are not available as part of the EA process. This list includes, but is not limited to,</p> <ul style="list-style-type: none"> <li>• Surface Water Management Program</li> <li>• Erosion and Sediment Control Plan</li> </ul>

		<p>documentation governing environmental management of the Project following the Environmental Assessment. While these are not currently available, there is a need to engage with BNDN to obtain input on these documents as planning progresses.</p>	<ul style="list-style-type: none"> <li>• Fish Salvage Plan</li> <li>• Spill Response Plan</li> <li>• MDMER approvals and EEM plans</li> <li>• Saskatchewan Water Security Agency permits for <ul style="list-style-type: none"> <li>○ Aquatic habitat protection</li> <li>○ Operating a waterworks</li> <li>○ Operating a sewage works</li> </ul> </li> <li>• Effluent Monitoring Plan</li> <li>• Environmental Monitoring Plan(s)</li> <li>• Decommissioning and Reclamation Plan</li> </ul> <p>Engagement with BNDN on these plans should occur through an Environmental Committee or similar oversight mechanism (see above). The specific details of such a committee can be developed through consultation with BNDN and must be formalized through aa BNDN-Denison project agreement for the Wheeler River Project.</p>
54.	8.4.3.1 Methodology and Metrics	<p>The collection of sediment samples was completed using cores and grab petit Ponar in three upstream reference locations (LA-7A, LA-8, and LA-9), Whitefish Lake (LA-5 and LA-6), McGowan Lake (LA-1), and Russell Lake (LAB-1 and LAB-2). Sediment quality testing was conducted to characterize COPC including nutrients, metals, and radionuclides.</p> <p>Only the top 2 cm of cores of grab samples were analyzed in the lab. It is not clear in the methodology why</p>	<p>BNDN requests additional information on the rational for only analyzing COPC within the top 2 cm of sediment samples. This should include information on whether this limited data will negatively affect the ability to evaluate potential impacts of groundwater contamination entering Whitefish Lake from below during operations, decommissioning, and future centuries.</p>

		laboratory analysis was limited to the top 2 cm.	
55.	8.4.3.2.3 Metals	Despite significant concerns regarding the presence of mercury in water and sediment, the Proponent has elected not to test sediments for it. BNDN acknowledges that the mining process does not use mercury and it is present in low levels in the background environment. However, for the purposes of good stewardship, communications, and trust, having an assessment of the background levels of mercury is important to BNDN.	BNDN requests that the proponent sample sediments for mercury to establish background levels. This is information that is culturally important given the potential harm and the psychological toll of mercury in aquatic ecosystems. Background levels can then be compared with ongoing monitoring throughout the life of mine.
56.	Table 8.5-2: Baseline Fish Tissue Chemistry Summary	In Section 8.5 Fish Health, the Proponent has included a summary table with information on contaminants in fish tissue and bone tissue. The information provided does not include total number of samples.	BNDN requests table 8.5-2 be updated with information on total number of fish (n) samples for each location.



## 4.5 Wildlife and Terrestrial Ecology

Section 9 of the EIS focuses on the Terrestrial Environment, and is divided into the following 4 subsections outlining 12 Valued Components:

1. **Section 9.1 - Terrain, Soil, and Organic Matter/Peat**
2. **Section 9.2 - Vegetation and ecosystems, Listed Plant Species and Wetlands**
3. **Section 9.3 - Ungulates, Furbearers, and Woodland Caribou**
4. **Section 9.4 - Raptors, Migratory Breeding Birds, and Bird Species at Risk**

Key activities with the potential for adverse effects on *Terrain, Soil, and Organic Matter/Peat* include surface land clearing, major earthworks, surface/grading preparations and associated use of equipment. Potential impacts of these key activities on *Terrain, Soil, and Organic Matter/Peat* include:

- altered topography and surface drainage patterns resulting in increased surface erosion and potentially destabilized landscape features,
- change in soil quantity and quality,
- degradation and/or loss of peat/organic matter,
- and alteration of wetland hydrologic functions that support the viability of peat/organic matter.

Key activities with the potential for adverse effects on *Vegetation and ecosystems, Listed Plant Species and Wetlands* include site preparation (e.g., clearing, grading and construction of roads, airstrip, and surface infrastructure), water management (e.g., withdrawal/use of surface and/or groundwater and release of effluent), and reclamation of disturbed areas. Potential impacts of these key activities on *Vegetation and ecosystems, Listed Plant Species and Wetlands* include:

- change in areal extent of habitat types,
- change in the level of constituent of potential concern (COPC) in plant tissue,
- change in the number of listed plants, and
- change in the areal extent of wetlands.

Key activities with the potential for adverse effects on *Ungulates, Furbearers, and Woodland Caribou* and *Raptors, Migratory Breeding Birds, and Bird Species at Risk* include site preparation (e.g., clearing, grading and construction of roads, airstrip, and surface infrastructure), operation (i.e., vehicle movement, material handling), water management (e.g., withdrawal/use of surface and/or groundwater and release of effluent), waste management (e.g., temporary storage, handling, and off-site transportation), and reclamation of disturbed areas.

Potential impacts of these key activities on *Ungulates, Furbearers, and Woodland Caribou* and *Raptors, Migratory Breeding Birds, and Bird Species at Risk* include:

- habitat loss (due to vegetation clearing),
- habitat alteration (due to sensory disturbances, habitat fragmentation, and edge effects),
- direct mortality (due to incidental take, collisions with equipment, buildings, aircraft and power lines), and

- indirect mortality (due to increased harvest and/or predation, nest failure or abandonment, changes in predator-prey dynamics, or increased public access).

The EIS provides mitigation measures designed to avoid or minimize all potential impacts of the Project. The Proponent predicted that the residual effects of the Project on the Terrestrial Environment would be low to moderate in magnitude, occur within a local to regional geographic extent, occur continuously over the life of the Project, and be reversible to some extent. Considering the mitigation and follow-up measures proposed, the Proponent has predicted with a high level of confidence that residual environmental effects from the Project on the Terrestrial environment are unlikely to be significant.

The following section describes issues identified in our scoped review of the EIS that pertain Section 9, Terrestrial Ecology. Table 5 provides a summary of comments identified using professional expertise and judgement, and recommendations for addressing them.

#### Key Issues:

- A 500 m buffer surrounding the Project Area is used to measure the areal extent of indirect habitat alteration for moose and woodland caribou. However, scientific research states that anthropogenic disturbance can affect ungulate habitat selection, resulting in habitat avoidance up to 1 km from the disturbance. Without considering a larger avoidance buffer around proposed anthropogenic disturbances, we believe that the EIS underestimates the areal extent of potential habitat alteration.
- Two bird species at risk (SAR), Barn Swallow and Horned Grebe, were observed during baseline studies. These species were not included as key indicators for SAR birds. Instead, the SAR were represented by other bird SAR that use different habitat and exhibit distinct breeding behaviours. This is problematic because these species will have unique levels of habitat alteration/loss and mortality levels than the representative species.
- Two bat species, Little Brown Bat (*Myotis lucifugus*) and Northern Myotis (*Myotis septentrionalis*) were detected during baseline studies. These species are listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and in the Species at Risk Act (SARA) schedule. Despite being present, bats were excluded from the EIS. Areas that will be cleared for mine development and operations could contain maternity roost trees. Based on Appendix 9-b, this habitat was not adequately evaluated through field surveys.

*Table 5. Comments and recommendations for the Wheeler River EIS related to terrestrial environment*

#	Document Reference	Comment	Request/Recommendation
57.	9.2.5.2 Additional Vegetation-specific	The Proponent has committed to using seed that is certified weed-free, with a valid "Certificate of Seed Analysis" for the revegetation process.	BNDN recommends that, in addition to using weed-free certified seeds, consultation occur with Indigenous communities, including BNDN, to select an appropriate

	Mitigation Measures		seed mix that closely mimics the pre-construction plant community and includes plants of medicinal and traditional importance. This could be done by either sourcing seed mix from a local seed distributor, or using wild seed propagated from plants collected from the Project Area. In addition, the seed mix should contain native plant species only.
58.	<p>9.3.4.2.1 Alteration and/or Loss of Habitat</p> <p>Figure 9.3-9 Available Habitat for Moose</p>	<p>The EIS uses a 500 m buffer around the Project Area to define indirect habitat alteration for moose (Figure 9.3-9). This includes habitat alteration from sensory disturbance such as anthropogenic noises, vehicle traffic, aircraft traffic, and increased predator access. However, the EIS references scientific research that states that roads and vehicle traffic can affect moose habitat selection, resulting in habitat avoidance up to 1 km from roads (Shanley and Pyare 2011).</p> <p>Furthermore, the EIS acknowledges uncertainty concerning the available background and baseline information used to identify available moose habitat in this assessment.</p> <p>Without considering a larger avoidance buffer (as demonstrated in various research) around proposed anthropogenic disturbances, we believe that the EIS underestimates the potential extent of moose habitat alteration. To be more conservative, a 1000 m buffer should be used surrounding the Project area.</p>	<p>BNDN recommends using a 1000 m buffer surrounding the Project Area to measure the extent of moose habitat alteration. We believe this analysis will provide a more accurate and conservative outcome with respect to potential project impacts to moose.</p>

59.	9.3.5.2.7 Mitigation Measures	<p>One of the mitigation measures implemented to protect ungulates, furbearers, and Woodland Caribou includes de-icing the Project roads for winter traction, which will result in fewer wildlife collisions.</p> <p>Salt used for de-icing is likely to attract ungulates, including moose, to roadways to satisfy their mineral requirements (Rea et al 2021).</p>	<p>BNDN requests that the Proponent revise this mitigation measure to explicitly state that salt will not be used for de-icing Project roads to avoid attracting ungulates to the Project Area. This mitigation measure can be found in section 9.3.5.2.7 Road and Traffic Management.</p>
60.	<p>9.3.6.4.1 Alteration and/or Loss of Habitat</p> <p>Figure 9.3-14</p>	<p>The EIS uses a 500 m buffer around the Project Area to define Woodland Caribou habitat alteration from sensory disturbance.</p> <p>However, scientific research expects up to 5 km (or greater) of Caribou avoidance around mining Projects, and that related semi-permeable barriers, such as roads, likely exacerbate this effective habitat loss [(Smith et al. 2000; Dyer et al. 2001; Courtois et al. 2008; Vistnes and Nellemann 2008; Nagy 2011; Polfus et al. 2011; Leblond et al. 2011, 2013; CPAWS Wildlands League 2013; Johnson et al. 2015)].</p> <p>Without considering a larger avoidance buffer (as demonstrated in various research) around proposed anthropogenic disturbances, we believe that the EIS underestimates the potential extent of Caribou habitat alteration.</p>	<p>BNDN requests that the Proponent present the extent of caribou habitat alteration/loss from the proposed Project within a range of uncertainty informed by scientific research.</p> <p>Specifically, the percent alteration of habitats must be presented using a 500 m (low end) up to a 5,000 m (high end) buffer. We believe this analysis will provide a more accurate range of outcomes with respect to potential project impacts to caribou.</p>
61.	9.4.3.3 Bird Species at Risk	<p>Incidental observations of Barn Swallow (<i>Hirundo rustica</i>) occurred during baseline studies (Appendix 9-B). This bird SAR was not included as a Key Indicator for this Valued</p>	<p>a. BNDN requests that the Barn Swallow is included as its own key indicator for the VC Bird SAR within the EIS.</p>

	Appendix 9-B	<p>Component. Instead, the EIS represents the Barn Swallow using two other SAR birds including the Olive-sided Flycatcher (<i>Contopus cooperi</i>), and Common Nighthawk (<i>Chordeiles minor</i>). This does not make ecological sense because Barn Swallows use distinct habitat and exhibit distinct breeding behaviour from these other SAR. Therefore, the barn swallow should be its own key indicator because it will have unique levels of habitat alteration/loss and levels of mortality than the other species.</p> <p>In addition, Barn Swallows have a higher likelihood of being impacted by project activities than the other representative SAR, because they nest directly on artificial structures. The EIS states that species that nest on buildings are more susceptible to entrapment in Project components. This species is listed as Threatened on SARA Schedule 1. In Canada, the Migratory Birds Convention Act, 1994 protects Barn Swallow, its nests, and eggs.</p>	<ul style="list-style-type: none"> <li>b. Additional surveys should be conducted to confirm the presence of any Barn Swallow nests on all buildings in the Project Area prior to commencement of construction.</li> <li>c. If Barn Swallow nests are located, contact the SK MOE for regulatory advice on the appropriate actions given the specific situation.</li> <li>d. The Proponent should monitor all barn swallow nests found within the Project Area to confirm their continued usage throughout the lifecycle of the mine. If avoidance of nests is observed near Project activities, the Proponent should adopt an adaptive management approach and provide additional nesting sites elsewhere. Specifically, the Proponent could consider installing nesting structures in suitable areas to provide alternative nesting options for Barn Swallows.</li> <li>e. Staff should be trained to identify and report barn swallows and their nests.</li> <li>f. Future monitoring programs during the life of the project must include the barn swallow.</li> </ul>
62.	<p>9.4.3.3 Bird Species at Risk</p> <p>Appendix 9-B</p>	<p>Incidental observations of Horned Grebe (<i>Podiceps auratus</i>) occurred during baseline studies (Appendix 9-B). This species is listed as Special Concern on SARA Schedule 1. The Horned Grebe was not included as a Key Indicator for this Valued Component. Instead, the EIS represents this species with two other bird SAR, Yellow Rail (<i>Coturnicops noveboracensis</i>), and Rusty Blackbird</p>	<ul style="list-style-type: none"> <li>a. BNDN requests that the Horned Grebe is included as its own Key Indicator for the VC Bird SAR within the EIS.</li> <li>b. Future monitoring programs during the life of the Project must include the Horned Grebe.</li> </ul>

		<p>(<i>Euphagus carolinus</i>). The Horned Grebe uses distinct habitat from these other species. Therefore, the Horned Grebe should be its own key indicator because it will have different levels of habitat alteration/loss and levels of mortality.</p>	
63.	9.4.3.3 Bird Species at Risk	<p>The Bank Swallow (<i>Riparia riparia</i>), a bird SAR may be present within the terrestrial RSA. This species was not included in the EIS as a key indicator for bird SAR. This species is listed as Threatened on SARA Schedule 1.</p> <p>The breeding range of the Bank Swallow (<i>Riparia riparia</i>) overlaps with the terrestrial RSA. Bank swallows breed in varying natural and artificial habitat with sand-silt substrates including vertical banks, riverbanks, bluffs, stockpiles, aggregate pits, and roadcuts (COSEWIC 2013). Suitable habitat may be present because soil surface textures across the RSA are predominantly sand textured (sand, loam sand/sandy loam and silty sand). The creation of soil stockpiles during construction may create suitable breeding habitat for this species.</p>	<ol style="list-style-type: none"> <li>BNDN requests a justification for excluding the Bank Swallow from the EIS.</li> <li>If a valid justification does not exist, BNDN requests this species be added as a Key Indicator for bird SAR unless it can be proven not present in the RSA.</li> <li>All soil stockpiles should be monitored for Bank Swallow nesting activity before the stockpiles are disturbed when needed for site reclamation.</li> <li>If Bank Swallow nests are located, contact the SK MOE for regulatory advice on the appropriate actions given the specific situation.</li> </ol>
64.	9.4.3.3.2 Information from Indigenous Knowledge, Local Knowledge, and Engagement	<p>The EIS states that knowledge providers reported that multiple Whooping Cranes (<i>Grus americana</i>) have been observed along the Wheeler River, Moore River, and along the Cree River (outside of the terrestrial RSA) (19-LK-ERFNTrip-134.169) (19-LK-ERFNTrip-134.170). Whooping Cranes are listed as Endangered on SARA Schedule 1.</p>	<ol style="list-style-type: none"> <li>BNDN requests an explanation for excluding this species despite being reported by a Trapper from English River First Nation. If a valid justification does not exist, the species Whooping Crane (<i>Grus americana</i>), should be included as a key indicator for SAR birds.</li> <li>Future monitoring programs during the life of the Project must include surveys for the Whooping Crane.</li> </ol>

		The EIS does not include this species as a key indicator for SAR birds, nor does it include an explanation why this species was omitted despite being reported by a knowledge provider from English River First Nation.	
65.	9.4.3.3.3 Baseline Studies	Short-eared Owls ( <i>Asio flammeus</i> ) were not observed during the baseline surveys (Appendix 9-B). This is likely because targeted surveys for this species were not conducted. The detection probability of Short-eared Owls is very low at sunrise when the breeding songbird point count surveys were conducted. Short-eared Owls are most detectable from one hour before sunset to half an hour after sunset.	<ul style="list-style-type: none"> <li>a. BNDN requests that short-eared Owls continue to be assumed present within suitable habitat, unless proven otherwise by a qualified biologist using the Short-Eared Owl Survey Protocol (Saskatchewan Ministry of Environment 2015).</li> <li>b. Future monitoring programs should utilize the protocol developed by the Saskatchewan Ministry of Environment to better (2015) understand whether this species is present.</li> </ul>
66.	9.4.3.3.3 Baseline Studies	Yellow Rail ( <i>Coturnicops noveboracensis</i> ) were not observed during the baseline surveys (Appendix 9-B). This is likely because targeted surveys for this species were not conducted. The Yellow Rail is nocturnal; therefore, survey effort must take place between 23:00-3:00. Therefore, this species would not have been observed when the breeding songbird point count surveys were conducted.	<ul style="list-style-type: none"> <li>a. BNDN requests that Yellow Rail should continue to be assumed present within suitable habitat, unless proven otherwise by a qualified biologist using the Yellow Rail Survey Protocol (Saskatchewan Ministry of Environment 2014).</li> <li>b. Future monitoring programs should utilize the protocol developed by the Saskatchewan Ministry of Environment (2014) to better understand whether this species is present.</li> </ul>
67.	Appendix 9-b	Two bat species, Little Brown Bat ( <i>Myotis lucifugus</i> ) and Northern Myotis ( <i>Myotis septentrionalis</i> ) were detected during passive acoustic surveys in 2019 (Appendix 9-b). These species are listed as Endangered by COSEWIC and SARA schedule. Despite being present, bats were completely	<ul style="list-style-type: none"> <li>a. BNDN requests justification for excluding bat species from the EIS despite two Endangered species confirmed present.</li> <li>b. BNDN also request the Proponent put protocols in place to identify and assess bat maternity roost trees prior to</li> </ul>

		excluded from the EIS. Areas that will be cleared for mine development and operations could contain maternity roost trees. Based on Appendix 9-b, this habitat was not adequately evaluated through field surveys.	clearing and employ mitigation measures such as retaining maternity roost trees, modifying the timing of clearing, and offsetting for the destruction of habitat for endangered species.
<b>68.</b>	<p>9 Terrestrial Ecology</p> <p>9.1.8 Monitoring and Follow-up</p> <p>9.2.8 Monitoring and Follow-up</p> <p>9.3.8 Monitoring and Follow-up</p> <p>9.4.8 Monitoring and Follow-up</p>	<p>Denison's proposed terrestrial ecology mitigations described are generalized and conceptual in the EIS.</p> <p>With the level of detail provided in the EIS, it is not possible for BNDN to comment on the adequacy or effectiveness of the proposed mitigation measures or whether proposed mitigations will meaningfully diminish Project impacts on BNDN rights and interests.</p>	<p>BNDN holds invaluable indigenous knowledge related to terrestrial ecology topics including traditional and medicinal plants, ungulates, furbearers, game birds etc. within the RSA. BNDN must be meaningfully involved in the development and implementation of the various management and monitoring plans mentioned throughout Chapter 9 of the EIS to ensure that proposed impacts are sufficiently reduced. These plans include but are not limited to the wildlife monitoring plan, avian monitoring, and Woodland Caribou Management Plan. The role that BNDN will have in developing management and monitoring plans should be defined within a project agreement between BNDN and Denison</p>



## 4.6 Atmospheric Environment

Section 6.0 of the Wheeler River Project EIS discusses the impact of the Project on the atmospheric environment. The EIS provides a detailed description of baseline air quality conditions, predicted project-related impacts and proposed mitigation measures. A review was completed in collaboration with BNDN to comment, identify potential concerns/deficiencies, and provide recommendations to minimize the impact of the Project on BNDN rights and interests, and the atmospheric environment.

Air Quality was selected as a VC because the Project will emit contaminants and change air quality. Air Quality was raised as a concern by BNDN during preliminary engagement with Denison as it connected to human and ecological health. The atmospheric environment acts as a pathway that can impact other ecosystem components which impacts BNDN rights, interests, and health, including:

- First Nation land and resource use including but not limited to hunting, fishing, trapping, gathering and cultural sites
- Human health
- Surface water quality and sediment quality
- Fish and fish habitat
- Terrain and soils
- Vegetation including medicinal, spiritual, edible, or culturally significant plants
- Wildlife and wildlife habitat

The Wheeler River Project will introduce new emissions sources and air contaminants into the region creating higher concentrations of pollutants and exceedance conditions. Denison assessed the following constituents of potential concern (COPC), also known as air contaminants or pollutants:

- total suspended particulate matter (TSP)
- inhalable particulate matter (PM10)
- respirable (fine) particulate matter (PM2.5)
- carbon monoxide (CO)
- sulphur dioxide (SO2)
- nitrogen dioxide (NO2)
- uranium
- arsenic
- cadmium
- chromium
- cobalt
- copper
- lead
- molybdenum
- nickel
- selenium
- vanadium
- zinc
- radon gas

The Project's predicted air emissions from various sources (e.g., generators, process plant emissions, vehicle emissions, etc.) were combined with exiting air quality data (baseline conditions) in a model to understand the change in air emissions caused by the Project. Emissions for each COPC were estimated and modeled to predict changes in COPC concentrations and deposition rates.

Denison anticipates that unpaved surfaces such as site roads will be the main source of dust emissions and trace metals from the Project, with contributions also coming from processing emissions during operations. Denison expects fuel combustion from mobile and stationary equipment to be the main source of combustion and greenhouse gases from the Project. The main sources of uranium and radon occur in operations and include the ISR processing plant and operation of the ISR wellfield.

The following table outlines the project activities that impact air quality during each phase of the Project:

Project Phase	Project Activity Resulting in Changes to Air Quality
Construction	Development of access roads and air strip
	Site preparation and earthworks; clearing, levelling, and grading of the Project Area
	Power generation – generators
	Installation of main substation and distribution of power around site
	Wellfield and freeze hole drilling; ground freezing
	Batch plant operation (concrete); crusher at borrow area
	Development of surface infrastructure (camp, operations centre, plants, ponds, pads, and support facilities)
	Waste management (composting, domestic and industrial landfill operation, recycling)
	On-site and off-site operation of vehicles and transport of materials
	Air transportation for workers
Operations	Operation of the ISR wellfield
	Wellfield and freeze wall drilling
	Batch plant operation (grout and cement); crusher in borrow area

	Expansion of pond and pads
	Operation of the processing plant and production of uranium concentrate
	Waste management (composting, domestic and industrial landfill operation, recycling)
	Hazardous waste management (temporary storage, handling, and off-site transportation)
	Storage and disposal of drill waste rock, process precipitates, and industrial wastewater treatment plant precipitates
	On-site and off-site operation of vehicles and transport of materials
	Power supply – generators and backup generators
	Package and transport of nuclear substances
	Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)
	Air transportation for workers
	Progressive decommissioning and reclamation
Decommissioning	Reclamation of disturbed areas
	Closure of ISR and freeze wells and related infrastructure ☐
	Decontamination of surface facilities and injection, recovery, and monitoring wells
	Asset removal (including site power transmission lines and electrical infrastructure)
	Demolition and disposal of non-salvageable surface infrastructure and materials
	Remediation of contaminated areas
	Generators
	Waste management (composting and landfill operation)
	Decommissioning of landfills; hazardous materials management

	On-site and off-site operation of vehicles and transport of materials
	Mining horizon remediation and thawing of freeze wall

Air quality is regulated by the Saskatchewan Ministry of Environment (MOE) through the Saskatchewan Ambient Air Quality Standards (SAAQS). For certain contaminants which do not have provincial regulatory standards, the Canadian Council of Ministers of the Environment (CCME) have agreed to implement a national Air Quality Management System. The framework resulted in the development of the Canadian Ambient Air Quality Standards (CAAQS) for particulate matter less than 2.5 microns (PM<sub>2.5</sub>), ozone, nitrogen dioxide, and sulphur dioxide. For COPCs without a SAAQS or CAAQS, Denison used standard from other jurisdictions including Ontario.

For the majority of COPCs, Denison's modeling results predicted that the Project would be in compliance with provincial and federal air quality standards. However, Denison modeling results showed that the Project will cause exceedance conditions (pollutant concentrations above the regulatory limit) for the following air contaminants:

- **24-hour Total Suspended Particulate Exceedances**
  - Concentrations of 24-hour TSP were predicted to exceed the criterion of 100 µg/m<sup>3</sup> during Construction, Operation, and Decommissioning, up to a maximum of 313% of the criterion during Construction.
  - 24-hour TSP concentrations exceed the criterion 28% of the time during Construction, 21% of the time during Operation, and 0.5% of the time during Decommissioning
- **24-hour Particulate Matter (PM<sub>10</sub>) Exceedances**
  - Concentrations of 24-hour PM<sub>10</sub> were predicted to exceed the criterion of 50 µg/m<sup>3</sup> at off-property receptors during Construction and Operation, up to a maximum of 232% of the criterion during Construction.
  - 24-hour PM<sub>10</sub> concentrations exceed the criterion 17% of the time during Construction and 12% of the time during Operations.
- **1-hour Nitrogen Dioxide Exceedances**
  - Concentrations of 1-hour NO<sub>2</sub> were predicted to exceed the criterion of 79 µg/m<sup>3</sup> at off-property receptors during Construction, Operation, and Decommissioning, up to a maximum of 225% of the criterion during Operation and Decommissioning.
  - Exceedances showed that 1-hour NO<sub>2</sub> concentrations exceed the criterion less than 1% of the time during any of the modelled Project phases at the maximum off-property receptor, which occurs on the Property Boundary.
- **24-hour Uranium Exceedances**

- Concentrations of 24-hour uranium were predicted to exceed the criterion of 0.15 µg/m<sup>3</sup> at off-property receptors during Operation only, up to a maximum of 148% of the criterion.
- 24-hour uranium concentrations exceed the criterion less than 0.5% of the time at the maximum off-property receptor, which occurs on the Property Boundary.

(Denison, 2022)

#### Key Issues:

- The Project will produce exceedance conditions for TSP, PM 10 and Uranium, this may be exacerbated during wildfire events or cumulative effects from other local uranium mining operations (e.g., Key Lake, McArthur River, etc.)
- The EIS air dispersion model does not include air contaminant emissions from the Cameco McArthur River Mine and Key Lake Mill. Those two projects were in care and maintenance while the EIS was drafted but have recently resumed operations. As such, the EIS does not adequately capture the cumulative effects on the atmospheric environment. Fugitive dust and uranium emissions (and potentially other contaminants) have increased potential for exceedances with the resumption of Cameco's operations.

*Table 6. Comments and recommendations for the Wheeler River Project related to air quality and emissions*

#	Document Reference	Comment	Request/Recommendation
69	EIS Section 6.0	Denison's air dispersion model does not include any receptor locations related to BNDN traditional land and resources use (TLRU) and Indigenous Knowledge (IK) sites. BNDN members use the lands and waters in the Project area for TLRU and ceremonial purposes.	BNDN TLRU and IK sites should be considered in Denison's air quality assessment. The geographic locations for TLRU and IK should be inputted into the air dispersion model as special receptors. This will provide site specific data for BNDN land users who use the LSA so they can effectively assess the Project's impact on land use and rights.
70	EIS Section 6.0	Denison states in the EIS "the Cameco McArthur River Operation and Key Lake sites are currently in Care and Maintenance mode; therefore, there is	Denison must redo air dispersion modeling to account for the Cameco McArthur River Uranium

		<p>currently no truck traffic between the sites on Highway 914. When these sites are to become operational again, there is potential for a cumulative effect at sensitive locations near the highway.” On November 28th, 2022, operations resumed at Cameco's McArthur River Uranium Mine and Key Lake Mill.</p> <p>Denison did not model Cameco related air emissions in their air dispersion model. The EIS model does not account for any of Cameco’s air emissions from the mill, mine, and associated truck traffic between sites. Without this data included in the model, the EIS does not adequately account for the cumulative effects of Cameco’s McArthur River Mine and Key Lake Mill on the atmospheric environment.</p>	<p>Mine and Key Lake Mill which have resumed operations since the EIS was released.</p> <p>Without this data included in the model the EIS does not accurately capture baseline conditions or cumulative effects on the atmospheric environment.</p> <p>Fugitive dust and uranium emissions (and potentially other contaminants) have increased potential for exceedances with the resumption of Cameco’s operations, as exceedances are already predicted with the Wheeler River Project alone.</p>
71	EIS Section 6.0	<p>The Project is predicted to produce exceedances for TSP of 313% over the regulatory limit. 24-hour TSP concentrations exceed the criterion 28% of the time during Construction, 21% of the time during Operations.</p> <p>These exceedance conditions do not include TSP emissions from Cameco’s McArthur River Mine and Key Lake Mill which have now resumed operations.</p> <p>There is also the potential for wildfire smoke to further exacerbate dust emissions.</p> <p>TSP exceedances represent a potential health risk for land users and workers near the Project site. Especially for at-risk groups such as elders, youth, and people with existing respiratory conditions.</p>	<ol style="list-style-type: none"> <li>Denison must employ additional mitigation measures to reduce TSP emissions on site including enhanced dust suppression efforts.</li> <li>Denison must remodel TSP to include emissions from Cameco’s McArthur River Mine and Key Lake Mill.</li> <li>Please provide information on how TSP will be monitored during the Project and how Denison will know when exceedance conditions are occurring.</li> <li>Please provide information on how adaptive management will be used when a TSP exceedance is discovered. Including</li> </ol>

			<p>discussion on how the Project will be managed during poor air quality events caused by wildfire smoke.</p> <p>e. Please provide information on how exceedances conditions near the Project site will be communicated to the public.</p>
72	EIS Section 6.0	<p>The Project is predicted to produce exceedances for PM10 of 232% over the regulatory limit. 24-hour PM10 concentrations exceed the criterion 17% of the time during Construction, 12% of the time during Operations.</p> <p>These exceedance conditions do not include PM10 emissions from Cameco's McArthur River Mine and Key Lake Mill which have now resumed operations.</p> <p>There is also the potential for wildfire smoke to further exacerbate dust emissions.</p> <p>PM10 exceedances represent a potential health risk for land users and workers near the Project site. Especially for at-risk groups such as elders, youth, and people with existing respiratory conditions.</p>	<p>a. Denison must employ additional mitigation measures to reduce PM10 emissions on site including enhanced dust suppression efforts.</p> <p>b. Denison must remodel PM10 to include emissions from Cameco's McArthur River Mine and Key Lake Mill.</p> <p>c. Please provide information on how PM10 will be monitored during the Project and how Denison will know when exceedance conditions are occurring.</p> <p>d. Please provide information on how adaptive management will be used when a PM10 exceedance is discovered. Including discussion on how the Project will be managed during poor air quality events caused by wildfire smoke.</p> <p>e. Please provide information on how exceedances conditions near the Project</p>

			site will be communicated to the public.
73	EIS Section 6.0	<p>The Project is predicted to produce exceedances for uranium of 148% over of the regulatory limit.</p> <p>These exceedance conditions do not include uranium emissions from Cameco's McArthur River Mine and Key Lake Mill which have now resumed operations.</p> <p>Uranium exceedances represent a potential health risk for land users and workers near the Project site. Additionally, uranium deposition in the aquatic and terrestrial environment can cause effect pathways to humans through the food chain through the consumption of edible/medicinal plants, berries, fish, and wildlife.</p>	<p>a. Denison must employ additional mitigation measures to reduce uranium emissions on site including enhanced scrubber systems and containment measures.</p> <p>b. Denison must remodel uranium to include emissions from Cameco's McArthur River Mine and Key Lake Mill.</p> <p>c. Please provide information on how uranium emissions will be monitored during the Project and how Denison will know when exceedance conditions are occurring.</p> <p>d. Please provide information on how adaptive management will be used when a uranium exceedance is discovered.</p> <p>e. Please provide information on how exceedance conditions near the Project site will be communicated to the public.</p>
74	EIS Section 6.0	The Saskatchewan MOE Air Quality Modelling Guidelines specifies that the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) should be used for assessments in Saskatchewan. Denison opted to use the CLAMET/CALPUFF dispersion model for the EIS.	Please provide additional rationale for the selection of the CALPUFF model over the provincially recommended AERMOD.
75	Appendix 6-C	Carbon dioxide emissions related to air travel for Project personnel were not included in the GHG emissions calculations. Project related emissions	Denison must include emissions from air travel for project personnel in the GHG emissions



	Climate Baseline and Greenhouse Gas Emissions Report	from air travel would be significant source due to the remote nature of the site. The GHG emission estimate included in EIS Appendix 6-C does not provide a fulsome representation of Project related GHG emissions.	calculations. This will provide a more accurate representation of project-related GHG emissions.
76	EIS Section 6.0	Denison acknowledges the Project's contribution to climate change through GHG emissions but does not outline a plan to offset GHG emissions. Other mines in Canada, including the Canadian Malartic Mine in Quebec have GHG offset plans in which carbon emissions are tracked and offsetting activities are developed in collaboration with local First Nations (Canadian Malartic, 2014).	Denison must develop a GHG/Carbon offsetting plan to mitigate potential impacts of the Project to climate change. Denison could work with BNDN and other local First Nations on initiatives that help to offset the Project's GHG emissions (e.g. tree planting, wetland restoration, carbon offsets). This would demonstrate a commitment to corporate social responsibility, climate stewardship and reconciliation on Denison's behalf.
77	EIS Section 6.0	The Project is reliant on burning diesel for construction, supplementary power generation, mine processing activities, and mine equipment. The GHG intensive nature of the Project's construction and operation phases are a concern for BNDN and not consistent with federal or provincial directives to reduce GHGs. Cleaner technology and fuel sources are available to reduce the Project's GHG emissions. For a project based around supplying fuel for the energy transition, a more progressive approach that utilizes Best Available Technology is required in order to reduce GHG emissions.	Where feasible Denison must implement the use of low carbon technology and fuels in the final Project design to reduce GHG emissions. Specifically, Denison should redesign the Project to: <ul style="list-style-type: none"> <li>• Replace all diesel electricity generation with LNG/CNG generators (and add in renewables where feasible) for construction phase</li> <li>• Replace all diesel powered mine equipment and vehicles with electric or LNG/CNG models</li> <li>• Use renewable energy sources for electricity</li> </ul>

			generation (e.g. wind, solar) as early in the project lifecycle as possible
78	EIS Section 6.0	Denison does not specify how it will monitor air contaminant concentrations during all phases of the Project. Continuous on-site ambient air monitoring for all COPCs (including particulates, metals, and radon) is the only way to truly assess the Project's impact on air quality and compliance with government standards.	Denison must conduct continuous on-site monitoring for all contaminants of concern (including particulates, metals, and radon) in order to assure regulatory compliance and verify the accuracy of air dispersion models and EIS predictions.
79	EIS Section 6.0	Denison does not specify how BNDN will be involved in air quality monitoring during construction, operations and decommissioning phases of the Project.	<ul style="list-style-type: none"> <li>a. BNDN requests the implementation of robust and long-term environmental monitoring to verify protection of the environment, including community-led monitoring during Construction and Operations of the Project.</li> <li>b. Denison must develop specific roles and responsibilities to BNDN members in relation to air quality monitoring and site wide environmental monitoring. This should include, at a minimum, one environmental monitor position for BNDN. This would provide increased transparency and confidence to Denison's environmental management practices and performance.</li> </ul>

## 4.7 Mine Infrastructure and Engineering

The EIS includes a technical section (2.0) describing the components and activities of the project and their relevance to environmental and community concerns.

BNDN recognizes the relative advantages of the ISR method compared to other mining methods in terms of land footprint, noise, mobile equipment emissions, and surface disturbance.

The preparation, mixing, transportation via surface-run pipe, injection/recovery, and storage of acidic mining solution and uranium-bearing solution represent the most significant unique risks associated with the project.

The planned process plant and ancillary site facilities are similar to those constructed on other remote mine site projects in Northern Saskatchewan. Construction must follow best practices and lessons learned from other sites for implementing and adhering to environmental protections and respecting local communities interests.

Operation of the ISR wellfield, freeze walls, process plant, ponds, and site facilities should incorporate practices that minimize the risks of spills and other environmental impacts, and in addition have the necessary procedures in place to contain and clean up incidents in a timely manner should they happen.

### Key Issues:

- The Proponent must implement protocols and technologies to minimize the likelihood and magnitude of contamination of the local environment. The project should use automated control systems where possible to reduce the chances of minor incidents causing significant emissions or spills.
- The Proponent is responsible to protect the health and safety of employees, contractors, and visitors to the site. The frequency and depth of training programs for operations, maintenance, repairs, emergency response, spill clean-up, and risk mitigation measures must be appropriate.

*Table 7. Comments and recommendations for the Wheeler River mine infrastructure and engineering*

#	Document Reference	Comment	Request/Recommendation
80.	Draft EIS 2.2.2.2.2 Uranium Bearing Solution Holding Area	The Proponent states that the UBS holding area will have leak detection (Figure 2.2-18). The system is shown as a pipe running under the pond.	a. BNDN requests more details on the leak detection system used for all ponds shown in Figure 2.2-18.  b. BNDN requests that Denison respond to all the following questions in writing:

	Page 2-28		<ul style="list-style-type: none"> <li>• Is the pipe connected to an automated sensing system?</li> <li>• If not, how frequently is the system monitored?</li> <li>• What chemical or physical indicator(s) are used to detect a leak?</li> <li>• What are the detection limits/thresholds for each indicator?</li> <li>• What is the precision of each indicator?</li> <li>• Who is notified, and how quickly would a response be mobilized?</li> </ul>
<b>81.</b>	<p>Draft EIS 2.2.2.2.2 Uranium Bearing Solution Holding Area</p> <p>Page 2-28</p> <p>&amp; 2.2.4.5 Process Precipitate Pond</p> <p>Page 2-57</p>	The Proponent states that the UBS holding area will have leak detection (Figure 2.2-18). The system is shown as a pipe running under the pond.	BNDN requests to know what specific containment/restoration methods will be used in the event that a leak is detected, and how quickly they would be implemented. This applies to both the UBS holding area and process precipitate pond.
<b>82.</b>	<p>Draft EIS 2.2.2.2.2 Uranium Bearing Solution Holding Area</p> <p>Page 2-28</p>	The Proponent states that the UBS holding area will be designed as a pond contained by a double composite liner system (Figure 2.2-18), and that options to use tanks instead of holding area will be evaluated as engineering advances.	BNDN requests that Denison undertake a risk assessment for the design of the UBS holding area. BNDN recommends the safer, less environmentally risky option be selected and that BNDN can review and provide input into the decision that Denison makes.
<b>83.</b>	<p>Draft EIS 2.2.1.4.5</p> <p>Page 2-24</p>	The Proponent states that the wellfield pipelines will be designed to have secondary containment or	BNDN requests more details on the leak detection system used for wellfield lines. Specifically, BNDN requests that Denison respond to the following questions:

		catchment and have leak detection systems in place at key locations.	<ul style="list-style-type: none"> <li>• Is an automated sensing system used?</li> <li>• Will automated controls shut off pressure in the event of a significant leak?</li> <li>• If no automation is used, how frequently is the system monitored?</li> <li>• What chemical or physical indicator(s) are used to detect a leak?</li> <li>• What are the detection limits/thresholds for each indicator?</li> <li>• What is the precision of each indicator?</li> <li>• Who is notified, and how quickly would a response be mobilized?</li> </ul>
<b>84.</b>	Draft EIS 2.2.1.4.5 Primary Containment of Mining Solution – Wells  Page 2-19	The Proponent states that the well designs and operational monitoring of the wellfield will mitigate accidental release of mining solution or UBS in the sandstone above the mining area	BNDN requests to know how Denison will monitor the integrity of wells once in production. Will tests be conducted at regular intervals?
<b>85.</b>	Draft EIS 2.2.1.4.5 Fuel Storage and Dispensing Facility  Page 2-66	The Proponent states that fuels will be stored in approved, above-ground, 25,000 L double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.	BNDN requests to confirm when the permanent fuel storage facility will be constructed. If temporary fuel storage for construction is required, indicate how much, how it will be stored and dispensed, and show on a sketch where it will be located. Construction fuel requirements for site development may be significant.
<b>86.</b>	Draft EIS 2.2.4.5 Process Precipitate Pond	The Proponent states that process precipitates may be stored in totes inside the process precipitate pond.	BNDN requests details on the procedures for placement and handling of precipitate totes within the pond. Care should be taken to ensure that equipment and totes do not compromise the pond lining. Totes should be

	Page 2-57		sealed and transport of totes from the plant to the pond should be carefully planned to minimize the risk of a spill, and in the event of a spill ensure that runoff is captured on the site.
87.	Draft EIS 2.8 Project Design Features  Page 2-95	Denison states that they will maintain an up-to-date record of the various hazardous substances on site and will maintain Safety Data Sheets and appropriate procedures for spill management, handling, and clean up in an accessible location	BNDN requests a description of the safety and spill response training programs that employees will undergo. What is the duration of each training program and how often will retraining be conducted?
88.	Draft EIS 2.8 Project Design Features  Page 2-95	Denison states that they will maintain an up-to-date record of the various hazardous substances on site and will maintain Safety Data Sheets and appropriate procedures for spill management, handling, and clean up in an accessible location	BNDN requests to know what resources will be kept on site for management and clean-up of spills, for example spill kits, absorbents, neutralization agents, vacuum trucks, PPE, hand tools, etc.
89.	Draft EIS 2.2.2.2.4 Yellowcake drying and packaging  Page 2-29	The Proponent describes various measures used to mitigate yellowcake dust emissions: the yellowcake drying and packaging area will be outfitted with hygiene systems to capture dust generated during the material handling of the yellowcake product and sent to either the dryer or calciner venturi scrubbers. All equipment located after the dewatering of the yellowcake will be selected to provide minimal dust generation and outfitted with dust collection systems where required. The ventilation system in this area of the processing plant will also be adequately designed to provide safety of workers and control fugitive dust emissions.	BNDN recommends redundant hygiene systems be installed (n+1 units) to ensure continuity of air filtration in the event of equipment failure.

<p><b>90.</b></p>	<p>Draft EIS 9.3.5.1 Project Design Measures  Page 9-219</p>	<p>The Proponent states that all contaminated areas will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.</p>	<p>BNDN requests to know the size and type of fence considered for each project area. Confirm if the wellfields will be fenced. Show all fences on a site layout drawing like Figure 2.2-1.</p>
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## 5.0 Conclusion

Birch Narrows Dene Nation looks forward to responses from Denison on all the comments above. We expect that identified issues will be resolved through ongoing engagement with the CNSC, SMOE and Denison throughout the Environmental Assessment and permitting for the Project.

## 6.0 References

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# WHEELER RIVER PROJECT ENVIRONMENTAL IMPACT STATEMENT TECHNICAL REVIEW RESPONSE



English River  
First Nation

Prepared by:



Source

February 22, 2023

# EXECUTIVE SUMMARY

Denison Mines Corp. is proposing to develop the Wheeler River project (the Project), an In-Situ Recovery (ISR) uranium mining and processing facility located in the Athabasca Basin in northern Saskatchewan, approximately 600 km north of the city of Saskatoon. Denison's proposal requires approval by the Canadian Nuclear Safety Commission (CNSC) under the *Nuclear Safety and Control Act*. Before the CNSC can make a licensing decision on this proposal, an environmental assessment conducted under the *Canadian Environmental Assessment Act, 2012* affirming that the proposed activities will not cause significant adverse environmental effects, is required. This project is also subject to the environmental assessment requirements of the Government of Saskatchewan.

On November 21, 2022, the CNSC accepted the draft Environmental Impact Statement (EIS) from Denison, releasing the EIS for public review and comment. The EIS is intended to provide analysis on the project's potential environmental effects and measures to mitigate those potential impacts. Further, the EIS is based on the incorporation of western science and Indigenous Knowledge (IK) that includes direct input from English River First Nation (ERFN).

It is ERFN's expectation that input from ERFN and our citizens will be appropriately considered in the EIS. It is necessary that all parties recognize the potential for this project to have adverse impacts on the environment and rights, interests, and way of life of the ERFN.

A uranium mining project, like any other mining project, may result in both positive and negative impacts on the environment, including health and society. Where the Wheeler River project is unique in Canada is in respect to the many unknowns and uncertainties associated with the novel In Situ Recovery (ISR) mining technology which would be used in Canada for the first time. ISR technology poses novel factors, including risks and potential impacts, that will be considered for the first time in this assessment.

The most significant risks result from the potential for hazardous materials to escape Denison's control and contaminate the surrounding environment. While spills are a common and mitigatable risk with any mining project, the primary concern with this project is that such spills would occur below ground where contamination is not visible or always detectable. ERFN and its citizens, at multiple points through engagement with Denison, have raised concerns about the potential for mining fluids to escape beyond the project footprint and contaminate surrounding ground and surface water. **The toxic nature of mining fluids being used combined with the complex flow pathways of ground and surface water surrounding the mine site pose significant potential risks to the regional ecosystem, downstream waterbodies, and ERFN.**

ERFN's primary interest is to ensure that the potential risks are quantified, that effective mitigation measures are identified, and that the project is designed and operated to ensure that those risks are managed over the long-term.

ERFN has reviewed the draft EIS from this perspective.

We also note that the Wheeler River project is proposed in the context of significant perceived risks among ERFN members about the nuclear industry. ERFN recognizes that the nuclear industry in Canada is among the safest in the world. However, many of our members are aware of nuclear catastrophes and accidents in other parts of the world, leading to significant concerns about uranium mining. The associated psychological and perceived impacts of the Wheeler River project experienced by ERFN members may contribute to changes in the ERFN way of life, including avoidance and reduced enjoyment or connectedness to Nuhtsiye-kwi Benéne (ERFN's Ancestral Homelands). ERFN and Denison are working together to better understand the impacts of cumulative effects on ERFN and within the Ancestral Lands, and what role Denison can play in reducing the potential for impact in this area. ERFN expects that Denison and CNSC will implement appropriate and effective mitigation and accommodation measures to address cumulative impacts.

## **REVIEW OF THE DRAFT EIS**

ERFN, with support from Shared Value Solutions and Source Environmental Associates, reviewed the draft EIS. We summarize our key findings in three general categories: (a) Project Elements that ERFN Supports, (b) Project Elements That Require Additional Information or Refinement, and (c) Project Elements where ERFN has Significant Concerns:

### **PROJECT ELEMENTS THAT ERFN SUPPORTS**

- Denison is proposing the use of a freeze-wall as a containment system for mining fluids. While we believe there are inherent challenges in ensuring that the freeze-wall is effective, ERFN agrees that the freeze-wall is an important mitigation measure that will reduce overall project risks. It is therefore imperative that both the design of the freeze-wall and the associated emergency procedures in the unlikely event of a failure is fully considered, and that provisions for long-term maintenance are included in the licensing conditions.
- Denison is proposing the use of effluent treatment for the Wheeler River project. Treatment of contact water is essential for ensuring that effluent meet appropriate water quality guidelines prior to discharge. We support effluent treatment, but note that additional refinement is necessary. ERFN expects that all water discharged from the Wheeler River site will meet appropriate water quality guidelines.
- Denison intends to send left-over process precipitates off-site for additional processing and disposal rather than being left on site. This will reduce the environmental impacts left on site, and assuming waste materials are appropriately handled and disposed of responsibly, will reduce the overall risk to the environment. ERFN notes that Denison should continuously improve methods of minimizing the development of waste products to minimize its overall environmental footprint.
- Denison proposes to recycle significant amounts of process water that will limit both the amount of water withdrawn from and released to the environment to support processing. ERFN proposes that Denison to continue to identify efficiencies and use best technologies to further reduce external water demands.

## PROJECT ELEMENTS THAT REQUIRE ADDITIONAL REFINEMENT

- The water balance associated with Denison's water recycle program is not clearly defined. ERFN believes that it is important for Denison to quantitatively describe water use in the project within the EIS, rather than waiting until the permitting phase of the project. The water balance for the project must be better understood, as it may disclose significant impacts on the aquatic environment.
- ERFN acknowledges that Denison intends to do a best available technology study to define water treatment options. Until this study is conducted, 'best' remains to be defined. We request that ERFN be fully engaged in this study and be provided with an opportunity to discuss with ERFN the best treatment option for this project in order to protect the aquatic environment.
- The water recycle program is conceptual at this stage. Denison has committed to following the "As Low as Reasonably Achievable" standard and continual improvement initiatives during each phase of the project, including the next phases of licensing. ERFN notes this commitment, and recommends quantitative assessment of water recycle as part of the EIS, as this may address the potential issue with effluent acute toxicity discussed in the comments below.
- While Denison has met the minimum standard for baseline data collection (i.e., one year of data), ERFN maintains that there are insufficient data to accurately characterize the baseline aquatic environment. Given the insufficient datasets, the present assessment of the potential impacts carries too much uncertainty. Based on the baseline characterization (Ecometrix, 2020, EIS Appendix 8-D), the majority of aquatic environment baseline data were collected in 2016 or earlier, and only one year of data (2016) was collected for aquatic biota (benthic invertebrates, plankton, fish tissues) and sediments. Most of the hydrological and fish habitat data forming the basis for those characterizations were collected prior to 2014, and there are very little winter data. Denison has not justified the limited spatial and temporal coverage of the baseline studies. ERFN recommends that Denison should collect at least one additional year of data to assess the current aquatic environment and make the necessary revisions to the baseline characterization. It's important to note that most of the previous baseline data is now over five years old, so the best practice would be to collect two more years of baseline data. This would also serve to meet the provincial TOR and EIS guidance that prescribes all biological and time-sensitive data should be less than two years old (Saskatchewan 2021).
- The EIS has analyzed the potential impacts of the project on Northern Pike and White Sucker, which are considered significant to ERFN. However, there is no evaluation of the effects on Walleye, Lake Whitefish, Lake Trout, and Arctic Grayling, which are also considered important by ERFN. Denison has used Northern Pike and White Sucker as a representation for these species, but there is no evidence provided that these species are appropriate surrogates. ERFN also notes inconsistencies in the fish presence/absence data used for the baseline and EIS. Additionally, the potential impact on food web dynamics and its implications for fish species is not thoroughly discussed.

- The EIS would also benefit from more robust efforts to identify and justify key assumptions, as well as key knowledge gaps and how such gaps will be addressed. These are requirements under CEAA 2012. Issues identified in our review and discussed below include key assumptions used in modelling, as well as gaps in data and knowledge relating to critical aspects of the EIS, including the identification of potential impacts and the assessment of significance in relation to groundwater/hydrology, the aquatic environment, local biota and other important values. ERFN has identified instances throughout the report in which such assumptions or knowledge gaps require further justification or additional detail.
- The aquatic environment section of the EIS is also missing information on how malfunctions were evaluated (as required by CEAA 2012 S.19(1)[a]), and provides limited discussion of food web dynamics and their implications to the EIS as required by CEAA 2012 REGDOC 2.9.1. Please see the comment tracking tables for some specific examples of knowledge gaps and assumptions requiring clarity from Denison.
- Denison presents a very narrow assessment of Human Health impacts as a result of the Wheeler River Project. By considering only the direct impacts of chemical and radiological elements of the project on public and worker health, Denison has failed to consider an entire suite of secondary impacts to human health, including the project's impacts on sexual health and violence, use of drugs and alcohol, and the psychological and mental health of ERFN members. Additional consideration of these factors and appropriate mitigation measures should be required in the EIS.
- Denison notes that the increased amount of contaminants of potential concern released to the environment by this project are muted in comparison to the baseline conditions. ERFN is concerned that the impacts of the Wheeler River project still result in additive or synergistic effects on the local and regional environments. As baseline contaminant levels in human health receptors are already high, any additional inputs from the Wheeler River project will serve to add additional stress to an already impacted environment. These issues should be addressed in the EIS.
- ERFN is concerned that the EIS does not sufficiently account for the cumulative effects of past projects and their impacts. Although Denison has attempted to integrate Indigenous Knowledge (IK) with western science, it is the view of ERFN that the representation of these efforts in the EIS falls well short of best practices. There are still significant gaps in the consideration of both cumulative effects and IK that will need to be addressed in the EIS.
- Denison understates the impact of the Project on the Community Well-Being by focusing only on the effects of ERFN citizens participating in the Project's rotational work schedule and related impacts to family and community cohesion. Although the employment and involvement of ERFN citizens may have an effect on certain aspects of Community Well-Being, the Project also has broader direct impacts on ERFN's Ancestral Territory, affecting the well-being of all ERFN citizens. The presence of the Project will alter how all ERFN citizens interact with Nuhtsiye-kwi Benéne, thus influencing ERFN's overall Community Well-Being and Quality of Life. This must be acknowledged and addressed in the EIS.

- Although the erosion of the traditional economy and negative impacts on harvesting activities through the Wheeler River Project was identified as a major concern by ERFN, Denison understates these potential negative impacts and concludes that traditional harvesting activities such as trapping, hunting, and fishing will not be significantly affected. It is crucial that Denison takes proactive measures to support the traditional economy and that these measures be to the satisfaction of ERFN as a condition of licensing.
- It is important to ensure that a robust monitoring and follow-up programs are developed that measures the impacts of the Project on the KIs, including traditional economy, to ensure that there are no additional negative residual effects of the Project. Additional residual adverse economic effects may likely result from the Project, such as: economic downturn associated with a boom-bust industry; economic leakage, exacerbating socio-economic disparities between the LSA, the RSA, and outside communities; income and economic disparities within the LSA and RSA based on gender, culture, or other factors; and adverse effects on the traditional economy, as the effects presented in the assessment likely underrepresent future impacts. ERFN has obtained assurances from Denison that these issues will be addressed through proactive monitoring and follow-up programs.
- The draft EIS lacks contingency plans for many potential scenarios in which failure occurs. Denison notes and ERFN agrees that failure of the freeze-wall is predicted to be an unlikely event, but ERFN notes that a response plan for this and other events must be developed as a condition of licensing.
- The draft EIS does not provide sufficiently detailed information to model the dispersion of radioactive material if it were to enter into Wheeler River in the event of a vehicular accident. While the likelihood of this scenario to occur is low, Denison must be appropriately positioned to respond in such an event as a condition of licensing.
- Denison does not adequately characterize the potential for system failure of the effluent treatment facility. As a result, the draft EIS provides no insight into how Denison may be able to store water or otherwise prevent the release of contaminated water to the environment. This scenario must be evaluated in the EIS, and emergency response procedures must be addressed as a condition of licensing.

## **PROJECT ELEMENTS THAT ARE SOURCES OF CONCERN**

- As presented in the draft EIS, Denison is proposing to leave heavily impacted water in the leach field, with the expectation that the plume will not migrate to Whitefish Lake sufficiently to cause environmental impacts. Given the risks involved, ERFN expects Denison to take a more proactive approach to leach field decommissioning to ensure the leach field is actively remediated at the end of project life. ERFN recommends targets based on returning groundwater to near-baseline conditions by doing as much mitigation as possible while the mine is in operation/in closure in order to reduce uncertainty and risk for future generations. This is a fundamental concern for ERFN, and must be addressed in licensing conditions.
- The predicted effluent quality of the industrial wastewater treatment plant is quite saline. The quality of this water at end-of-pipe (prior to the diffuser) may cause acute toxicity to

aquatic life, meaning discharge may contravene the Fisheries Act/Canadian Metal and Diamond Mine Effluent Regulations. Ensuring that adequate measures are implemented to ensure that discharge water quality is within guidelines that are adequately protective of aquatic life is a fundamental concern for ERFN.

- One of the core challenges of using ISR is to ensure the containment of mining fluids (solvent materials injected into the ore body, as well as uranium and other ore products mobilized during recovery) to the Project area. Denison plans to use a freeze-wall to prevent lateral groundwater flow and potential contamination of groundwater and surface water. While the technology is not entirely new in Canada, the large size of the freeze-wall presents a significant operational and closure challenge. Denison's assessment largely depends on models and assumptions, but provides little supporting evidence or reference to previous studies or projects. ERFN stresses the importance of ensuring that Denison's models are shown to be conservative and that Denison is able to carefully monitor and maintain the freeze-wall to prevent the release of contaminated material. In the event of mining fluids or other contained materials being released, ERFN expects Denison to detail emergency procedures to stop the release and restore the affected environment. ERFN understands that Denison is committed to developing an emergency response procedure for this event.
- Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the *Traditional Knowledge Study and Health and Socio-Economic Study Report*. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN's rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user. It is important for the proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and socio-cultural and economic perspective. Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated. The draft EIS should be revised to reflect the totality of ERFN TK and land use information.

ERFN is prepared to accept that ISR mining may be a better approach compared to conventional open-pit uranium projects. Other open pit operations in ERFN territory have left long-lasting damage to our Ancestral Homeland that cannot be fully remediated. However, this Project is the first of its kind in Canada. ERFN believes that it must be held to the highest standards. Denison as the proponent and CNSC as the regulator must employ strict precautionary approaches in all instances where uncertainty or potential risks cannot be resolved.

**To Denison's credit, they have worked closely with ERFN in the months and years that have led up to the submission of their draft EIS to provide information to ERFN about the nature of the**



proposed mine, to develop an open and trusting relationship, and to gain an understanding of ERFN knowledge, rights, practices, interests, and concerns. However, ERFN is of the view that the draft EIS does not yet currently utilize sufficiently conservative models or precautionary approaches to contingency planning or in the consideration of failure or accident scenarios. These issues will be of greatest concern to our citizens.

In situ recovery is an entirely new type of uranium mining to what we have seen within Nuhtsiye-kwi Benéne, and there are many unknowns. The onus to provide evidence that will assure our community that this project will not cause adverse environmental impacts lies directly with Denison. Unless more conservative models are used to predict impacts, and more robust environmental precautions are taken in the design of mitigation measures, ERFN may conclude that the potential risks of significant adverse environmental effects will be greater than the potential benefits of the project. We are prepared to work with Denison and the CNSC to address what we see as the current gaps.

We also recognize that this phase of the environmental assessment serves as a turning point. ERFN expects that Denison and CNSC will continue to work collaboratively with ERFN to resolve all issues identified in this review, as well as other concerns as they are identified and presented. We seek to collaborate with all parties in gaining confidence in the Project, executing opportunities to ensure appropriate participation by ERFN in the project, and working to mitigate and accommodate all impacts to rights and interests.

Additionally, as the CNSC is responsible for regulating the entire lifecycle of the Wheeler River project, CNSC's obligations extend beyond the Environmental Assessment. With these obligations is the Duty to Consult through construction, operations, closure, and post-closure through to the completion of reclamation. ERFN will require the CNSC to conclude a long-term oversight agreement with ERFN to ensure appropriate oversight of all aspects of this Project throughout its duration. Such an agreement will need to address ERFN's process, capacity and resource requirements for effective consultation and accommodation over the life of the project.



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# TABLE OF ACRONYMS

CCME	Canadian Council of Ministers of the Environment
CEAA	<i>Canadian Environmental Assessment Act (2012)</i>
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminant of Potential Concern
CSA	Canadian Standards Association
DFO	Fisheries and Oceans Canada
dw	Dry Weight
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Emergency Management System
ERFN	English River First Nation
GBA+	Gender Based Assessment (enhanced)
GHG	Greenhouse Gas
HHRA	Human Health Risk Assessment
HRMP	Heritage Resources Management Plan
HQ	Hazard Quotient
IAA	<i>Impact Assessment Act (2019)</i>
ILRU	Indigenous Land and Resource Use a
ISR	In-Situ Recovery
KI	Key Indicator
LSA	Local Study Area
MDMER	Mineral and Diamond Mining Effluent Regulations
MP	Measurable Parameter
PAPR	Powered Air Purifying Respirator
PM <sub>10</sub>	Particulate Matter (< 10 µm)
RSA	Regional Study Area
SARA	<i>Species at Risk Act (federal)</i>
SEAA	<i>Saskatchewan Environmental Assessment Act</i>
SVS	Shared Value Solutions Ltd.
TDS	Total Dissolved Solids
TOR	Terms of Reference
TSP	Total Suspended Particles
TSS	Total Suspended Solids
VC	Valued Component
WMP	Water Management Plan
ww	Wet Weight

# 1.0 INTRODUCTION

Denison Mines Corp. is proposing to develop the Wheeler River project (the Project), an In-Situ Recovery (ISR) uranium mining and processing facility located in the Athabasca Basin in northern Saskatchewan, approximately 600 km north of the city of Saskatoon. Denison's proposal requires approval by the Canadian Nuclear Safety Commission (CNSC) under the Nuclear Safety and Control Act. Before the CNSC can make a licensing decision on this proposal, an environmental assessment conducted under the Canadian Environmental Assessment Act, 2012 affirming that the proposed activities will not cause significant adverse environmental effects, is required. This Project is also subject to the environmental assessment requirements of the Government of Saskatchewan.

On November 21, 2022, the CNSC accepted the draft Environmental Impact Statement (EIS) from Denison, releasing the EIS for public review and comment. This EIS is intended to provide analysis on the project's potential environmental effects and measures to mitigate those potential impacts. Further, the EIS is based on the incorporation of western science and Indigenous Knowledge that includes direct input from English River First Nation (ERFN). ERFN expects that input from ERFN and our citizens will be appropriately considered and influenced the outcome of the EIS. All parties must recognize the potential for this Project not only to have adverse impacts on the environment, but also on the Rights, interests, and cultural fabric of ERFN citizens that may be permanently influenced by this Project.

This report presents comments, questions, and feedback on behalf of ERFN, in response to Denison Mines' draft EIS for the Wheeler River Project.

The following review considered the background of ERFN, their Ancestral Lands, the history of their relationship with the Crown, and the development of uranium mining in their Ancestral Lands over the past 80 years. In addition to the draft EIS, information from the ERFN *Traditional Knowledge Study and Health and Socio-Economic Study Results* was considered.

Overall, the objective of this review is to determine whether Denison has accurately characterized the existing baseline conditions, understand how this Project is expected to change the baseline conditions and ERFN Valued Components, and discuss mitigations for limiting adverse impacts.

## 1.1 ENGLISH RIVER FIRST NATION BACKGROUND

Our main settlement area is located about 500 km north of Saskatoon at English River First Nation 192D Wapachewunak Reserve, Saskatchewan, along the Churchill River. Our Ancestral Lands (Nuhtsiye-kwi Benéne in Dene) encompass a large section of boreal forest in central northern Saskatchewan, stretching from the Churchill River in the south to Wapata Lake in the north (see Figure 1). The terms "Ancestral Lands," "Nuhtsiye-kwi Benéne" and "ERFN territory" are used interchangeably throughout this document to refer to the lands that we consider to be our home.

We have seven historical settlements located at Porter Island, Cree Lake, Elak Dase, Knee Lake, Dipper Rapids, Wapachewunak and La Plonge. Since 1992, an additional twelve reserve parcels have

been added to the land base through the Treaty Land Entitlement process, which aims to resolve outstanding Treaty land obligations (Government of Saskatchewan, 2021).

Our ancestors signed Treaty 10 in 1906. The band is currently governed by a Chief and six councillors who are elected to a four-year term, which expires in October of 2023 (First Nations Land Management Resource Centre [FNLARC], 2021).

The English River First Nation name originates from the English River area, which was inhabited by the Poplar House people for periods during the year. Most of the families that now live at the Wapachewunak Reserve or the adjacent Métis hamlet of Patuanak traditionally lived along the Churchill River system at Primeau Lake, Knee Lake, Dipper Lake and/or Cree Lake to the north (Canada North Environmental Services, 2017). Summers were primarily spent fishing the river system. For the rest of the year, family units would spread out through the northern forests for trapping and subsistence hunting. Commonly used winter trapping areas included Haultain Lake, Costigan Lake, Foster Lake, and the area between Cree Lake and the Churchill River (Jarvenpa, 1980).



ERFN's total citizenship is 1,766, with approximately 804 citizens living on reserve lands (Crown-Indigenous Relations and Northern Affairs Canada [CIRNAC], 2022). Comprised of both Cree and Dene people, the "people of the river," we are known for our bold and collaborative spirit and trusting and humble nature (Canada North Environmental Services, 2017).

Our community is shaped by our respected Elders who are widely consulted for decisions, wisdom, and strength. We are dedicated to stewardship of the land and the education of future generations through youth camps and other opportunities to share knowledge on the land.

### 1.1.1 HISTORIC RELATIONSHIP WITH THE CROWN

Prior to European contact, our ancestors relied completely on the lands and waters for survival and subsistence. Our ancestors were experts in hunting, fishing, trapping, and gathering. Along with European settlers, however, came the imposition of external knowledge and management systems (including fur conservation areas, mineral claims, and reserves) often without our citizens' input or consent (Jarvenpa, 1980).

With the introduction of fur conservation areas in the 1940s, our citizens' geographical range for trapping and seasonal hunting became restricted. New boundaries regulated by the province limited community citizens' ability to provide traditional foods to their families and community in the manner our ancestors had for generations. Government regulation also brought trappers from settler

communities into ERFN territory, leading to increased conflict over land and a decline in animal populations (Dodson, 2006).

Later, an increase in geological exploration brought prospectors to the region and the era of uranium mining began. Our trappers would find cutlines cleared through their trapping areas for mineral exploration (Jarvenpa, 1980). Around the same time, outside promoters began setting up remote fly-in outfitter camps to bring tourists in for fishing and hunting on several lakes in our territory. This sparked fears that prospecting and tourism would seriously hamper our trapping and fishing activities. This background provides important context to informing the potential impacts of this project on our rights and interests, as the impacts of the Wheeler River project must be considered both in isolation and as one which interacts with the changes which have already occurred as a result of resource extraction and colonial policies.

## **1.2 URANIUM MINING IN NUHTSIYE-KWI BENÉNE**

Uranium ore was discovered in Saskatchewan on the north shore of Lake Athabasca in the early 1930s. The discovery of high-grade uranium deposits in the province sparked a uranium rush in the 1950s and 1960s, leading to the development of several uranium mines. Today Saskatchewan remains one of the world's top producers of uranium, providing approximately 15 percent of the globe's total (World Nuclear Association, 2015). Some of this rapid development can be attributed to the Canadian government's efforts to supply uranium oxide ( $U_3O_8$ ) concentrates or "yellowcake" to the United States nuclear weapons industry (Haalboom, 2016).

Within our Ancestral Lands, three uranium mines are currently in operation, with another two just to the northeast near Wollaston Lake. Within the Ancestral Lands are Key Lake (operational in 1983) and the Key Lake Extension (2014), McArthur River (1999), and Cigar Lake (2014). To the northeast are McLean Lake (1999) and Rabbit Lake (1975). Exploration has occurred throughout the Ancestral Lands and new mine sites are currently undergoing assessment at Wheeler River and Midwest to the northeast of Waterbury Lake (Canadian Nuclear Safety Commission, 2021). Other sites, like Millennium Mine just north of the Key Lake mine, have undergone recent environmental assessment but have been paused by the proponent due to economic conditions. See Figure 1 for mine locations.



Highway 914 (locally referred to as the Key Lake highway) runs from Pinehouse north to the McArthur River mine and serves as a main transportation route for the Key Lake and McArthur River mines. Ore from McArthur River is trucked along this highway to the Key Lake mill, 80 km south. (World Nuclear Association, 2021)

The proliferation of uranium mine site activity, exploration, and the persistent mining traffic along the Key Lake highway has had effects on our Ancestral Lands and the people who occupy those lands. As with many economic developments and changes that happen, there can be both positive and negative effects. Communities can be conflicted when faced with the complexities of providing employment and growth opportunities for their family, versus protecting the land that feeds you (Trifa et al., 2019).

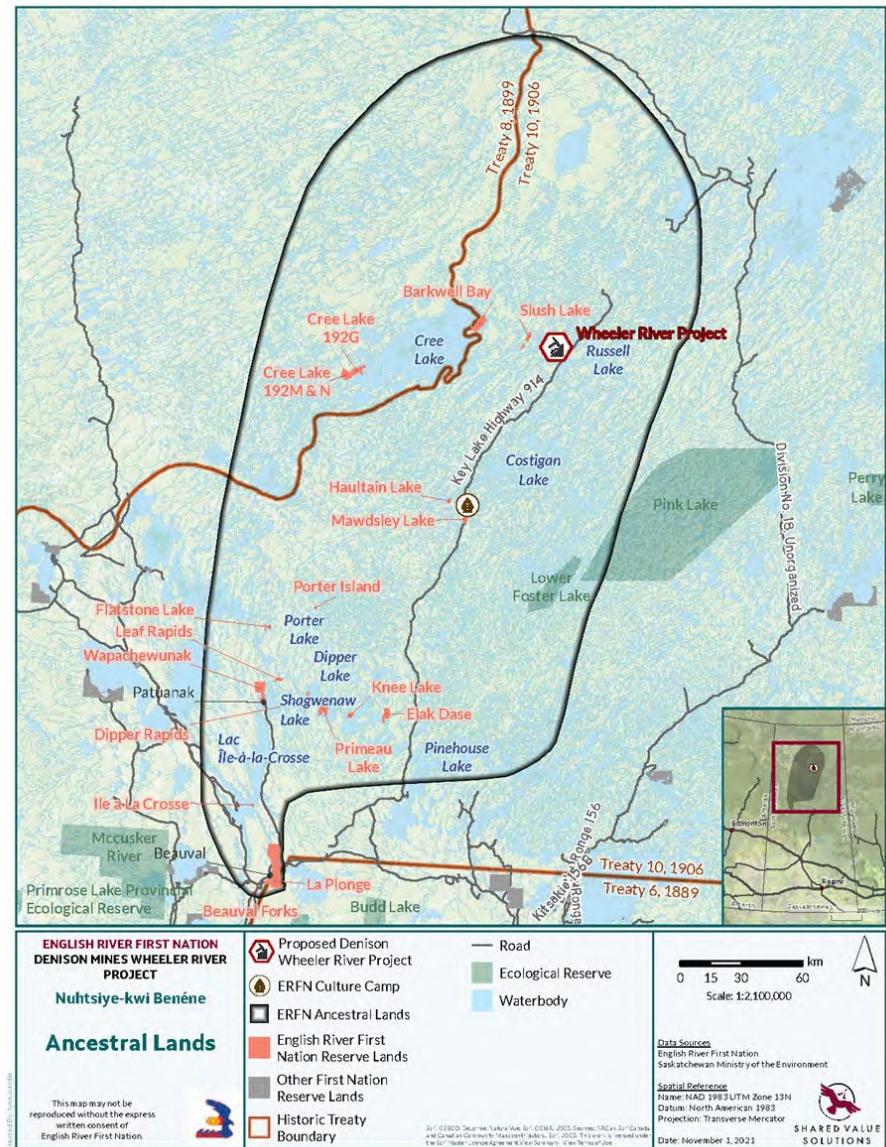


Figure 1. English River First Nation Ancestral Lands (Nuhtsiye-kwi Benéne)

## 1.3 CONSIDERATION OF IMPACTS

A uranium mining project like other mining projects has many inherent impacts on the environment, health, and society. These factors are associated with the extraction and production of refined natural resources, which generate potentially harmful by-products such as tailings and effluent, as well as cause physical disturbance across the project footprint that disrupts fish and wildlife habitat, and prevent rights-based activities such as fishing, hunting, trapping from occurring. Depending on

how these environmental impacts manifest, they may lead to impairment to human health and mental wellness as there is greater potential for both workers and members of the public to come into contact with harmful materials, and activities which they are accustomed to pursue in their daily lives may be adversely impacted as a result of the project.

Beyond the biophysical impacts, this project, like other mining projects, presents both positive and negative socio-economic impacts. A project such as this, if operated effectively, will generate significant wealth both locally and on larger geographic scales. It may also encourage public and private investment in the region and nearby communities to the benefit of residents and businesses in those communities. However, this project will increase the number of transient and temporary workers who come to the area, taxing public resources, impacting existing social networks, and altering established community dynamics. These are all factors which have been seen in other comparable mining projects both locally and across Canada, and place a burden on our citizens and community.

Where the Wheeler River project is unique within the context of Canada is in the unknowns associated with the novel mining approach to be employed. Perhaps the greatest among these risks is the potential for hazardous materials to escape Denison's control and contaminate the surrounding environment. While spills are a common and mitigatable risk with any mining project, the primary concern with this project occurs below ground where containment is not visible or always detectable. ERFN and our citizens, at multiple points through our engagement with Denison, have raised concerns about the potential for mining fluids to escape beyond the freeze wall containment system and contaminate surrounding groundwater and surface water. The toxic nature of mining fluids being used combined with the complex flow pathways of ground and surface water surrounding the mine site present a situation in which the escape of mining fluids would have a significant adverse impact on the regional ecosystem and downstream waterbodies.

Compounding the concerns surrounding the Wheeler River project are the perceived inherent risks associated with the nuclear industry. ERFN recognizes that the nuclear industry in Canada is among the safest in the world. Further, we acknowledge that uranium ore and concentrate present relatively low risks to the environment and human health when exposure is limited. However, the perceived risks and concerns of ERFN members about biophysical impacts of this project are real, and both Denison and CNSC must acknowledge the psychological and perceived impacts which accompany the Wheeler River project. For example, while the project footprint may restrict the use of that area by ERFN citizens for the exercise of Aboriginal and Treaty Rights at the mine site itself, the nature of this project will result in ERFN citizens modifying their behaviours to avoid a much larger area around the project. Impacts are likely to include not hunting, fishing, or consuming harvested resources from both the surrounding area and waters flowing from the project area. Modified behaviour, including avoidance and reduced enjoyment or connectedness to Nuhtsiye-kwi Benéne, are just as significant as biophysical impacts. In assessing the impacts of this project, CNSC must recognize these potential impacts on Aboriginal and Treaty rights, and work with Denison and ERFN to ensure appropriate accommodations.

## 1.4 REVIEW OBJECTIVES

English River First Nation and Shared Value Solutions Ltd. (SVS) provide this review and assessment of Denison Mines Corp.'s draft EIS for the Wheeler River Project. Shared Value Solutions consultants and sub-consultants with expertise in water resources, aquatic ecology, terrestrial ecology, fisheries biology, wildlife biology, air quality, human health, socio-economics, and regulatory processes conducted the review. The objectives of the technical review were to:

- Determine whether ERFN rights, interests, concerns, and values are adequately considered by Denison in the EIS.
- Determine whether Denison has adequately identified and assessed potential project interactions with the environment and ERFN Rights, interests, concerns, and values in the EIS.
- Determine whether Denison has offered adequate avoidance, mitigation, and enhancements measures to reduce adverse impacts of the Project on the environment and ERFN Rights, interests, and values.
- Provide recommendations to Denison for addressing any shortcomings found through the above assessment.

Overall, this review intended to determine whether Denison has accurately characterized the existing baseline conditions, understand how this project is expected to change the baseline conditions and ERFN Valued Components, and discuss mitigations for limiting adverse impacts.

This report provides a summary of our review findings, which are also provided in the form of a Comment and Response Tracking Table in Appendix A.

## 1.5 REVIEW METHODOLOGY AND SCOPE

The comments and recommendations provided within this submission focus on the following values and technical areas: Indigenous Knowledge and local knowledge, quality of life and well-being, land and resource use, fish and aquatic environment, wildlife and terrestrial environment, geology and groundwater, human health, and economics. Within each key issue of concern, technical reviewers completed a high-level scan of all relevant studies in the EIS to identify potential project interactions with the environment and ERFN rights, interests, concerns, and values. Once interactions and potential impacts were identified, technical reviewers assessed whether Denison proposed adequate measures to address the impacts. Where relevant, technical reviewers identified knowledge gaps and identified potential measures or modifications that could be adopted by Denison to avoid or mitigate impacts on ERFN rights, interests, concerns, and values.

The following sections of the Draft EIS were reviewed:

- Section 1 – Project Introduction and Overview
- Section 2 – Project Description



- Section 3 – Indigenous and Local Knowledge
- Section 4 – Engagement
- Section 5 – Approach and Methodology of the Assessment
- Section 6 – Atmospheric and Acoustic Environment
- Section 7 – Geology and Groundwater
- Section 8 – Aquatic Environment
- Section 9 – Terrestrial Environment
- Section 10 – Human Health
- Section 11 – Land and Resource Use
- Section 12 – Quality of Life
- Section 13 – Economics
- Section 14 – Accidents and Malfunctions
- Section 15 – Effects of the Environment on the Project
- Section 16 – Assessment Summary and Conclusions

Appendices related to these sections were also considered. In Section 4.0, each technical reviewer provides a synopsis of their review findings.

### **1.5.1 SPATIAL SCOPE AND FOCUS**

The spatial extent of the Draft EIS technical review was specific to ERFN's Ancestral Lands. Where appropriate, technical reviewers also discussed impacts in the context of the broader environment or in the context of ERFN Rights and interests, both of which extend beyond the spatial footprint of the Project Area, and include Local Study Area (LSA), and Regional Study Area (RSA).

## **2.0 PROJECT DESCRIPTION AND REGULATORY PROCESS**

The Wheeler River mining project is a uranium extraction project located at the division between the Churchill River and Athabasca basins in northern Saskatchewan. This project is novel within the Canadian context as it utilizes in-situ recovery technology that involves the injection of a mining solution into the uranium deposit through a series of cased injection wells. The mining solution proposed for Wheeler is a low-pH or acidic solution. As the solution passes from the injection wells through the uranium deposit it dissolves the uranium and leaves virtually all other minerals in the

host rock in place. Once dissolved, the uranium-rich mining solution is recovered and pumped back up to the surface through another set of cased drill holes called recovery wells.

One of the primary benefits of ISR over conventional surface or subsurface mining is that this project will not require a large open pit operation or underground workers, potentially resulting in an overall safer project that can be better returned to its initial state following the life of the project. Criticism of the ISR approach primarily focuses on potential impacts associated with interactions of mining fluids with groundwater that can move vertically or laterally, degrading lands and waters in the surrounding area. To prevent this interaction, Denison has proposed the establishment of a freeze wall that will surround mine activities, effectively preventing lateral flow outside of a contained area (referred to as the mining theatre) that is controlled by Denison. The Wheeler River project will represent the first instance of ISR mining for uranium in Canada, however, ISR uranium mines do exist elsewhere in the world.

The Project is regulated through three primary processes: federal environmental assessment under the Canadian Environmental Assessment Act (2012; CEAA, 2012), the Nuclear Safety and Control Act, and the provincial Saskatchewan Environmental Assessment Act (SEAA).

## FEDERAL

The proposed Project will include the construction, operation, and decommissioning of a uranium mine, processing plant, and supporting facilities on a site that is not within the boundaries of an existing licensed uranium mine or mill. As such, the Wheeler River Project is a designated project as set out in section 31 of the Regulations Designating Physical Activities and is therefore subject to a federal environmental assessment. The CNSC will be the responsible federal authority for Wheeler's environmental assessment. At the time of initial filing, Bill C-69 which would enable the Impact Assessment Act (IAA 2019), had not yet been adopted. As a result, this Project follows the CEAA 2012 assessment process.

## PROVINCIAL

Environmental Assessment in Saskatchewan is regulated by the *Environmental Assessment Act* and its application hinges on whether a project is a development, or not, based upon the criteria in Section 2(d):

2(d) "development" means any project, operation or activity or any alteration or expansion of any project, operation or activity which is likely to:

- i. have an effect on any unique, rare or endangered feature of the environment;
- ii. substantially utilize any provincial resource and in so doing pre-empt the use, or potential use, of that resource for any other purpose;
- iii. cause the emission of any pollutants or create by-products, residual or waste products which require handling and disposal in a manner that is not regulated by any other Act or regulation;
- iv. cause widespread public concern because of potential environmental changes;

- v. involve a new technology that is concerned with resource utilization and that may induce significant environmental change; or
- vi. have a significant impact on the environment or necessitate a further development which is likely to have a significant impact on the environment.

The likely applicable Section 2(d) triggers are Sections 2(d) (iv) and (v); a potential for public concern, and a new technology application in Saskatchewan (in situ recovery for uranium), respectively.

Accordingly, Denison self-declared that Wheeler is a development under SEAA.

Denison will conduct, prepare, and submit an environmental impact statement (EIS) to the Saskatchewan Ministry of Environment's Environmental Assessment and Stewardship branch that meets the requirements outlined in the Saskatchewan Environmental Assessment Act. Ultimately the Project will require the issuance of a ministerial approval under section 15 of the Saskatchewan Environmental Assessment Act before proceeding to licensing and permitting.

## **3.0 REVIEW FINDINGS**

### **3.1 ATMOSPHERIC AND ACOUSTIC ENVIRONMENT**

#### **3.1.1 SUMMARY OF EIS CONTENT**

Section 6 of the EIS is focused on the Atmospheric and Acoustic Environment. Air Quality was selected as a VC based on the likelihood of Project-related activities interacting with and changing the ambient air environment. Emissions are regulated for constituents of potential concern (COPC [contaminant of potential concern] – radioactive vs. non-radioactive measurable parameters [MPs]), and to address concerns raised during consultation and engagement processes for the Project. Noise was selected as a VC in general based on the likelihood of Project-related activities interacting and changing the existing sound environment, which has the potential to affect human health, and change animal behaviours (e.g., hunting activity); noise has been used historically in other environmental assessments and was also raised as a concern during consultation and engagement processes for the Project.

In the assessment of Atmospheric and Acoustic Environment, Denison evaluates two key indicators (KIs) and associated MPs:

- Air Quality – Levels of dust, combustion products, uranium, metals, and/or radionuclides
- Noise – Noise levels

Air Quality and Noise were selected as intermediate VCs (i.e., do not have an assessment endpoint), and as such a significance determination was not completed, but was integrated into the residual effects evaluation, residual effects characterization, and significance determinations for related receptor VCs (i.e., terrestrial environment, human health, and land use).

Baseline monitoring to characterize air quality and noise KIs has been conducted for the Project and includes the following, consistent with provincial and federal guidelines:

- Air Quality: since 2016, uses passive approaches to monitor select particulate matter, trace metals, and radioactive materials (in the form of dust fall), regional studies/projections, as well as estimates incorporated into modelling data for Project Activities and future climate considerations; and,
- Noise: since 2021, completed Baseline Noise Measurement Program (via Health Canada and ISO standards and best management practices), incorporating meteorological data from the nearest Environment and Climate Change Canada's (ECCC) Key Lake site to incorporate into modelling data for Project Activities and future climate considerations.

According to the EIS, an adaptive management program (including a community complaints and response procedure) is to be implemented through Denison's Environmental Management System (EMS) for the Project, with monitoring requirements directed by federal and provincial regulators, indigenous groups and interested parties, that will define sampling requirements for:

- Air Quality: at the processing plant stacks and for controlling dust, emissions monitoring (radioactive and non-radioactive releases)
- Noise: continue baseline monitoring or consider as requested in additional consultation

Short-term and/or infrequent residual Air Quality effects were predicted at receptor locations beyond the Project boundary during at least one Project phase. The predicted sound levels (Noise Effects) were below threshold values regulated by federal and provincial guidelines at all receptor locations; however, as sound level increase from baseline is predicted to be noticeable, the effect was conservatively carried forward in the EIS as a residual effect.

### **3.1.2 EVALUATION AND RECOMMENDATIONS**

Denison appears not to have met provincial requirements for the collection of baseline data, as they required much of their assessment on passive monitoring from a single noise monitoring station. Data were only collected for 2 locations during 1 week in May 2021 and did not include a portion of Highway 914 (like atmospheric component and identified traffic impacts from Project Activities). Unrepresentative data (meteorological events – temperature, relative humidity, precipitation, wind speed) were removed prior to summarization (14 hours, or 7.5% of measurement data). One of the two monitoring locations was disturbed during the monitoring period and these data were also discarded in the analysis. Denison must provide further baseline information to support sound level criteria conclusions, project level-, residual-, and cumulative effects evaluations for modelling that links noise receptors with other VCs; as compliance determination is based on baseline measurements. Noise significance determination for receptor VCs may not be representative of actual conditions.

As KIs associated with the Air Quality VC pertain to levels of dust, combustion products, uranium, metals, and/or radionuclides; passive monitoring methods (commenced in 2016) were used to characterize the baseline air quality for the Project (included particulate matter [dustfall], NO<sub>2</sub>, SO<sub>2</sub>,

radon, and external gamma). Provincial regional background concentrations were used for TSP, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CO; while Key Lake ECCC background data were used to represent concentrations of uranium, arsenic, and nickel; and Cigar Lake data were used for copper, lead, selenium, and zinc background concentrations. Passive methods represent averaged concentrations for deployment periods, and in some cases are not directly comparable to the regulatory criteria identified in Table 6.1-5. Conversion calculations were used on the passive monitoring data to compare the minimum requirements of averaged baseline results gathered, against identified provincial/federal criteria for use in modelling effects for the Project. Only predicted short-term (less than 3 years) and medium-term exceedances of modelled COPC concentrations of TSP, PM<sub>10</sub>, uranium (24-hour), and NO<sub>2</sub> (1-hour) to exceed air quality criteria at receptors located outside of the Property Boundary (6.1.4.2); however, as per the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012), the eight highest 1-hour predictions and the single highest 24-hour prediction at each receptor can be discarded. Similar to other sections of the EIS, Denison fails to fully support or justify assumptions made in the baseline assessment of atmospheric and acoustic effects.

## **3.2 GEOLOGY AND GROUNDWATER**

### **3.2.1 SUMMARY OF EIS CONTENT**

Section 7 of the EIS for the Wheeler River Project is focused on examining implications for Geology and Groundwater. The relationship between geology and groundwater and other environmental components such as surface water and project design is direct. As a result, this section focuses examining the interactions between groundwater and the biophysical and human environment.

### **3.2.2 EVALUATION**

Denison has developed walk-away water quality targets for the leach field based on assessment of potential for impacts in Whitefish Lake. The resultant water quality targets for the leach field that are proposed in the draft EIS represents heavily impacted, acidic and metal-laden water in the leach field at closure. Based on groundwater modeling, Denison states that this water would dissipate underground over the decades/centuries following closure and would not express in sufficient quantities in Whitefish Lake to cause measurable environmental impacts. In our opinion, this approach to development of walk-away targets for the leach field is less conservative/proactive than targeting return-to-baseline conditions. We recommend targets based on returning groundwater to near baseline conditions by doing as much mitigation as possible while the mine is in operation/in closure. This would reduce uncertainty and risk of additional mitigations being required to protect future generations. This is a foundational point that goes beyond the specific technical uncertainties in Denison's groundwater model.

Water recycle is talked about but not incorporated into water quality/water balance modeling. Water recycling is fully supported and should be incorporated into the project design. Integration of water recycling into the project in a quantitative way would inform water treatment and water management planning and may help reduce the likely of acute toxicity in treated effluent at end of

pipe. A full assessment of the interactions of geology and groundwater components with other aspects of the biophysical and human environment are outlined in detail in Appendix B.

## **3.3 AQUATIC ENVIRONMENT**

### **3.3.1 SUMMARY OF EIS CONTENT**

Section 8 of the EIS is focused on the aquatic environment and addresses two intermediate VCs: Surface Water Quantity and Surface Water Quality; and four VCs: Fish and Fish Habitat, Sediment Quality, Benthic Invertebrates, and Fish Health. The Sediment Quality and Benthic Invertebrates VCs are addressed together because they are inherently linked.

Denison sets out the specific indicators used to measure and assess the effects of the Project (Key Indicators), characterizes existing conditions to provide context and a basis for evaluating potential changes, identifies potential interactions between the Project and each VC and KI, describes proposed mitigation measures and evaluates any residual and cumulative effects that can't be mitigated. Key interactions identified by Denison include two clear-span bridges between the proposed mine site and airstrip and treated effluent discharge to South Whitefish Lake.

Denison concludes that due to the localized, minimal nature of potential project impacts and the predicted successful mitigations, no residual or cumulative effects are anticipated for the aquatic environment VCs.

### **3.3.2 EVALUATION**

This section provides a generalized, high-level summary of SVS concerns regarding the aquatic environment EIS section. Specific concerns are addressed in more detail in the comment tracking table (Appendix A).

As noted elsewhere, this Project would be the first ISR uranium extraction project in Canada, so there are no similar local assessments to pull from or aid in this evaluation. Other ISR mines are typically located in warmer areas of the world compared to northern Saskatchewan. Denison's assessment relies primarily on modelling and assumptions across many aspects of the Project, from effluent treatment and discharge to the freeze-wall technology proposed for groundwater containment. In the EIS, these assumptions are often presented in a "trust us" manner, with little supporting evidence or reference to previous studies or projects provided.

One of ERFN's key concerns throughout the entire EIS is the lack of sufficient data to accurately characterize the baseline aquatic environment. Denison has provided information regarding the standard protocols used for field sampling activities, but has not justified (iwith reference to guidance documents, etc) the spatial and temporal coverage of the baseline studies.

Based on the baseline characterization (Ecometrix 2020, EIS Appendix 8-D), the majority of aquatic environment baseline data were collected in 2016 or earlier, and only one year of data (2016) was collected for aquatic biota (benthic invertebrates, plankton, fish tissues) and sediments. Most of the

hydrological and fish habitat data forming the basis for those characterizations were collected prior to 2014, and there is very little winter data.

Accepted guidance from other jurisdictions (e.g., British Columbia) suggests that one year of data is the bare minimum required, but at least two years of data across multiple seasons should be collected to sufficiently characterize baseline conditions. Spatial coverage of baseline data was difficult to evaluate, given that sample location coordinates were not provided. However, some key data gaps (e.g., detailed bathymetry and habitat mapping in North Whitefish Lake but no data for South Whitefish Lake, and no benthic invertebrate community characterization at SA-6 immediately upstream of South Whitefish Lake) suggest that the spatial coverage of baseline data was not well-scoped. Saskatchewan TOR and EIS guidance (Saskatchewan 2021) suggests that all biological and time-sensitive data should be <2 years old, and CEAA 2012 (Section 8.1) requires that baseline data be of sufficient detail. The baseline data used for the EISs do not meet these basic requirements.

The EIS has included an examination of the potential project impacts on Northern Pike and White Sucker, two species identified as having significant importance to ERFN. However, no evaluation of potential project effects on Walleye, Lake Whitefish, Lake Trout, and Arctic Grayling (also identified as important to ERFN) is provided. Denison has used Northern Pike and White Sucker as surrogates for these other species but did not provide evidence (e.g., other studies) that these species were adequate surrogates. Additionally, we note contradictions in the fish presence/absence data used for the baseline and EIS. Finally, there is little discussion regarding the implication of food web dynamics on the potential project effects on fish species.

Denison does not identify and justify their assumptions, nor do they identify knowledge gaps and steps to address the gaps. This information is required under CEAA 2012. The aquatic environment EIS is also lacking information regarding how malfunctions were considered (required under CEAA 2012 S.19(1)[a]) and provides a very minimal discussion of food web dynamics and their implications to the EIS (required under CEAA 2012 REGDOC 2.9.1). Denison acknowledges that their effluent discharge is anticipated to trigger Metal and Diamond Mining Effluent Regulations (MDMER), but provides little recognition of the requirements; there is no mention of end-of-pipe lethality testing, and the proposed water quality monitoring variables do not include pH or un-ionized ammonia.

As noted above, key assumptions and parameters associated with impact predictions are not justified or are poorly supported by evidence, which decreases the reliability of Denison's conclusions. It is unclear whether the modelling of effluent in the environment used conservative scenarios (i.e., maximum discharge rate at low flow) or average scenarios. The baseline water quality used for modelling the receiving environment (South Whitefish Lake) appears to be based on a regional mean rather than the water quality at the discharge location. The current within the mixing zone was based on upstream (SA-6) flows but resulted in an average velocity greater than what was measured at SA-6, potentially overestimating the mixing capabilities of South Whitefish Lake at the discharge point. Potential tissue concentrations in Northern Pike were modelled based only on contact with surface water with no acknowledgement of the potential for transfer from food. Constituents of potential concern (COPCs) are identified but little evidence (e.g., references to other ISR projects) is provided to justify the list and there is no mention of verification or potential changes to the list through monitoring. Finally, Denison also focuses the EIS on effluent discharge to surface water (South Whitefish Lake)



but noted that deep-well pumping to the ground may also be used, yet the potential impacts of deep-well pumping are not addressed.

The control and treatment of water throughout all phases of the project is not well explained in the EIS. The creation of monitoring and management plans is noted, but no details are provided. Denison asserts that effluent will be treated but provides no examples of successful ISR effluent treatment. There are contradictory statements regarding the potential release of collected and stored water during the construction phase. Denison identified that total suspended solids (TSS) will be the criterion for determining whether treated effluent is safe for release but provided no evidence for this decision nor consideration of other water chemistry variables. Notably, there are specific prescribed requirements that effluent must meet under MDMER to be discharged into the environment. Denison has also estimated that their treated effluent ponds would hold water for 72 hours prior to discharge to provide time for testing, but no details about: (1) the testing process, timeline, or laboratory, and (2) contingency information regarding what happens if the effluent fails the testing, have been provided.

The predicted effluent quality of the industrial wastewater treatment plant is quite saline. The quality of this water at end of pipe (prior to the diffuser) may cause acute toxicity to aquatic life, meaning discharge may contravene the Fisheries Act/Canadian Metal and Diamond Mine Effluent Regulations.

### **3.3.3 RECOMMENDATIONS**

Given that there are many uncertainties associated with the use of ISR in northern Canada, we believe that diligence, clarity of commitments, and contingency-planning are crucial to ensuring that the environment and interests and values of ERFN are protected. For the reasons summarized above and in the comment tracking table (Appendix A), we believe that the EIS (and its associated baseline and modelling) does not meet these criteria. In addition to providing clarification on specific details, as requested in the comment tracking table, we make the following recommendations.

ERFN recommends that, at minimum, Denison conduct one additional year of baseline data collection for all aquatic environment endpoints and revise the baseline characterization appropriately. It is also worth noting that nearly all previous baseline data are now over five years old, so true diligence would involve two additional years of baseline data. Baseline data collection should include (but not be limited to):

- Benthic invertebrate and sediment sampling at SA-6
- Benthic invertebrate and sediment sampling at two locations in existing baseline lakes (near the inlet and outlet) and one additional location in South Whitefish Lake (at the proposed discharge location)
- Phytoplankton and zooplankton community sampling in existing baseline lakes
- Whole-sample benthic invertebrate tissue chemistry analyses



- Repeating previous fish tissue sampling but including the retention and analysis of liver tissues
- Fish tissue (muscle) sampling from all important species identified by ERFN that are present within South Whitefish Lake. Denison should either investigate non-lethal sampling options or partner with ERFN to obtain tissue samples from multiple species
- Detailed bathymetric and habitat surveys of South Whitefish Lake
- In-situ measurement and characterization of bottom currents at the effluent discharge location during winter, at high flow, and at low flow

We recommend that Denison update the EIS to include a discussion regarding ecosystem interactions and changes that could result from effluent discharge but that is not captured within their modelling, such as eutrophication and the effect of warm effluent on the aquatic environment of South Whitefish Lake during winter.

We recommend that Denison update the EIS to include specific details, including supporting data from other projects, about the effluent treatment options that are available and that may be used on the Project. Denison should also include details about how effluent storage, testing, and discharge timelines will be met, including sample timing, the anticipated analytical laboratory, and the planned actions in case effluent fails testing.

We recommend that Denison update the EIS to include data from other projects in the region, specifically those releasing treated effluent, that support the modelling results for surface water quality, sediment chemistry, and fish tissue chemistry.

We recommend that Denison update the EIS to provide a discussion about potential malfunctions and their potential impacts, as well as steps to address both. We also recommend Denison update the EIS to include a discussion about contingency planning should their assumptions and modelling be inaccurate.

We recommend that Denison prepare a water management plan for, at minimum, the construction phase, with clear direction and commitment to updating the plan to include the operations and decommissioning phases. We expect this plan to include clarity on water storage, water release, and water treatment (where necessary). The plan should also include details on how potential impacts will be monitored, thresholds for management actions, and details regarding the actions themselves. The monitoring details should be provided either within the water management plan itself or within an attached surface water monitoring plan.

## 3.4 TERRESTRIAL ENVIRONMENT

### 3.4.1 SUMMARY OF EIS CONTENT

The Terrestrial Environment portion of the EIS (Section 9) was prepared following the Canadian Standards Association (CSA) requirements for Class 1 Nuclear Facilities and Uranium Mines and Mills

(CSA, 2012), using expected sources of emissions (i.e., atmospheric and liquid releases) to predict exposure pathways of radiological and non-radiological COPCs. Various aspects of the terrestrial environment considered in the risk assessment include KIs and measurable parameters to assess changes from baseline for the following VCs:

- a. Terrain, Soils, Organic Matter/Peat
- b. Vegetation and Ecosystems, Listed Plant Species and Wetlands
- c. Ungulates, Furbearers, and Woodland Caribou
- d. Raptors, Migratory Breeding Birds, and Species at Risk

For the Terrain, Soils, and Organic Matter/Peat VC, the following KIs and MPs, were selected for further assessment:

- Terrain morphology and stability
- Soil quantity and quality
- Organic Matter/Peat quantity

For the Vegetation and Ecosystems, Listed Plant Species and Wetlands VC, the following KIs and MPs, were selected for further assessment:

- Vegetation abundance and concentrations of COPC in vegetation
- Listed plant species quantity
- Wetland extent

For the Ungulates, Furbearers, and Woodland Caribou VC, and Raptors, Migratory Breeding Birds, and Species at Risk VC, the following KIs were selected for further assessment:

- Ungulates, Furbearers, and Woodland Caribou VC: Moose, Wolverine, Pine marten, Mink, Muskrat and Woodland Caribou; and,
- Raptors, Migratory Breeding Birds, and Species at Risk VC: Bald eagle and Osprey, Waterbirds and Waterfowl, Upland Game Birds, Migratory Songbirds, Common nighthawk, Short-eared owl, Yellow rail, Rusty blackbird, and Olive-sided flycatcher.

Measurable Parameters used to evaluate potential cumulative effects for the above select species VCs include:

- Habitat alteration or loss (i.e., direct loss of habitat [e.g., vegetation clearing], or indirect alteration of habitat that renders habitat unusable e.g., sensory disturbance])
- Change in mortalities (i.e., direct [e.g., vehicle/infrastructure collisions] or indirect [e.g., increased harvest or nest abandonment])

Baseline monitoring activities to characterize the Terrestrial Environment KIs were conducted between 2017 and 2019, and were designed to demonstrate compliance with regulatory requirements, address adaptive management measures, and outline commitments in the EIS, including the following:

- Mapping (anthropogenic, fire, and ecosites) and mapping refinements
- Ecosite characterization, plant structural diversity, and species richness assessment
- Linear feature natural regeneration assessment
- Rare Vascular Plant Surveys
- Vegetation and Soil Collection and Chemical Analysis
- Winter track count survey
- Spring ungulate pellet group/browse availability survey
- Small mammal trapping survey and tissue analysis
- Amphibian nocturnal call and visual search surveys
- Breeding Songbird Point Count Call Survey
- Semi-aquatic Furbearer Shoreline Survey
- Aerial Waterfowl and Raptor Stick Nest Survey
- Regional Ungulate Aerial Surveys
- Acoustic Bat Surveys
- Covert Camera Survey
- Regional Fur Harvest Data literature review
- Terrain and Soils literature review
- Vegetation literature review and ecosite classification corrections
- Avian species of management concern literature review
- Ungulate literature review

According to the EIS, an adaptive management program (including a community complaints and response procedure) is to be implemented through Denison's Environmental Management System (EMS) for the Project, with monitoring requirements directed by federal and provincial regulators, Indigenous groups and interested parties, that will define sampling requirements for:

- Dust monitoring

- Construction/geotechnical monitoring
- Soil Salvage monitoring
- Soil Quality monitoring
- Pre-construction Listed Plant Surveys
- Pre-construction nest surveys (prior to completing and site preparation or soil disturbance in accordance with the EMS)
- Vegetation Monitoring
- COPC in Vegetation
- Routinely monitored wildlife and avian species throughout the life of the Project in accordance with the management and monitoring plans within the EMS (including species-specific setbacks during sensitive periods)
- Progressive reclamation and revegetation monitoring in disturbed areas (in accordance with the Reclamation and Closure Plan)

Overall, potential cumulative effects for the terrestrial environment are associated with site preparation (i.e., vegetation clearing, earthworks, grading, stripping and salvaging of soils), operations (i.e., vehicle traffic, material handling, water management, waste management) and reclamation works during various Project phases and activities. Denison identifies potential changes to the Terrestrial Environment may occur as a result of Project activities after general and species-specific mitigations are implemented, but that residual effects are not considered significant.

### 3.4.2 EVALUATION AND RECOMMENDATIONS

Denison present baseline conditions based on several assumptions that may or may not be applicable to the use in an ISR facility. As the Wheeler River project represents a first of its kind project in Canada, there is a need to make assumptions or use appropriate proxy information from other similar type projects. However, it is necessary when making these assumptions that Denison presents evidence to justify the use of these assumptions.

Boreal woodland caribou are an important species at risk which are shown to utilize the RSA, and their habitat will be impacted by this project. However, the draft EIS does not provide adequate discussion on the impacts and residual effects of this project on seasonal differentiation and usage of caribou habitat. The timelines provided in the baseline studies do not identify the preferential habitat usage of the species during important timing windows based on the life history requirements of the species. As the draft EIS acknowledges, the conservative approach is used for determining Project impacts and residual effects on caribou, it is necessary to consider the impacts of the project on seasonal caribou habitat given their listing as a *threatened* species under the *Species at Risk Act*.

The Wheeler River project is located in an area of discontinuous permafrost. Climate change and other environmental factors have slowly eroded the amount of permafrost located in this area

however, the draft EIS fails to provide any relevant discussion on the potential for permafrost to influence the project. Of significant note is that if permafrost is found near the project area, slumping and heave associated with permafrost melting will result in impacts to infrastructure. Additionally, thawing permafrost has the ability to release methane and other GHGs to the atmosphere, altering the project-related emissions.

Denison in theirThe identification of terrestrial VCs in the draft EIS also fails to connect VCs to the information provided in the ERFN *Traditional Knowledge Study & Health and Socio-Economic Study Report* or information provided by others. As a result ERFN questions the appropriateness of the VCs selected as metrics of broader valued components of the biophysical environment.

## **3.5 HUMAN HEALTH**

### **3.5.1 SUMMARY OF EIS CONTENT**

Section 10 of the draft EIS examines the potential impacts of the project on Human Health. Human Health is assessed through two core VCs: Human Health, referring to the general public, and Worker Health and Safety. In both instances, Denison examines the impacts of the project to human health through the lens of exposure to COPCs and radiological material, though for public health this is considered as the incremental lifetime cancer risk, or radiation dose.

For both VCs, Denison the draft EIS finds that the Wheeler River project will have a negligible adverse impact on Human Health relative to background conditions. Denison suggests that for COPCs to be released into the environment and local foodweb, the background concentrations of several COPCs including cadmium, selenium, molybdenum and zinc are at or above hazard quotient levels identified for posing a risk to human health. Additionally, for members of the general public, the increase in radiation dose is suggested to be negligible compared to the healthy dosage guidelines used in the assessment.

Denison The draft EIS also identifies the use of personal protective equipment as a primary form of minimizing risk to worker health in areas where potential interactions may occur. Generally, Denison the draft EIS suggests that as a result of project design and the low concentration of radioactive material being handled, the risk to worker health can be easily mitigated.

Overall, Denison the draft EIS concludes that the overall impacts to Human Health are low, and that now residual effects were identified. It also further notes that in addition to the use of mitigation measures outlined in this section, Denison will develop a Radiation Protection Plan, as well as comply with any relevant regulatory requirements for the protection of workers' health and safety.

### **3.5.2 EVALUATION AND RECOMMENDATIONS**

The assessment of Human Health as it relates to this project is very narrow in scope and does not appropriately consider the relationship ERFN citizens have with the lands, waters, and resources surrounding the Wheeler River project site. Notably, the draft EIS frame human health solely through the lens of biophysical health effects, however, major projects which have impacts on lands and

waters with spiritual connections to those that interact with it must also consider the psychological and mental health wellness effects. Based on the information provided by ERFN in the *Traditional Knowledge Study & Health and Socio-Economic Study Report*, the potential impacts on psychological and mental health wellness to of this project as evidenced by the impacts from other similar uranium mining projects are real and meaningful. As a result, these impacts must be considered.

Absent from the assessment of this project on human health has been the examination of project-adjacent impacts on human health. There is a growing body of evidence to suggest that there is a close correlation between the presence of mines and increased rates of sexual violence, sexual health issues, as well as drug and alcohol use (Hoozeveen, et al. 2021). While the Wheeler River EIS is governed by the terms of CEAA 2012, which doesn't specifically require analysis of gender-based issues, it does not mean that these impacts to human health aren't occurring, and further that they aren't disproportionately impacting women, girls, and members of the LGBTQ2+ community.

The draft EIS should consider not only the direct impacts of their project but also the tangible secondary impacts of the Wheeler River project in the assessment of Human Health Impacts. As the latter analysis has not been conducted, ERFN is unable to assess whether or not there will be residual impacts on our citizens.

## **3.6 LAND AND RESOURCE USE**

### **3.6.1 SUMMARY OF EIS CONTENT**

Section 11 of the EIS is focused on Land and Resource Use, which is considered through the lens of three VCs: Indigenous Land and Resource Use (ILRU), Other Land and Resource Use, and Heritage Resource Use. In each of these sections, the draft EIS sets out the specific indicators used to measure and assess the effects of the Project (Key Indicators), characterizes existing conditions to provide context and a basis for evaluating potential changes, identifies potential interactions between the Project and each VC and KI, describes proposed mitigation measures and evaluates any residual and cumulative effects that cannot be mitigated.

Generally, the draft EIS finds that the Wheeler River project has the potential to induce effects on ILRU, but concludes that these effects can be eliminated, reduced, or controlled through mitigation measures and that the Project will not result in any significant residual adverse effects.

### **3.6.2 EVALUATION AND RECOMMENDATIONS**

A key issue with Section 11 of the EIS is the limited understanding of ERFN's use in the area, poor and seemingly watered-down inclusion of the information provided by ERFN in the *Traditional Knowledge Study & Health and Socio-Economic Study Report*, and a lack of understanding of collectively held rights of English River First Nation protected by section 35 of the Constitution Act and Treaty 10. Although ERFN has provided detailed information on Traditional Knowledge, land and resource and our citizens' interaction with the land, as well as providing advanced comment on EIS drafts, Denison has not adequately characterized how this project will impact ERFN rights with respect to the use and

interaction with the land and resources. Specifically, the draft EIS errors in interpreting the impacts of the project on individual vs. collectively held rights, and inappropriately focuses on mitigating and compensating individual rights at the expense of or overlooking the impacts of the project on collectively held rights. This approach is inappropriate for the purpose of understanding impacts on the ERFN as a whole.

The scoping study found that ERFN has well-established rights in the area where the proposed project is located. There have been decades of research carried out about ERFN's connection to and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and socio-cultural and economic perspectives. These findings were reiterated and backed up by the *Traditional Knowledge Study & Health and Socio-Economic Study Report*.

The summary of the *Traditional Knowledge Study & Health and Socio-Economic Study Report* and subsequent effects assessment has been approached from an individualistic and narrowed lens. Frequently, Denison has used words such as "limited" or "absent" when referring to ILRU in the Study Areas. Statements like these diminish the value of the lands and indicate that Denison did not comprehend the information and statements in the *Traditional Knowledge Study & Health and Socio-Economic Study Report*. That is, the studies are limited in nature and cannot be assumed to provide a comprehensive representation of the use of the land. Rather, considering that 129 land use features were mapped within the Study Area, it can be concluded that the actual amount of use in the areas is much more extensive.

Finally, there is concern that the cumulative effects of past projects and impacts were not properly considered in the EIS. Denison asserts that "existing projects were not considered as part of CEA because they were captured and assessed within baseline conditions." However, the impact of past projects on ILRU was not adequately considered or acknowledged in the baseline summary. While Denison states that it gathered and brought Indigenous Knowledge together with western science, the reflection of such activities in the EIS is not sufficient. There is little analysis of how many ERFN members consider the impacts from past projects to have already surpassed a reasonable impact threshold, and how existing and future impacts on ERFN's rights may be additionally affected by this project.

## 3.7 QUALITY OF LIFE

### 3.7.1 SUMMARY OF EIS CONTENT

Section 12 of the EIS is focused on Quality of Life, which is considered through the lens of three VCs: Cultural Expression, Community Well-Being, and Infrastructure and Services. In each of these sections, Denison sets out the specific indicators used to measure and assess the effects of the Project (KIs), characterizes existing conditions to provide context and a basis for evaluating potential changes, identifies potential interactions between the Project and each VC and KI, describes proposed mitigation measures and evaluates any residual and cumulative effects that can't be mitigated.

Generally, the draft EIS finds that given the already considerable amount of uranium mine development in the region, the addition of the Wheeler River project will have limited impacts on Quality of Life, concluding that, other than moderate impacts caused by the rotational nature of working at the mine, the Project will not result in any significant residual adverse effects.

### **3.7.2 EVALUATION AND RECOMMENDATIONS**

A significant problem in Section 12 of the EIS is that KIs used for the VCs of Cultural Expression and Community Well-Being are highly limited in scope and are not informed by Indigenous perspectives. For example, the indicators used to measure and assess the Project on Cultural Expression are limited to “Knowledge Transfer” and “Traditional Diet” and indicators for Community Well-Being are limited to “Population and Demographics,” “Income of Local Workers” and “Community Cohesion.” While these are important indicators to consider, additional KIs must be included to reflect a more holistic understanding of Cultural Expression and Community Well-Being that are informed by Indigenous perspectives, especially given the estimates in the draft EIS that communities in the LSA are predominantly (95.2%) Aboriginal (EIS Section 12.2.3.1, p. 12-56). These were concerns raised in ERFN’s August 2022 submission of comments on the draft EIS provided by Denison before it was submitted to CNSC but were not addressed in this updated version of the EIS. In that August 2022 submission, ERFN provided input on additional Key Indicators that could be used for these Valued Components, informed by ERFN’s use of core guiding principles such as the medicine wheel of community health and well-being, but these recommendations have been disregarded by Denison.

Another key issue is that the draft EIS minimizes the potential effects of the Project on Community Well-Being by limiting their consideration of effects to those associated with the participation of ERFN’s citizens in the Project’s rotational work schedule and related impacts on family and community cohesion. The Project also has broader direct impacts on ERFN’s Ancestral Territory, effecting the well-being of all ERFN citizens. The existence of the Project will change how all ERFN citizens interact with Nuhtsiye-kwi Benéne and in turn ERFN’s overall Community Well-Being and Quality of Life. This must be reflected in the EIS.

Finally, while the draft EIS has included consideration of some of the effects of population and demographic changes and increased income for LSA residents caused by the Project, such as increased demand for housing and substance abuse issues, the full range of impacts associated with these dynamics of a remote mining Project on Community Well-Being and Quality of Life, especially those disproportionately experienced by women and other segments of the population, have not been fulsomely considered. Denison’s proposed mitigation measures to address the potential impacts of the Project on Community Well-Being and Quality of Life are also not adequate to support their conclusion that the Project will not have residual effects.



## 3.8 ECONOMICS

### 3.8.1 SUMMARY OF EIS CONTENT

The Economics Section of the Wheeler River Project Draft EIS seeks to describe the existing economic environment of the LSA and RSA, as well as determine potential Project-specific impacts (negative and positive) and cumulative effects from the Project on these areas. Traditional Economy was included as a KI for the Economy VC rather than being included as a separate VC. The Economics VC includes five KIs to capture and measure the probable effects. These KIs are:

- Employment and Training
- Income
- Traditional Economy
- Business Opportunities
- Government Revenues

The purpose of the Economics Section is to meet the Terms of Reference (EASB# 2019-005) requirements for the Project as issued by the Saskatchewan Ministry of Environment and CNSC. The Economics EIS Section is based on existing data from Statistics Canada (up to and including data from the 2016 Census of Population), other publicly available reports and data, Project data, Indigenous Knowledge, local knowledge, and engagement. The assessment seeks to respond to the following questions:

- Will the Project increase training and employment in the LSA?
- Will the Project increase income in the LSA?
- Will the Project change participation in the traditional economy?
- Will the Project increase business opportunities in the LSA?
- Will the Project increase government revenues at the provincial and federal level?

Recognizing data limitations and challenges, the assessment uses professional judgement, feedback from engagement and Knowledge Holders, as well as Project expenditures and employment estimates to determine and measure potential effects.

While the Project is anticipated to have a generally positive effect on most of the Economy KIs, there is a potential residual negative effect anticipated for the traditional economy. The draft EIS states that, because the effects of this KI are anticipated to be low in magnitude, medium-term in duration, frequent, and reversible after decommissioning, the effects are not significant.

### 3.8.2 EVALUATION

There were a few general issues with the report's structure and its presentation of data. A lot of the quantitative data were only presented as percentages. The understandability of the baseline and project effects would be enhanced by presenting the nominal values in the report alongside the percentages.

A greater focus on ensuring no new baseline data was introduced in the Project Effects section, and no project effects were introduced in the baseline section would help improve the understandability of the report. This issue was particularly noted in reviewing the traditional economy assessment. The quantitative baseline data only included historic data and did not forecast Measurable Parameters (MPs) without the project to match the temporal boundaries of the assessment. Forecasting baseline data to match the temporal boundaries of the assessment will help better understand the impacts of the Project on Key Indicators (KIs). Specifically, the following KIs could benefit from forecasting quantitative baseline data:

- Employment and training
- Income
- Government revenues

The historic data in the baseline could be enhanced by including the most recent 2021 census data where appropriate.

In terms of the assessment of Project-related effects, many project effects are discussed qualitatively. The results of the assessment are subjective and, recognizing limitations in available data to complete a more robust economic analysis, ongoing monitoring and reporting will be needed to ensure that LSA communities, including English River First Nation (ERFN), can realize the economic benefits of the Project, a concern already raised in the engagement sessions. Quantifying the impacts of the project on KIs where possible could add to the understanding of the project effects. Specifically, the following KIs could benefit from the quantification of Project impacts:

- Employment and training
- Income
- Business opportunity
- Government revenue

Estimating the impacts of the Project in the LSA and RSA may change the residual effects assessment for some of these KIs.

Income, Business Opportunity, and Traditional Economy KIs are missing important Measurable Parameters. For example, understanding of the Project effects on the Income KI could be enhanced by adding Income Disparity as an MP as part of Income. This could include looking at affordability and

purchasing power in the study areas. Adding this MP to the assessment of Income may impact the direction and magnitude of the residual impact of the Project on this KI.

Moreover, understanding of the Project effects on the Business Opportunity KI could be enhanced by adding existing business access to labour as an MP. This could help in understanding if the Project could have an impact on the ability of existing businesses to hire and retain the staff necessary to maintain their existing operations. Adding this MP to the assessment of Business Opportunity may impact the direction and magnitude of the residual impact of the Project on this KI.

The Traditional Economy KI could also be enhanced by adding additional MPs to the assessment. Additional MPs could include, but may not be limited to things such as:

- Commercial traditional economy
- Non-commercial traditional economy
- Social and cultural benefits of traditional economy

These aspects are discussed in the baseline and effects of the project but aren't addressed explicitly as MPs, nor are the linkages to Economics KIs clearly defined.

Impacts on the Traditional Economy may be underestimated in this assessment. As noted above, the draft EIS relies on a single informant trapper for much of the data. This is not the only individual interacting with the Project area for traditional purposes. ERFN member use of the project area and the associated Traditional Economy may be affected due to potential stigma from the Project, which may affect harvesting avoidance behaviours and lead to avoidance of the Project area. The draft EIS concludes that the impacts on the Traditional Economy are negligible to low and concludes that the impacts are fully reversible. ERFN does not agree with this assessment, and expects that Denison will commit to disseminating information and knowledge sharing on the project and to implement robust mitigation measures to counteract any changes in harvesting avoidance. .

Reviewing the approach to and results of the assessment of the project's effects on the Traditional Economy with traditional users and Knowledge Holders will add to the validity of the assessment. Ensuring the assessment and compensation plans consider potential future participants in the traditional economy, as well as current participants in the traditional economy, could have an impact on the magnitude and reversibility of the residual effects of the Project on this KI.

The Government Revenues KI, as it is currently presented, does not fully capture the impact of the Project on all levels of government. Expanding the existing Government Revenues KI to be Government or Government Finance would better capture the effects of the Project on this part of the Economy VC. This change would mean including an assessment of the Project on government costs as well as government revenues. Some government costs are currently presented in the project effects section for this KI.

Using the lens of GBA+ where and when possible, could enhance the assessment. This was partially done in the baseline. The GBA+ lens may result in opportunities for Denison to enhance the magnitude of impact on Employment and Training, and Income KIs by proposing a strategy to hire

women and members of the LGBTQ2+ community along with others who are traditionally marginalized in a resource-based economy.

The assessment would be enhanced with additional information pertaining to the recommended procedures, strategies, and metrics for local recruitment, procurement, and training, as well as a human resource development plan. Nevertheless, it has come to our attention that the Proponent is presently engaged in active negotiations regarding the terms of an agreement to implement these practices, plans, and measures. It is recommended that the Proponent outline a pragmatic roadmap for ensuring that ERFN members have access to higher-quality employment opportunities beyond entry-level or general labourer roles in the mining operation. In addition, the establishment of a local recruitment, training, and procurement center in a neighboring community could prove advantageous to ERFN.

Depending on the terms of the agreement, the proposed practices, plans, and measures for local hiring, local procurement, and local training could result in material changes to the Residual Effects assessment.

Finally, in terms of monitoring, it is important to ensure that a robust monitoring program is developed that measures the impacts of the Project on the KIs and Measurable Parameters identified in this assessment. The monitoring plan should include Project effects on the Traditional Economy KI. Ongoing monitoring could help ensure that there are no additional negative residual effects of the Project on LSA or RSA communities, including ERFN. Additional residual adverse economic effects may likely result from the Project, such as:

- Economic downturn associated with a boom-bust industry
- Adverse effects on the Traditional Economy, as the effects presented in the assessment likely underrepresent future impacts
- Economic leakage, exacerbating socio-economic disparities between the LSA, the RSA, and outside communities
- Income and economic disparities within the LSA and RSA based on gender, culture, or other factors

### **3.8.3 RECOMMENDATIONS**

It is recommended to quantify the Project-related effects on KIs where possible. Estimating and quantifying project effects in the LSA and RSA could add to the understanding of the Project effects and enhance the residual effects assessment. To better evaluate potential economic effects on LSA communities on employment, training, and income, it is recommended that the assessment review existing data and run a series of scenarios, including the best, average, and worst cases. Specifically, the following KIs could benefit from the estimation of Project effects in the LSA and RSA:

- Employment (direct, indirect, induced)
- Income (direct, indirect, induced)

- Business opportunity (% of project spend in the LSA and RSA)
- Government revenue

It is recommended that the Denison develop and share clear and targeted plans to maximize economic benefits for the LSA communities, including ERFN. These plans should be updated based on ongoing monitoring and should be communicated regularly to ERFN. These plans should include, but are not limited to:

- Outreach to schools with relevant programs, activities, and information to encourage young people to find related employment at the Project
- Working closely with ERFN leadership and community members to identify ways to grow relevant local businesses, encourage Project-related employment, and recruit and retain community members for training and employment opportunities
- Support local hiring practices through the establishment of a local recruitment and training centre within a nearby community for ensuring ERFN members have a pathway to having higher quality positions than simply general labourers or junior positions within the mine
- On-the-job training opportunities for ERFN citizens across all job types, including those that are transferrable outside of the mining sector
- Investments into local businesses, such as training, grants, and procurement preferences to encourage local businesses to benefit from Project activities
- Establishment of the local procurement centre within a nearby community
- Grants to encourage the development and growth of relevant small businesses
- Work with local Knowledge Holders to develop a community-led and informed robust compensation plan for ERFN traditional land users who may be affected in the future by the Project, either via a lack of access to the site, stigma associated with the site, or other effects of Project activities
- Undertake a GBA+ analysis of Project effects including income, training, and employment

These practices, plans, and measures would benefit from being reviewed by interested and impacted Indigenous and non-Indigenous parties. More detail in these practices, plans, and measures would help validate the residual effects assessment.

An ongoing and robust monitoring program will also be needed to ensure that there are no additional negative residual effects of the Project on ERFN. . To help maximize potential positive economic effects for the LSA, it is recommended that the Project actively monitor and report on Key Indicators such as, but not limited to:

- The number of Indigenous, non-Indigenous, local, and regional staff that are hired at the site and their average salaries

- The number and value of contracts for LSA, RSA, and outside businesses
- The type, uptake, outcomes of and feedback from training and education opportunities for LSA residents
- Progress, outcomes, and feedback from all Project-related economic development activities

## 3.9 ACCIDENTS AND MALFUNCTIONS

### 3.9.1 SUMMARY OF EIS CONTENT

In Section 14 of the EIS, Denison outlines their assessment of risk associated with accidents and malfunctions. For this assessment, accidents and malfunctions are events or conditions that are not part of any activity or normal operation of the Project as proposed by Denison. This is consistent with the definition of an accident as described in REGDOC 3.6, “any unintended event, including operating errors, equipment failures, and other mishaps, the consequences, or potential consequences of which are significant from the point of view of protection or safety” (CNSC, 2022). In contrast to the description provided in the draft EIS, accidents and malfunctions, while unplanned, in most cases should be reasonably foreseeable.

The draft EIS outlines a range of potential sources of accidents and malfunctions which may occur in relation to the Wheeler River project. This is outlined in detail in Appendix 14A, however, a total of 69 were identified, and only six are described in depth, as they are characterized to be medium to high initial risk. The draft EIS presents a preliminary screening assessment of risk based on the likelihood of occurrence and consequence of severity, with events of greater likelihood and consequence being considered of greater risk than those with lower likelihood and consequence.

For each of the seven scenarios discussed in depth, the draft EIS offers an overview of the scenario, potential consequences to environment and/or human health, possible mitigation considerations, likelihood, and an overall evaluation of risk. The draft EIS then evaluates the seven scenarios to have the following overall risk:

SCENARIO	EVALUATION OF RISK
• Vehicle Accident and Aquatic Release of Radioactivity	Low
• Vehicle Accident and Aquatic Release of Fuel and Hazardous Chemicals	Low
• Loss of Freeze Capacity	Moderate
• Failure of the Freeze Wall	Moderate

- Process Vessel and Piping System Failure Low
- Facility Fire and/or Explosion Low
- Vehicle Accident and Terrestrial Release of Radioactivity and Chemicals Low

Where there remains some uncertainty is in determining the influence of the overall evaluation of risk. Specifically, it remains unclear to ERFN as to the implications of a risk being considered moderate compared to one which is considered low. Additionally, it is unclear whether the preliminary assessment indicating a high risk has any bearing on the final evaluation.

### 3.9.2 EVALUATION

In review of Section 14, ERFN is alarmed by the approach taken in the draft EIS to downplay and avoid meaningful dialogue regarding potential impacts as a result of accidents and malfunctions. The draft EIS has identified seven scenarios to focus the discussion of accidents and malfunctions. These scenarios include:

- Vehicle Accident and Aquatic Release of Radioactivity
- Vehicle Accident and Aquatic Release of Fuel and Hazardous Chemicals
- Loss of Freeze Capacity
- Failure of the Freeze Wall
- Process Vessel and Piping System Failure
- Facility Fire and/or Explosion
- Vehicle Accident and Terrestrial Release of Radioactivity and Chemicals

ERFN agrees that these are among the most likely sources of accident or malfunction which may result in significant environmental or human health impacts, but that overall, represent a relatively small subset of scenarios or possible sources of accidents and malfunctions, which may cause significant impacts. Other considerations include the failure of drilling equipment, well casings, wastewater treatment processes, and other process/infrastructure failure(s) resulting in the release of harmful materials. These scenarios all require full consideration in the assessment of risk and the development of mitigation measures.

ERFN was disappointed by the lack of Traditional Knowledge and local knowledge used in the assessment of risks. We acknowledge that Denison considered the concerns raised through community engagement related to accidents and malfunctions, but that knowledge, as it relates to effects pathways, monitoring, and mitigation approaches, was not fully integrated in the draft EIS.

ERFN does not consider the accidents and malfunctions assessment in the draft EIS to be supported by evidence. For example, there are instances where professional judgement rather than modelling and analysis is used to assess the likelihood of an incident, however, no insight is provided to support the rationale for this judgement. Additionally, the draft EIS does not present meaningful contingency strategies or design changes based on the assessment of accidents and malfunctions in many cases, noting that the risk of failure is sufficiently low to be effectively zero, or that contingency planning is not feasible. This is most evident in the discussion regarding the potential loss of freeze capacity. ERFN as well as others have raised concerns about the potential for groundwater contamination in the event mine fluids escape the freeze wall. The potential impacts on surrounding ground and surface water would be catastrophic, as escape may only be detected once an ecological response is observed.

“In a very unlikely case of groundwater contamination, establishing an exposure pathway from deep contaminated groundwater to a surface waterbody is associated with large uncertainty. In addition, fate and transport of mine fluids cannot be easily quantified. However, it is recognized that, in a very unlikely case of contamination, remediation at the depth of the mining horizon would be very difficult and the spread of contamination could potentially result in effects that could be characterized as major as per the consequence scale described in Section 14.5.2. Accordingly, Denison has put great effort into making sure the structural stability of the freeze wall is maintained, and that the freeze plant is maintained in good working order.” (Denison, {2022}, p. 14-42)

Notably, the draft EIS recognizes the challenge that it would face not only in containing a breach of the freeze wall but also in even detecting and tracing exposure pathways. ERFN is therefore concerned that, without an additional layer of contingency planning in place, mining fluids may be able to enter the environment undetected. As part of the Environmental Assessment, Denison is responsible to present contingency strategies that clearly contemplate such events. Additionally, the draft EIS has not presented a viable method to monitor the effectiveness of the freeze wall in real-time (or near real-time). The significance of this omission is underscored by Denison’s acknowledgment there is no manner to truly flesh out the likelihood of failure:

“[Denison] argued that a loss of freeze capacity resulting in freeze wall failure and the subsequent release of mining fluids from the mining theatre into the local/regional groundwater environment was very unlikely. Accordingly, and based on professional judgement, a nominal value of  $1 \times 10^{-7}$  was assigned as the annual probability of this scenario.” (Denison, {2022}, p. 14-42)

The use of a nominal value in such an important risk assessment is tantamount to tailoring the outcome to fit the overall narrative. ERFN emphasizes the lack of certainty regarding potential failure, and underscores the requirement for a cautionary approach to ensuring that there are appropriate contingency plans in place. Specifically, if the loss of freeze-wall capacity is even remotely plausible, ERFN believes this should require Denison and the CNSC to fully address this low-probability but extremely high-risk event through contingency and emergency planning.



### 3.9.3 RECOMMENDATIONS

ERFN requests that CSNC and Denison take seriously the possible threat to the environment and by extension ERFN rights and interests associated with the failure of the freeze-wall. We cannot overstate the need to provide additional analysis of contingency measures to avoid contamination in the event the freeze wall fails to contain mining fluids and other sources of groundwater contamination associated with Wheeler River activities.

Specifically, we request that Denison provide additional information on the inputs and analysis which led to the risk assessment for all factors. This includes appropriate effects modelling, effects pathways, and rationale for all assumptions used in the analysis. The conservatism of any modelling assumptions must be clearly discussed, and where more conservative assumptions were available but not used, a rationale for these decisions must be provided. This information is essential to being able to effectively understand the potential risks to the environment, health, and ERFN Rights.

We request that Denison provide additional discussion on how the accident and malfunction risk assessment will alter design elements and how activities are to be conducted. We also request that Denison provide options for mitigations, which include ensuring appropriate anticipatory measures are in place (supported by the rationale for their use), mitigation effectiveness monitoring, and intervention triggers in the event that risk mitigations are not found to be fully effective.

Finally, we recommend that Denison demonstrate how ERFN Traditional Knowledge was considered and incorporated in the assessment of accidents and malfunctions. This must go beyond simply responding to concerns which were raised by ERFN, but rather must demonstrate that Traditional Knowledge and input from ERFN citizens is actively used in ensuring that accidents and malfunctions do not adversely impact the environment, human health, or the rights and interests of ERFN citizens.

## 3.10 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

### 3.10.1 SUMMARY OF EIS CONTENT

In the analysis of the effects of the environment on the project, the draft EIS attempts to characterize possible impacts on the project as a result of discrete environmental events such as wildfire and seismic activity, as well as longer-term-events such as the impacts of climate change over the life of the mine. The consideration of major environmental events is essential in the risk assessment of this project, given the inherent risks associated with the extraction, handling, and processing of uranium ore.

The draft EIS focuses on the potential effects of four types of environmental events: seismic activity, forest fires, extreme weather events (short-term) and climate change. We acknowledge that in drafting a section devoted to the effects of the environment on the project, it is difficult to untangle the effects of climate change with the impacts of other discrete events, therefore, with perhaps the exception of seismic activity, climate change is an underpinning factor influencing all of the potential effects of the environment on the project.

### 3.10.2 EVALUATION

In the review of the Effects of the Environment on the Project, the absence of several factors is noteworthy, including a lack of consideration for long-term water level rise (e.g. flooding) or fall (e.g. drought), which may impact the long-term viability of plans for water taking and effluent discharge. These two factors are discussed briefly within the extreme short-term weather effect, but analysis and mitigation measures for long-term episodes are not contemplated within the EIS. Additional, consideration and discussion should have been afforded to the potential for tornadic events and heavy snowfall/ice conditions on the project.

Overall, we find the discussion on the effects of the environment on the project to be inadequate for the purpose of predicting potential impacts or identifying appropriate mitigation measures. In many key areas, The draft EIS only provides a superficial analysis and discussion on the general conditions associated with the identified effects, and makes general or ambiguous commitments to develop effective mitigation measures in future project planning documents. In some instances, general standards are appropriate, such as in the case of seismic risk, where mitigations must be built into the detailed design of all infrastructure on site. However, for known or predicted risks such as wildfire, which poses a real, ongoing and likely threat to the project, the EIS must contain a fully fleshed-out discussion.

Specifically in relation to wildlife ERFN would expect the EIS to include information is necessary to assess measures to protect ore and radioactive by-products (waste) from fire. How the Project, ore, and other on-site materials may react to fire or become mobilized by wind, water and or materials used in fire suppression require discussion at this conceptual stage.

The above example illustrates how the effects of the environment on the Project must be considered in the interplay between Project activities and environmental effects. Many other examples could be cited, including how water withdrawal during periods of drought may further reduce the overall amount of water available for Project activities. Similarly, the use of equipment at periods of increased fire risk (e.g., drought conditions) may trigger the ignition of a wildfire. Such interplays are also present in relation to the Project's potential impacts on seismic activity where injection and extraction of material from deep wells can influence the likelihood of seismic activity. As a result, it will be necessary for the EIS to discuss how uncertainty regarding environmental effects may influence project activities, as well as how project activities may be curtailed in order to prevent further exacerbation of effects.

### 3.10.3 RECOMMENDATIONS

Denison must provide a complete examination of the interaction between the local and regional environment and proposed activities. This includes providing further discussion and examples of how factors such as climate, fire, flooding, drought, weather, and seismic activity have impacted in situ recovery mines elsewhere and demonstrate examples of effective use of mitigation measures appropriate for an ISR uranium mining project within the northern context.

We recommend that Denison provide additional modelling and analysis of the potential impacts related to:

- Seismic activity, including magnitude and duration
- The dispersal of particulate material associated with mine stockpiles, and dry-stacked materials in the event of an on-site fire
- Viability of water-taking and effluent discharge bodies as a result of extended or prolonged drought and flooding respectively
- GHG contributions from the Wheeler River project to local, regional, and global climate change
- Management of uncertainty in environmental predictions as a result of increased climate volatility

## 4.0 SUMMARY AND RECOMMENDATIONS

ERFN, with support from Shared Value Solutions, and Source Environmental Associates, performed a review of the draft EIS. Overall, through our team's review of the EIS, we uncovered concerns regarding information gaps, missing values and indicators, the accuracy of the residual effects evaluations, and adequacy of proposed mitigation and enhancement measures and monitoring and follow-up programs that challenge reviewers from undertaking a comprehensive assessment of the Project. We characterize our findings in three general categories of (a) Elements ERFN support, (b) Elements ERFN believes require additional refinement, and (c) Elements where ERFN has significant concerns. .

- **Project elements THAT ERFN Supports**
  - Denison is proposing the use of a freeze-wall as a containment system for mining fluids. While we believe there are inherent challenges in ensuring that the freeze-wall is effective, ERFN agrees that the freeze-wall is an important mitigation measure that will reduce overall project risks. It is therefore imperative that both the design of the freeze-wall and the associated emergency procedures in the unlikely event of a failure is fully considered, and that provisions for long-term maintenance are included in the licensing conditions.
  - Denison is proposing the use of effluent treatment for the Wheeler River project. Treatment of contact water is essential for ensuring that effluent meet appropriate water quality guidelines prior to discharge. We support effluent treatment, but note that additional refinement is necessary. ERFN expects that all water discharged from the Wheeler River site will meet appropriate water quality guidelines.
  - Denison intends to send left-over process precipitates off-site for additional processing and disposal rather than being left on site. This will reduce the environmental impacts left on site, and assuming waste materials are appropriately handled and disposed of responsibly, will reduce the overall risk to the environment. ERFN notes that Denison should continuously improve methods of minimizing the development of waste products to minimize its overall environmental footprint.

- Denison proposes to recycle significant amounts of process water that will limit both the amount of water withdrawn from and released to the environment to support processing. ERFN proposes that Denison to continue to identify efficiencies and use best technologies to further reduce external water demands.

## • **PROJECT ELEMENTS THAT REQUIRE ADDITIONAL REFINEMENT**

- The water balance associated with Denison's water recycle program is not clearly defined. ERFN believes that it is important for Denison to quantitatively describe water use in the project within the EIS, rather than waiting until the permitting phase of the project. The water balance for the project must be better understood, as it may disclose significant impacts on the aquatic environment.
- ERFN acknowledges that Denison intends to do a best available technology study to define water treatment options. Until this study is conducted, 'best' remains to be defined. We request that ERFN be fully engaged in this study and be provided with an opportunity to discuss with ERFN the best treatment option for this project in order to protect the aquatic environment.
- The water recycle program is conceptual at this stage. Denison has committed to following the "As Low as Reasonably Achievable" standard and continual improvement initiatives during each phase of the project, including the next phases of licensing. ERFN notes this commitment, and recommends quantitative assessment of water recycle as part of the EIS, as this may address the potential issue with effluent acute toxicity discussed in the comments below.
- While Denison has met the minimum standard for baseline data collection (i.e., one year of data), ERFN maintains that there are insufficient data to accurately characterize the baseline aquatic environment. Given the insufficient datasets, the present assessment of the potential impacts carries too much uncertainty. Based on the baseline characterization (Ecometrix, 2020, EIS Appendix 8-D), the majority of aquatic environment baseline data were collected in 2016 or earlier, and only one year of data (2016) was collected for aquatic biota (benthic invertebrates, plankton, fish tissues) and sediments. Most of the hydrological and fish habitat data forming the basis for those characterizations were collected prior to 2014, and there are very little winter data. Denison has not justified the limited spatial and temporal coverage of the baseline studies. ERFN recommends that Denison should collect at least one additional year of data to assess the current aquatic environment and make the necessary revisions to the baseline characterization. It's important to note that most of the previous baseline data is now over five years old, so the best practice would be to collect two more years of baseline data. This would also serve to meet the provincial TOR and EIS guidance that prescribes all biological and time-sensitive data should be less than two years old (Saskatchewan 2021).
- The EIS has analyzed the potential impacts of the project on Northern Pike and White Sucker, which are considered significant to ERFN. However, there is no evaluation of the effects on Walleye, Lake Whitefish, Lake Trout, and Arctic Grayling, which are also considered important by ERFN. Denison has used Northern Pike and White Sucker as a representation for these species, but there is no evidence provided that these species are appropriate

surrogates. ERFN also notes inconsistencies in the fish presence/absence data used for the baseline and EIS. Additionally, the potential impact on food web dynamics and its implications for fish species is not thoroughly discussed.

- The EIS would also benefit from more robust efforts to identify and justify key assumptions, as well as key knowledge gaps and how such gaps will be addressed. These are requirements under CEAA 2012. Issues identified in our review and discussed below include key assumptions used in modelling, as well as gaps in data and knowledge relating to critical aspects of the EIS, including the identification of potential impacts and the assessment of significance in relation to groundwater/hydrology, the aquatic environment, local biota and other important values. ERFN has identified instances throughout the report in which such assumptions or knowledge gaps require further justification or additional detail.
- The aquatic environment section of the EIS is also missing information on how malfunctions were evaluated (as required by CEAA 2012 S.19(1)[a]), and provides limited discussion of food web dynamics and their implications to the EIS as required by CEAA 2012 REGDOC 2.9.1. Please see the comment tracking tables for some specific examples of knowledge gaps and assumptions requiring clarity from Denison.
- Denison presents a very narrow assessment of Human Health impacts as a result of the Wheeler River Project. By considering only the direct impacts of chemical and radiological elements of the project on public and worker health, Denison has failed to consider an entire suite of secondary impacts to human health, including the project's impacts on sexual health and violence, use of drugs and alcohol, and the psychological and mental health of ERFN members. Additional consideration of these factors and appropriate mitigation measures should be required in the EIS.
- Denison notes that the increased amount of contaminants of potential concern released to the environment by this project are muted in comparison to the baseline conditions. ERFN is concerned that the impacts of the Wheeler River project still result in additive or synergistic effects on the local and regional environments. As baseline contaminant levels in human health receptors are already high, any additional inputs from the Wheeler River project will serve to add additional stress to an already impacted environment. These issues should be addressed in the EIS.
- ERFN is concerned that the EIS does not sufficiently account for the cumulative effects of past projects and their impacts. Although Denison has attempted to integrate Indigenous Knowledge (IK) with western science, it is the view of ERFN that the representation of these efforts in the EIS falls well short of best practices. There are still significant gaps in the consideration of both cumulative effects and IK that will need to be addressed in the EIS.
- Denison understates the impact of the Project on the Community Well-Being by focusing only on the effects of ERFN citizens participating in the Project's rotational work schedule and related impacts to family and community cohesion. Although the employment and involvement of ERFN citizens may have an effect on certain aspects of Community Well-Being, the Project also has broader direct impacts on ERFN's Ancestral Territory, affecting the well-being of all ERFN citizens. The presence of the Project will alter how all ERFN

citizens interact with Nuhtsiye-kwi Benéne, thus influencing ERFN's overall Community Well-Being and Quality of Life. This must be acknowledged and addressed in the EIS.

- Although the erosion of the traditional economy and negative impacts on harvesting activities through the Wheeler River Project was identified as a major concern by ERFN, Denison understates these potential negative impacts and concludes that traditional harvesting activities such as trapping, hunting, and fishing will not be significantly affected. It is crucial that Denison takes proactive measures to support the traditional economy and that these measures be to the satisfaction of ERFN as a condition of licensing.
- It is important to ensure that a robust monitoring and follow-up programs are developed that measures the impacts of the Project on the KIs, including traditional economy, to ensure that there are no additional negative residual effects of the Project. Additional residual adverse economic effects may likely result from the Project, such as: economic downturn associated with a boom-bust industry; economic leakage, exacerbating socio-economic disparities between the LSA, the RSA, and outside communities; income and economic disparities within the LSA and RSA based on gender, culture, or other factors; and adverse effects on the traditional economy, as the effects presented in the assessment likely underrepresent future impacts. ERFN has obtained assurances from Denison that these issues will be addressed through proactive monitoring and follow-up programs.
- The draft EIS lacks contingency plans for many potential scenarios in which failure occurs. Denison notes and ERFN agrees that failure of the freeze-wall is predicted to be an unlikely event, but ERFN notes that a response plan for this and other events must be developed as a condition of licensing.
- The draft EIS does not provide sufficiently detailed information to model the dispersion of radioactive material if it were to enter into Wheeler River in the event of a vehicular accident. While the likelihood of this scenario to occur is low, Denison must be appropriately positioned to respond in such an event as a condition of licensing.
- Denison does not adequately characterize the potential for system failure of the effluent treatment facility. As a result, the draft EIS provides no insight into how Denison may be able to store water or otherwise prevent the release of contaminated water to the environment. This scenario must be evaluated in the EIS, and emergency response procedures must be addressed as a condition of licensing.

## • **PROJECT ELEMENTS THAT ARE SOURCES OF CONCERN**

- As presented in the draft EIS, Denison is proposing to leave heavily impacted water in the leach field, with the expectation that the plume will not migrate to Whitefish Lake sufficiently to cause environmental impacts. Given the risks involved, ERFN expects Denison to take a more proactive approach to leach field decommissioning to ensure the leach field is actively remediated at the end of project life. ERFN recommends targets based on returning groundwater to near-baseline conditions by doing as much mitigation as possible while the mine is in operation/in closure in order to reduce uncertainty and risk for future generations. This is a fundamental concern for ERFN, and must be addressed in licensing conditions.

- The predicted effluent quality of the industrial wastewater treatment plant is quite saline. The quality of this water at end-of-pipe (prior to the diffuser) may cause acute toxicity to aquatic life, meaning discharge may contravene the Fisheries Act/Canadian Metal and Diamond Mine Effluent Regulations. Ensuring that adequate measures are implemented to ensure that discharge water quality is within guidelines that are adequately protective of aquatic life is a fundamental concern for ERFN.
- One of the core challenges of using ISR is to ensure the containment of mining fluids (solvent materials injected into the ore body, as well as uranium and other ore products mobilized during recovery) to the Project area. Denison plans to use a freeze-wall to prevent lateral groundwater flow and potential contamination of groundwater and surface water. While the technology is not entirely new in Canada, the large size of the freeze-wall presents a significant operational and closure challenge. Denison's assessment largely depends on models and assumptions, but provides little supporting evidence or reference to previous studies or projects. ERFN stresses the importance of ensuring that Denison's models are shown to be conservative and that Denison is able to carefully monitor and maintain the freeze-wall to prevent the release of contaminated material. In the event of mining fluids or other contained materials being released, ERFN expects Denison to detail emergency procedures to stop the release and restore the affected environment. ERFN understands that Denison is committed to developing an emergency response procedure for this event.
- Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the *Traditional Knowledge Study and Health and Socio-Economic Study Report*. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN's rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user. It is important for the proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and socio-cultural and economic perspective. Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated. The draft EIS should be revised to reflect the totality of ERFN TK and land use information.

ERFN is prepared to accept that ISR mining may be a better approach compared to conventional open-pit uranium projects. Other open pit operations in ERFN territory have left long-lasting damage to our Ancestral Homeland that cannot be fully remediated. However, this Project is the first of its kind in Canada. ERFN believes that it must be held to the highest standards. Denison as the proponent and CNSC as the regulator must employ strict precautionary approaches in all instances where uncertainty or potential risks cannot be resolved.



To Denison's credit, they have worked closely with ERFN in the months and years that have led up to the submission of their draft EIS to provide information to ERFN about the nature of the proposed mine, to develop an open and trusting relationship, and to gain an understanding of ERFN knowledge, rights, practices, interests, and concerns. However, ERFN is of the view that the draft EIS does not yet currently utilize sufficiently conservative models or precautionary approaches to contingency planning or in the consideration of failure or accident scenarios. These issues will be of greatest concern to our citizens.

In situ recovery is an entirely new type of uranium mining to what we have seen within Nuhtsiye-kwi Benéne, and there are many unknowns. The onus to provide evidence that will assure our community that this project will not cause adverse environmental impacts lies directly with Denison. Unless more conservative models are used to predict impacts, and more robust environmental precautions are taken in the design of mitigation measures, ERFN may conclude that the potential risks of significant adverse environmental effects will be greater than the potential benefits of the project. We are prepared to work with Denison and the CNSC to address what we see as the current gaps.

We also recognize that this phase of the environmental assessment serves as a turning point. ERFN expects that Denison and CNSC will continue to work collaboratively with ERFN to resolve all issues identified in this review, as well as other concerns as they are identified and presented. We seek to collaborate with all parties in gaining confidence in the Project, executing opportunities to ensure appropriate participation by ERFN in the project, and working to mitigate and accommodate all impacts to rights and interests.

Additionally, as the CNSC is responsible for regulating the entire lifecycle of the Wheeler River project, CNSC's obligations extend beyond the Environmental Assessment. With these obligations is the Duty to Consult through construction, operations, closure, and post-closure through to the completion of reclamation. ERFN will require the CNSC to conclude a long-term oversight agreement with ERFN to ensure appropriate oversight of all aspects of this Project throughout its duration. Such an agreement will need to address ERFN's process, capacity and resource requirements for effective consultation and accommodation over the life of the project.

The process of addressing ERFN concerns is through the environmental assessment and during any future licensing applications is understood to be iterative, however, the following recommendations outline initial considerations for developing a pathway forward:

- Although typically not contemplated in depth during the Environmental Assessment phase, it is important to consider how to determine appropriate security bonding for this project. In the event mining fluids contaminate groundwater either during the operational phase of the project or during closure and post-closure phases, remediation will present a significant technical challenge at great cost. The long-term and uncertain nature of groundwater transport for the Wheeler River project means that it is difficult to fully assess risks 50 to 100 years from now. ERFN must be assured that there is a financial backstop to guarantee resources are in place to fully remediate the site.
- ERFN expects that the freeze-wall will be maintained until groundwater contained within the mining theatre meets appropriate mutually agreed upon water quality criteria. Given that a



permanent freeze-wall is the only identified solution that could ensure harmful contaminants are not able to escape, ERFN requires assurances that an effective freeze-wall be maintained indefinitely until groundwater returns to baseline condition. Financial assurances to maintain the freeze-wall until such time as baseline conditions are restored must be a condition of licensing.

- Given the need for certainty surrounding the effectiveness of the freeze-wall as a form of mitigation against groundwater contamination by mining fluids. ERFN believes that a Freeze Wall Monitoring and Management Plan that details how the integrity of the freeze-wall will be maintained throughout the life of the project should be developed as a condition of licensing. Additionally, we request that the plan outline a method for monitoring in real-time the integrity of the freeze wall in three dimensions, and that such monitoring data be publically accessible for the duration of the freeze-wall operations. .
- Large-scale mining operations often use labour and resources from outside the area in which they are located. This can be especially true for positions and activities that require high skill or experience levels. ERFN and its citizens, with support from Des Nedhe Group, are highly skilled and experienced in working in the uranium mining field. Denison must demonstrate how it will prioritize economic opportunities for residents and businesses in Northern Saskatchewan, notably ERFN citizens and businesses. It is recommended that Denison work with ERFN to establish training and employment opportunities programming at the Wapachewunak Reserve. Programming should work to ensure that Denison proactively removes barriers to ERFN citizens and other residents or businesses in Northern Saskatchewan, allowing them to benefit from this project.
- Through baseline archaeological studies, only a handful of sites of archaeological significant were identified as sites to be impacted by project activities. However, this project is set more broadly in an area which is expected to have high archaeological potential. As a result, we request, as a condition, that Denison provides capacity for the training and employment of ERFN cultural monitors who will be present throughout project construction to ensure chance archaeological finds are recognized and impacts mitigated.
- ERFN citizens have raised significant concerns regarding Project impacts on environmental and human health through a number of pathways. Given the potential for these impacts to come to fruition, we request that, as a condition of approval, Denison should be required to establish a program examining the ongoing impacts of this project relative to the predictions outlined in this EIS and in the Human Health Risk Assessment.
- Given the potential impacts to the aquatic environment, there is a need to establish an Aquatic Effects Monitoring Program (AEMP). This program is in addition to surveillance monitoring of project discharge and focuses on understanding biological response to the project. ERFN recommends, as a condition of approval, that Denison be required to establish an AEMP for this project. Further ERFN requests that capacity be provided to ERFN to ensure the ability to be fully engaged in the development, oversight, and execution of the AEMP, both at the technical table and with boots-on-the-ground monitors. It is further necessary that Denison works with ERFN to fully identify effects pathways, valued

components, and measurable endpoints that are consistent with how ERFN citizens view and interact with the lands and waters around the project site.

- ERFN recommends that Denison conduct one additional year of baseline data collection for all aquatic environment endpoints and revise the baseline characterization appropriately. It is also worth noting that nearly all previous baseline data are now over five years old, so true diligence would involve two years of additional baseline. Baseline data collection should include (but not be limited to):
  - Benthic invertebrate and sediment sampling at SA-6
  - Benthic invertebrate and sediment sampling at two locations in existing baseline lakes (near the inlet and outlet) and one additional location in South Whitefish Lake (at the proposed discharge location)
  - Phytoplankton and zooplankton community sampling in existing baseline lakes
  - Whole-sample benthic invertebrate tissue chemistry analyses
  - Repeating previous fish tissue sampling but including the retention and analysis of liver tissues
  - Fish tissue (muscle) sampling from all important species identified by ERFN that are present within South Whitefish Lake. Denison should either investigate non-lethal sampling options or partner with ERFN to obtain tissue samples from multiple species
  - Detailed bathymetric and habitat surveys of South Whitefish Lake
  - In-situ measurement and characterization of bottom currents at the effluent discharge location during winter, at high flow, and at low flow
- ERFN has recognized that the Project will have adverse impacts on the ability for ERFN citizens to engage in some traditional practices and activities. Further, we have outlined our desire to ensure not only the maintenance but also the growth of our citizen's connectedness to the land. We request that, as a condition of this project, Denison work with ERFN to identify and support mitigation measures directed towards ensuring the growth of traditional activities by ERFN citizens, and the promotion of connectedness to the land.
- The Wheeler River Project is complex and has a range of pathways with which it will interact with ERFN's Rights and interests. Given this complexity, ERFN expects that Denison will provide appropriate capacity support for ERFN's full participation in the ongoing environmental oversight for the entire life of the Project.

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# APPENDIX A: COMMENT TRACKING TABLE

COMMENT #	EIS SECTION REFERENCE	ISSUE	QUESTION/RECOMMENDATION
ATMOSPHERIC AND ACOUSTIC ENVIRONMENT			
ERFN-001	EIS Section 6.1.1.2.3 Other Guidelines and Standards	Background radon concentrations were used for predicted concentrations for the Project without an appropriate rationale for why CNSC criteria are not used.	Provide rationale why background radon concentrations were used in favour of air quality emissions standards/criteria from CNSC for predicted radon concentrations from the Project.
ERFN-002	EIS Section 6.1.1.3 Spatial and Temporal Boundaries	For simplicity, a single criterion and time-averaging period were selected for each COPC based on the most stringent criteria or standard presented (federal/provincial). Time period effects are expected to occur in relation to project phases and activities (scenarios), and that the prediction of effects are applicable to/driven by MPs and air quality criteria (1-hour, and 24-hour – short term emissions; and, 30-day, and annual averaging periods). Average compositions from dustfall data during baseline studies was limited to two sampling events (September and October 2021) and presented as a percentage of fixed dustfall – the lowest average of measurable concentrations was used to represent background levels.	The AQ modelling assumptions used for the Project are heavily reliant on conversion calculations and average baseline measurable concentrations from passive monitoring methods, instead of a more conservative approach using maximum measurable concentrations. Denison iterates that maximum concentrations for each scenario were extracted from modelling results and compared to criteria to determine effects; however, for dustfall, the lowest average measurable baseline concentrations were used to represent background levels in the modelling.
ERFN-003	EIS Section EIS 6.1.1.2.4 Summary of Assessment Criteria (KIs and MPs); EIS	As KIs associated with the Air Quality VC pertain to levels of dust, combustion products, uranium,	Passive methods represent averaged concentrations for deployment periods, and in some cases are not directly comparable to the

	Section 6.1.3.2 Existing Environment Air Quality	metals, and/or radionuclides; passive monitoring methods (commenced in 2016) were used to characterize the baseline air quality for the Project (included particulate matter [dustfall], NO <sub>2</sub> , SO <sub>2</sub> , radon, and external gamma). Provincial regional background concentrations were used for TSP, PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub> , SO <sub>2</sub> , CO; while Key Lake ECCC background data were used to represent concentrations of uranium, arsenic, and nickel; and Cigar Lake data were used for copper, lead, selenium, and zinc background concentrations.	regulatory criteria identified in Table 6.1-5. Conversion calculations were used on the passive monitoring data to compare the minimum requirements of averaged baseline results gathered, against identified provincial/federal criteria for use in modelling effects for the Project. Only predicted short-term (less than 3 years) and medium-term exceedances of modelled COPC concentrations of TSP, PM <sub>10</sub> , uranium (24-hour), and NO <sub>2</sub> (1-hour) to exceed air quality criteria at receptors located outside of the Property Boundary (6.1.4.2); however, as per the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012), the eight highest 1-hour predictions and the single highest 24-hour prediction at each receptor can be discarded.
ERFN-004	EIS Section EIS 6.1.1.2.4 Summary of Assessment Criteria (KIs and MPs); EIS Section 6.1.3.2 Existing Environment Air Quality	Table 6.1-15 shows 24-hour Arsenic concentrations met criteria established in Table 6.1-5 for background level comparisons (0.003 µg/m <sup>3</sup> - used conversion calculation due to passive sampling techniques used for baseline).	The EIS lacks clarity with respect to COPCs, as there was no discussion on the effects of 24-hour Arsenic concentrations meeting established criteria, nor was rationale included for the addition of Zinc as a COPC.
ERFN-005	EIS Section 6.1.3.2.7 Adopted Background Considerations	Ontario criteria for uranium in PM <sub>10</sub> were conservatively selected as the Project criteria although particle size information for ISR stacks (main source of Project uranium emissions) remains unknown. Input data to run the dispersion modelling included meteorological data from one year (2016 - minimum under guidelines).	Information is lacking on how uranium emissions can be mitigated if ISR plant stacks demonstrate particle sizes other than inhalable particulate matter (i.e., respirable particulate matter [PM <sub>2.5</sub> ] levels). Adjustments and refinements to the modelling and thus conclusions were made, heavily based on assumptions.
ERFN-006	EIS Section 6.1.3.1 Climate (Existing Environment); EIS Section 6.1.7.1 Climate Change Considerations (Cumulative Effects)	Climate considerations within the EIS do not address the potential for permafrost in the project area or potential disruption of permafrost by the Project (i.e., contributing GHG emissions directly and indirectly	Update Section 6 to include permafrost implications from interactions with the Project.

related to the project or as it relates to climate change).

ERFN-007	EIS Section 6.1.3.1 Climate (Existing Environment)	Baseline wind direction blowing predominantly from the west (~10%), followed by south and east directions (Appendix 6-C) with an average wind speed of 3.5 m/s. Proponent doesn't demonstrate relative maximums and minimums of wind speed over the averaging periods and wind data are not available for the climate normals period or from baseline studies for comparison and integration into project design/seasonal mitigations.	Update baseline information to reflect seasonal wind speed maximums and minimums and integrate it into mitigations.
ERFN-008	EIS Section 6.1.4.2 Potential Project-Related Effects	"The propagation of air emissions from Project activities associated with Construction, Operation, and Decommissioning was predicted using version 7 of the CALMET/CALPUFF modelling package (Exponent 2015). ... While the Saskatchewan Air Quality Modelling Guideline identifies that the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) should be used for most assessments in Saskatchewan, Section 3.3 of the guideline does allow for the use of more sophisticated models, including CALPUFF, where justified (SK MOE 2012a)." (pp. 6-30)	From the Saskatchewan Air Quality Monitoring Guideline (Section 3.3) "The use of specialized models [CALPUFF] requires consultation... [and] may be approved by the ministry on a case-by-case basis. This justification should clearly state the reasons why the approved models are not appropriate..." (SKMOE 2012). Provide a rationale for why the approved models were not appropriate based on the limited meteorological dataset available.
ERFN-009	EIS Section 6.1.5 Mitigation Measures	Additional mitigation measures include the use of chemical dust suppressants to address Air Quality. Denison does not provide evidence discussing the potential impacts on Air Quality from the use of chemical dust suppressants.	We request that Denison provide discussion regarding the potential impacts of using chemical suppressants to mitigate dust including whether there are there any risks to air quality associated with the chemical suppressants themselves.

ERFN-010	EIS Section 6.1.6.2 Significance and Confidence (Residual Effects Evaluation)	Denison states that a gap analysis memo and model input summary was prepared as part of the draft EIS. The memo appears to be missing from the EIS appendices.	Please either provide ERFN with the memo or clearly indicate where in the appendices this information is available.
ERFN-011	EIS Section 6.2.3.1 Baseline Noise Measurement Program (Existing Environment)	<p>Baseline data are not sufficient to support the assessment of noise impacts.</p> <p>Data were only collected for 2 locations during 1 week in May 2021, and did not include a portion of Highway 914 (like atmospheric component and identified traffic impacts from Project Activities). Unrepresentative data (meteorological events – temperature, relative humidity, precipitation, wind speed) were removed prior to summarization (14 hours, or 7.5% of measurement data). One of the two monitoring locations was disturbed during the monitoring period and these data were also discarded in the analysis.</p>	<p>Denison must provide further baseline information to support sound level criteria conclusions, project level-, residual-, and cumulative effects evaluations for modelling that links noise receptors with other VCs; as compliance determination is based on baseline measurements. Noise significance determination for receptor VCs may not be representative of actual conditions.</p> <p>Per the EIS, “based on professional experience, the SK MOE has considered the Alberta Directive 038 (AER 2013) as a suitable stand in for provincial guidance...”</p> <p>Please clarify how the current baseline data collection for noise aligns with this recommended guidance.</p>

## GEOLOGY AND GROUNDWATER

ERFN-012	EIS Section 2.3.3.1.1 Mining Area Remediation	Section 2.3.3.1.1 states that “the mining area decommissioning objectives have been developed through groundwater modelling work and are achievable based on metallurgical testing.” Section 7.6.2.1 refers to decommissioning objectives. The objectives are not appropriate for environmental protection. Table 2.3-3 decommissioning objectives portrays water quality that represents a substantial environmental risk and would need generations of monitoring	(i) Further effort should be taken to define the remediation goals that are achievable with best available technology and a commitment should be made to remediate to the maximum extent possible (until baseline levels are reached or the water is deemed suitable with no risk or need to monitor further). Funds spent to remediate will reduce the need for multi-generational monitoring and an unreasonable burden and risk on
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		to assess migration of this highly impacted plume. pH 4 is highly acidic and metal/radiation levels are concerning (200 Bq/l radium is 200 to 1,000 times over safe limits). For species where baseline levels are higher than safe levels, baseline levels should be used as a target.	(ii) future generations (to monitor for a very long period of time). An options assessment for decommissioning objectives should be conducted based on Best Available Technologies (BAT) for treatment of contaminated groundwater and non-degradation approaches for the decommissioning objectives. Consultation on decommissioning objectives is required. Please revise the project closure plan to reflect updated decommissioning objectives.
ERFN-013	EIS Section 2.3.3.1.1 Mining Area Remediation	To determine groundwater targets for decommissioning, the levels for groundwater protection from contaminated sites should be used for this project. This would involve use of typical numerical standards rather than the risk-based approach used in the EIS. A minimum level of protection is to define baseline groundwater levels where baseline is greater than WQGs for groundwater. It is acceptable to use the higher value as the target, with baseline being defined as 95% background.	As a point of reference, any groundwater decommissioning objective should be compared to the 95% background levels and/or numerical groundwater standards for contaminated sites at the depth of impact compared.
ERFN-014	EIS Section 2.3.3.1.1 Mining Area Remediation	Over the course of the project, a certain mass of acid will be added into solutions for injection into the formation. Use of peroxide/ferric may indirectly add acid load via oxidation of sulphide minerals or other oxidation-reduction reactions. Some of the acid used in the project will be	The mass load of alkali used during decommissioning should be commensurate with the net acid load added to the formation throughout the Project. Mitigation planning along these lines is recommended for consideration to support development of more environmentally responsible decommissioning targets.

		neutralized on surface as part of water treatment and discharge. The difference between total acid added to the formation and acid neutralized on surface through treatment represents the net acid load added to the formation and left underground. The EIS describes one mitigation for the leach area as being pumping alkali solution (i.e. caustic) into the leach formation to neutralize residual acid.	
ERFN-015	EIS Section 2.3.3.1.1 Mining Area Remediation	Section 2.3.3.1.1 on decommissioning and remediation of the mine area is vague and should be expanded. For example, certain reagents “may” be used, freshwater will be mixed with contaminated water as a remediation method, and remediation plans will be further refined.	Without prejudice to previous comments on the suitability of proposed decommissioning objectives (i.e. Table 2.3-3), the EIS requires a more specific plan on how decommissioning objectives will be achieved and how remediation targets will be assessed to be met.
ERFN-016	EIS Section 2.3.3.1.1 Mining Area Remediation	To be able to plan for decommissioning, it is essential that targets developed now, at the EIS stage. Otherwise, the project could be unacceptable to communities in the long term and there is no recourse.	Mitigation planning to meet the closure targets must be outlined conceptually so that bonding can be put in place to ensure the targets are met and the project is acceptable. With that in mind, development of targets and an approach to achieve these targets is required at the EIS level and should not be deferred.
ERFN-017	EIS Section 2.3.3.1.1 Mining Area Remediation	The EIS states that the freeze wall will be allowed to thaw once recovered water meets the proposed mining decommissioning groundwater quality objectives and has been demonstrated to be “stable over sufficient time.” The freeze wall should be maintained until there is no longer a groundwater plume. It is not environmentally	(i) The approach should be to fully mitigate the groundwater zone impacted until the targets are reached. The stress on communities is too high if a groundwater plume of acidity is left in the ground. Adequate neutralization is critical for the groundwater impact zone so that a plume does not develop. Similar to

responsible to leave the risk in the ground to monitor for many generations with the optimistic assumption that such a plume will not reach receiving environments. There is no precedent in Canada for the approach of purposefully leaving heavily impacted mine water injected underground with the expectation that it will not reach surface water. Modelling of such a plume is inherently uncertain and the highly impacted water represents a significant environmental hazard/liability.

- (ii) regulation of contaminated sites source areas and plumes, the site is not remediated until it meets this standard of care. It is unclear from the EIS how it will be determined that the freeze wall is no longer required at the site. ERFN must be engaged in decision-making for thawing of the freeze wall after Decommissioning objectives have been met.

ERFN-018

EIS Section 7.8.2.2.4 Post-  
Decommissioning

Section 7.8.2.2.4 groundwater monitoring, post-decommissioning outlines that monitoring will continue indefinitely, until “transfer of the site into the provincial institutional control program.” This ongoing monitoring requirement and stress on communities and ongoing governance should be avoided or minimized to the extent possible by increasing the amount of remediation of the fluids to background levels. Purposely avoiding remediation efforts by passing the responsibility to ongoing monitoring adds significant uncertainty about whether objectives will be achieved, and should further mitigation be required, funds for execution would not be available from the closed project.

Monitoring should be done as a last approach after all efforts have been made to maximize remediation and minimize/remove the groundwater plume. For this project, the timelines and risks are too great to avoid mitigation measure for source control. The freeze wall, remediation pumping and treatment should continue until no further improvements are possible or targets are reached that reduce the need for long-term plume monitoring.

ERFN-019	EIS Section 7.8.2.2.3 - Decommissioning Operation; Figure 7.8-2	Please clarify what changes to the groundwater monitoring network established during Operations will be anticipated during Decommissioning, including potential pathways of water from the mine site to the receiving environment. Figure 7.8-2 on PDF p. 618 of the EIS is meant to illustrate the conceptual groundwater monitoring network during Decommissioning; however the figure does not show the proposed monitoring locations.	A conceptual map similar to Figure 7.8-1 would be valuable and aid ERFN in determining the adequacy of the monitoring network and assessing potential impacts to important water courses.
ERFN-020	EIS Section 7.8.2.2.3 Decommissioning	The EIS mentions progressive reclamation in general terms.	The concept of progressive reclamation is recommended to be applied to remediation of groundwater in the different zones of the leach field after leaching of the zone is complete. For example, progressive reclamation/remediation of the Phase 1 and 3 could be started while leaching of Phase 4 and 5 is underway.
ERFN-021	EIS Section 2.2.1.4.6 Mining Solution	<p>The way water recycle is discussed and assessed in the EIS is inconsistent. Section 2.2.1.4.6 states <i>"once [Uranium Bearing Solution] UBS is recovered to surface, it will be pumped from the wellfield into the processing plant where uranium will be removed from the UBS (Section 2.2.2). The treated solution created can be refortified with reagents as required and pumped back into the mining area to maximize water recycling during the life of the mine..... No water recycling has been included in the water balances, although it is expected to occur."</i></p> <p>Similarly, Section 2.2.3 states, <i>"Denison intends to recycle process water to the</i></p>	<p>(i) The EIS should incorporate assessment of water recycling into a separate case for the water balance/water quality model (similar to the way base/upper case modeling is used for other phenomenon). The EIS should discuss limits of water recycling, such as the minimum amount of water required to operate the project or the potential for contaminant accumulation in leachate that prevents effective recycle.</p> <p>(ii) Further, recycling all or portion of the process water may increase the concentration of contaminants</p>

*greatest extent possible, thereby reducing the demand for freshwater supply and volume of treated effluent. To develop a conservative assessment basis for the EA, the water recycled flows from the industrial wastewater treatment plant back into the processing plant and wellfield have not been incorporated into the estimates for freshwater withdrawal and treated effluent discharge.” All models must be updated to include the operational strategy employed by Denison and actual conditions to occur during operations as best as possible.*

From the perspective of fresh water withdrawal from the environment, evaluating the project water balance with the assumption that no water is recycled is conservative. However, from a water management and water treatment perspective the opposite is true as use of water recycle reduces risks by reducing the total amount of solution requiring management, reducing the rate of discharge of treated effluent and associated contaminant load going to Whitefish Lake.

reporting to the IWWTP and may impact the effluent quality achievable. Accumulation of contaminants in the recycled solution and its impact on the performance of the IWWTP and effluent quality must be assessed and discussed. Incorporating water recycle may reduce the amount of process water requiring treatment and discharge and so may help ameliorate the concern with the high salinity of treated water.

ERFN-022	EIS Section 2 General	The EIS describes several water storage ponds on surface including precipitate ponds and process water ponds. The design basis for these ponds in terms of how much solution storage is required is not clear in the EIS.	The EIS should discuss the sizing basis for these ponds in more detail, including storage capacity for probable-maximum-flood, pond capacity used by precipitate, freeboard volume, and normal operations volume. This should also be discussed in the context of the total amount of solution requiring management at a given time (underground and on surface) and the extent of water recycle achievable. The ability to safely
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			manage process water on surface is a critical mitigation measure for the project and so understanding the design basis for these features is required to assess risk to the environment.
ERFN-023	EIS Section 2.2.2.2.1 Radon Purge Tank	Figure 2.2-13, the Processing Plant Overview shows the 5,000 m <sup>3</sup> uranium solution holding area would include tanks. This is incongruent with Section 2.2.2.2.1, which states that the UBS holding area will be contained by a double composite liner system with leak detection adjacent to the processing plant and under a fabric tension building system.	It is unclear if Figure 2.2-13 shows what is currently being considered for the design.
ERFN-024	EIS Section 7.4.2 Potential Project-related Effects; EIS Section 7.6.1 Life of Mine (0 to 38 years)	Section 7.4.2 and section 7.6.2.1 describe scenarios for upward migration of acidic, impacted mining waters and include discussion of upward migration distances of 11 to 50 m. The basis for these scenarios is not made clear in the work and the rationale for why these scenarios are conservative is not sufficient. Upward migration could be a real risk for the project. For example, current and decommissioned boreholes for monitoring could be a pathway for migration of acidic, contaminated fluids to the surface.	The EIS should provide a compelling case for the conservatism of the current approach and/or more rigorously assess the impact of substantive upward migration of leach solution.
ERFN-025	EIS Section 2.2.1.3 Freeze Wall	Section 2.2.1.3 states “current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock	Please explain the rationale for the selection of a 30-m thick freeze wall and how it ensures the containment of contaminants as predicted under a variety of different site and mining conditions.

(Figure 2.2-6).” This is 20 m smaller than the maximum extent of the area approximated to be influenced by mining around the deposit (50 m). This increases the risk of contaminants leakage from the mining affected area with potentially negative impacts on the receiving environment especially considering that the primary means of containing containment within the leaching zone relies on maintaining an inward hydraulic gradient by recovering more solution than what is being injected (1%). This is subject to planned and unplanned operational downtime due to maintenance or other reasons.

ERFN-026	EIS Section 2.2.1.3.1 Freeze Plant	The ammoniacal solution will be used in the freeze plant to maintain the freeze wall in place for the execution of mining activities. Section 2.2.1.3.1 states that “the freeze plant will be designed with ammonia safety in mind to monitor for and minimize risks to workers and the environment from potential leakages.” However, no information is provided on potential underground leakages and assessment of potential negative impacts on water quality/balance as well as any appropriate mitigation measures. This is important because as stated in the Application, “the sandstone hosting the uranium deposit is permeable and groundwater can flow horizontally through the deposit.”	<ul style="list-style-type: none"> <li>(i) Has the freeze-wall brine been evaluated as a potential source of groundwater contamination?</li> <li>(ii) How would leakage of freeze-wall liquid be detected or assessed?</li> </ul>
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ERFN-027	EIS Section 2.2.6.2 Back-up Power Supply	<p>Section 2.2.6.2 of the EIS states that <i>“to provide electrical service during times of utility outages, diesel generators will be installed to service the site and maintain essential functions. The generators will be used to maintain power to the processing plant and the camp, as well as to maintain other essential services as required.”</i>. Given that maintaining the freeze wall as well as a negative water balance in the ISR area are key to the mitigation of environmental impacts, a plan must be developed for maintaining the operation of the ISR pumping and freeze systems during power outages.</p>	<p>The EIS should discuss the impact of short term power outages on freeze-wall operation and efficacy and on the water balance associated with solution injection/recovery.</p>
ERFN-028	EIS Section 2.2.3.8 Industrial Wastewater Treatment Plant	<p>An important aspect of preventing environmental impacts is the industrial wastewater treatment plant (IWWTP) that is to treat excess process water and surface runoff. The EIS provides limited information about this system, its design basis, the Project-specific testing conducted, or how the predicted effluent quality provided in Table 2.2-1 of the EIS was developed. Section 2.2.3.8 states, <i>“a metallurgical test program was completed at SRC to help define the IWWTP design and performance criteria.”</i> However, no reference is provided to this program, nor have its results or conclusions have been discussed in the Application. This is a key part of the mine design and it is important, for review, that the EIS provide the information needed to</p>	<p>Table 2.2-1 in Section 2.2.3.9 outlines the upper bound effluent quality proposed for the Project and states, <i>“the effluent quality was determined to be achievable through laboratory test results conducted by Denison at SRC.”</i> However, this section does not provide a comparison of the concentrations achieved at the bench scale with the upper bound limits.</p>



		understand and evaluate the efficacy of the proposed mitigation measures.	
ERFN-029	EIS Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds	The IWWTP process appears to use processes similar to those of other waste water treatment sites in the Canadian uranium mining sector. It would be useful if the EIS discussed the IWWTP relative to analogue sites in terms of the treatment technologies used and the quality of effluent achieved at other sites.	How does the predicted effluent quality shown in section 2.2.3.9 compare to effluent from analogue sites in the Canadian uranium sector, for example water treatment systems at Cameco and Orano's projects in the region?
ERFN-030	EIS Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds	Table 2.2-1 of the EIS shows predicted effluent quality for the IWWTP. This table includes a prediction that the total dissolved solids in effluent is predicted to be 6,420 mg/L, with 600 mg/L chloride and 3,915 mg/L sulphate. The table also includes predicted effluent for copper of 0.042 mg/L. These levels approach the British Columbia's water quality guidelines associated with acute toxicity and so may be acutely toxic at the end-of-pipe (i.e. prior to discharge via diffuser in Whitefish Lake and subsequent dilution). Section 36.3 of the Fisheries Act specifies that, no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish." <sup>1</sup> The Canadian Metal and Diamond Mining Effluent Regulations (MDMER) includes a definition of deleterious substance as effluent that is acutely	Guidelines are not prescriptive and so the predicted effluent may or may not be acutely toxic, but since the levels of contaminants in predicted effluent are relatively high, it is recommended that the risk of acutely toxic effluent at end-of-pipe be assessed to support the EIS. Specifically, it is recommended that acute toxicity tests as described by MDMER be conducted on water quality matching the predicted effluent presented in the EIS.

<sup>1</sup> <https://laws-lois.justice.gc.ca/eng/acts/F-14/page-5.html#docCont>

lethal to several commonly tested species of fish and aquatic life.					
ERFN-031	EIS Section 2.2.3.8 and 2.2.3.9	(i)	Sections 2.2.3.8 and 2.2.3.9 of the EIS describe the IWWTP and note that the design of the system is being informed by an ongoing Best Available Technology (BAT) study. The EIS is not clear if the system as described in the EIS is a reflection of application of BAT or if this is an interim design pending completion of the BAT study.	(i)	Given the predicted effluent quality in 2.2.3.9 and the relatively high predicted levels of copper, it is recommended that this BAT study include assessment of use of organosulphide reagents (i.e. trimercapto-triazine). This type of chemical is a common and inexpensive method of removing heavy metals such as copper and cadmium from water. Use of organosulphide is commonly incorporated into mine water treatment systems and is generally recognized as part of BAT treatment of mine water. <sup>2</sup> Copper levels in the range of single digit parts per billion (ppb) are achievable, below the 22 ppb predicted effluent quality.
		(ii)	Similarly, the EIS notes the use of zero valent iron (ZVI) as a treatment reagent but it is not apparent how this is to be used in the process. ZVI can be a very effective method for removing metals and metalloids from mine water, particularly for relatively small treatment systems.	(ii)	We support the inclusion of this reagent in the process but requests additional information on how it is to be used. The predicted level of selenium in effluent (42 ppb) can likely be improved on through better application of ZVI.
		(iii)	Finally, the impact of different treatment technologies on TDS of effluent should be considered given the	(iii)	Overall, we support the use of a BAT study to inform design of the IWWTP and recommend that further bench testing be conducted in the future following

<sup>2</sup> <https://mend-nedem.org/wp-content/uploads/MEND3.50.1BATEAAppAD.pdf>

		<p>previous comment about potential for acute toxicity with the predicted effluent quality. Salt removal systems should be evaluated.</p>	<p>the BAT study to improve on the predicted effluent quality presented in the EIS.</p>
ERFN-032	EIS Section 2.2.3.8 Industrial Wastewater Treatment Plant	<p>According to the IWWTP flowsheet shown in section 2.2.3.8 of the EIS, treated effluent will be recycled.</p>	<p>Considering that the leach is acidic and the IWWTP involves acid neutralization, it is recommended that drawing water for recycle from earlier in the treatment process be considered. This would reduce reagent demands from unnecessary acidification/neutralization as well as the amount of radionuclide and metals-laden treatment by-products that will have to be used and managed.</p>
ERFN-033	EIS Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds	<p>Section 2.2.3.9 of the EIS states, “the effluent quality was determined to be achievable through laboratory test results conducted by Denison at SRC.” However, Section 6.2 of Appendix 10-A (Sensitivity Analysis) states, “If treated effluent is released at the maximum upper bound discharge rate, cadmium concentration in Whitefish Middle/South and McGowan Lake (LA-1) would exceed its surface water quality guideline of 0.00004 mg/L, and chromium concentration in Whitefish Middle/South would exceed its surface water quality guideline of 0.001 mg/L. The modelled concentrations of other COPCs are expected to be below their corresponding surface water quality guidelines.”</p>	<p>Methods of preventing these exceedances should be explored and incorporated into the project. For example, alternative treatment technology may reduce metal loading with treated effluent, and greater water recycle would reduce the volume of treated water discharged, reducing the load of metal introduced to Whitefish Lake via treated effluent.</p> <p>More generally, these exceedances caused by a higher rate of discharge is an example of how the assumption to exclude water recycling from water balance predictions is not entirely conservative.</p>

ERFN-034	Various	The Application lacks a clear discussion of the various source terms that were considered for water quality modelling. Most reagents utilized for the ISR process include highly soluble contents and must be considered for modelling purposes. The Application is lacking a clear discussion of the various source terms and information geochemical stability of various sources that were considered for water quality modelling.	Please clearly describe the sources of various contaminants in process water and how they inform water management/water treatment design. Distinguish between contaminants found in natural groundwater, contaminants released through leaching, and contaminants introduced as mill reagents (i.e. sulphate, TDS).
ERFN-035	EIS Section 2.2.1.4.3 Permeability Enhancement	Section 2.2.1.4.3 lists options considered for enhancing leach solution permeability in the leaching zone and includes potential for use of propellant permeability enhancement.	<ul style="list-style-type: none"> <li>(i) How does this material compare to common blasting explosives (i.e. ANFO) in terms of potential for water soluble explosive residue to be left behind after use?</li> <li>(ii) ANFO is commonly an environmentally relevant source of ammonia, nitrite, and nitrate at mine sites.</li> <li>(iii) Please discuss the potential impact of propellant permeability enhancement products as a source of contaminants.</li> </ul>
ERFN-036	EIS Section 2.2.2 Processing Plant Components	Section 2.2.2 states “Denison’s processing plans are based on numerous metallurgical tests completed as part of engineering activities. A detailed metallurgical testing program was developed and implemented in collaboration with the Saskatchewan Research Council (SRC) under the supervision of several third-party consultants and Denison. Around 1,000 L of UBS was produced by leaching over 64 kg of core samples	The EIS should discuss how this work was carried out, a summary of key conclusions including estimates of freshwater and recycled water use, recoveries expected, reagents consumed, waste produced and steady-state contaminant concentrations.

		recovered from the Phoenix deposit and the UBS produced was tested using variations of several parameters to define the processing plant design and its components.” This work is critical for informing levels of contaminants expected to be leached in the in-situ process which in turn require treatment and management. This work is not discussed substantially in the EIS.	
ERFN-037	EIS Section 2.2.4.8 Clean Waste Rock and Clean Waste Rock Pad	Section 2.2.4.8 states that approximately 7,800 m <sup>3</sup> of clean waste rock will be generated because of mining activities, and Section 2.2.3.6 states that “a pond may be constructed beside the clean waste rock pad (Section 2.2.4.8) to collect runoff if required. The pond would be a single geomembrane-lined pond (Figure 2.2-26). Water collected in the clean waste rock pond would be routed to the process water pond.”	The Application however does not provide information on the geochemical stability of the waste rock and how waste rock is expected to impact water quality of runoff/pond inflow.
ERFN-038	EIS Section 2.2.3.8 Industrial Wastewater Treatment Plant	Section 2.2.3.8 states that <i>“the majority of the IWWTP precipitates formed during the second stage of treatment are gypsum and these precipitates are not expected to be radioactive.”</i>	<ul style="list-style-type: none"> <li>(i) How much radioactivity is expected in these solids?</li> <li>(ii) Did the metallurgical test program include testing these solids for radioactivity and, if available, have these results been considered in the long-term management strategy for these solids?</li> </ul>
ERFN-039	EIS Section 2.2.3 Water Management	Figures 2.2-15 and 2.2-16 show that water from the IWWTP process precipitate pond will be recycled to the process pond at a rate of 5.35 m <sup>3</sup> /h that then primarily reports back to the	The geochemical stability of the precipitates in the two ponds should be evaluated and incorporated as source terms in water quality modeling. This should be discussed in the EIS.

IWWTP for treatment with some used for drilling. The water from the IWWTP precipitate pond forms ~ 65% and 41% of the flow rate reporting to the IWWTP for treatment during the operations and Decommissioning phases, respectively, so this is a significant source of feed water to the IWWTP.

ERFN-040	Various	<p>The EIS does not provide information on the mine's plans for events of care and maintenance (C&amp;M) or temporary closure. C&amp;M is an important potential phase of mine life that warrant assessment of potential impacts. During C&amp;M, changes to the site-wide water balance would be expected, potentially requiring modifications to the water management strategies at the site. In particular, it is important that a conceptual plan for how solution would be recovered/injected/managed on surface during a period of care and maintenance.</p>	<p>The EIS should include a conceptual description of how each major piece of mine infrastructure would be operated during C&amp;M maintenance and how risk of environmental impact would be mitigated under these conditions. The following topics are recommended for discussion in C&amp;M planning at the EIS level:</p> <ul style="list-style-type: none"> <li>(i) Any significant changes to the water management strategies at the site, including whether the Industrial Wastewater Treatment Plant would be expected to continue operating during C&amp;M.</li> <li>(ii) Any significant changes in how the freeze wall would be operated.</li> <li>(iii) Discussion of how leachate and process solution would be managed, i.e. would injection/recovery continue or cease, would any recovered solution be subjected to uranium recovery, how solution would be managed on surface if re-injection ceased.</li> <li>(iv) If monitoring activities would change during care and maintenance.</li> <li>(v) If any new mitigation measures are required to address C&amp;M specific risks.</li> </ul> <p>The development of the Care and Maintenance Plan must include input from ERFN.</p>
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ERFN-041	EIS Section 2.9.1 Environmental Management System Framework	Section 2.9.1 includes discussion of several environmental management plans.	<p>As a general comment, we recommend that requirements for any project plan include the following, at a minimum, in addition to plan-specific topics:</p> <ul style="list-style-type: none"> <li>(i) Purpose and objectives of the plan;</li> <li>(ii) Roles and responsibilities of staff including identification of Qualified Professionals(s);</li> <li>(iii) Schedule for implementing the plan through relevant project phases;</li> <li>(iv) Means by which the effectiveness of the mitigation measures will be evaluated including the schedule for evaluating effectiveness;</li> <li>(v) Schedules and methods for the submission of reporting to specific regulatory agencies, ERFN, and the public and the required form and content of those reports;</li> <li>(vi) Process and timing for updating and revising the plan including consultation with regulatory agencies and ERFN that would occur in connection with such updates and revisions.</li> </ul> <p>Further, following the development of a plan, the plan should be provided to regulatory agencies and ERFN for review and consultation. Consultation should include invitation for agencies and ERFN to provide their views on the content of the plan in a reasonable timeframe. Subsequently, Denison should provide a written explanation to each party that provided comments describing how the views and information provided by the party has been considered in the revised plan or why such views and information were not addressed in a revised plan</p>
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ERFN-042	EIS Section 2.9.1 Environmental Management System Framework	Section 2.9.1 of the EIS discusses environmental management activities including emergency response. As written, this section of the EIS focuses on the roles and responsibilities of Project staff. Communication to ERFN in the event of a mine emergency is critical for ERFN to evaluate potential impacts to rights and interests. Some mines in Canada overlook the importance of this communication and erode important partnerships with their Indigenous hosts by communicating information late or without transparency.	Recommendations for inclusion in the Plan include a communication protocol based on emergency risk ratings and communications with Nation representatives for high consequence near-miss incidents (i.e. near-miss incidents that could have resulted in major environmental impacts or medical emergencies), as these can be valuable opportunities to improve training and operating practices. It is recommended that management plans and emergency response planning include communication protocols with ERFN so that ERFN is alerted to any incident in a timely fashion. Collaboration with ERFN in plan development, communication protocol, involvement of ERFN members in monitoring/response planning is recommended.
ERFN-043	EIS Section 2.2.4.5 Process Precipitate Pond	Section 2.2.4.5 states “ <i>the precipitates generated in the processing plant will be transferred to the process precipitate pond....this pond design will allow the precipitate to be stacked below ground level.....any runoff collected in the pond will be directed to the process water pond and recycled through the plant.</i> ” The Application also states that the waste stored in this pond contains 2-3% uranium rendering it potentially economic for resale and recovery.	A plan for managing this material should reprocessing not be economically viable should be prepared and discussed in the EIS.
ERFN-044	EIS Section 2.2.4.3.2 Industrial Landfill	Section 2.2.4.3.2 discusses the industrial landfill that accepts industrial waste including radiologically contaminated waste. Leachate from this landfill will be collected and sent to the leachate collection pond immediately north of	Considering the limited life of the double liner system used for the landfill area, management of radiologically contaminated waste and its impact on the receiving environment for all phases of the project must be discussed in the EIS.



		the landfill and eventually to the process water pond. Although the Application states that “upon closure of the site, the industrial landfill will be covered with an engineered impermeable liner system to minimize infiltration of precipitation into the containment system,” the leachate is not expected to stop. The Application however does not provide information on the management of the leachate from the industrial landfill post-closure.	
ERFN-045	EIS Section 2.2.2.2.1 Radon Purge Tank	Section 2.2.2.2.1 states “the radon purge tank will contain a mechanical ventilation system to facilitate the aeration of the solution and the removal of radon gas from the UBS to the air outside of the plant.”	<p>(i) Is radon stripping on the exhaust proposed or is it to be directed into the atmosphere?</p> <p>(ii) Has exposure outside the building been evaluated?</p>

#### AQUATIC ENVIRONMENT

ERFN-046	EIS Section 8.1.3 Existing Environment	Detailed baseline hydrology collected in 2011-2014, prior to the operation of Cameco Cigar Lake. Very little data have been collected since (~1 measurement per year 2016-2019)	Update continuous flow data to include more recent years, with emphasis on low-flow period and winter flows.
ERFN-047	EIS Section 8 General	Surface water withdrawal	Please provide a description (of waterbody characteristics as well as the precise latitude and longitude proposed) of all water withdrawal points to be used at any point during this project.
ERFN-048	EIS Section 8 General	Recycling of process water.	Please provide examples from existing ISR projects that support the efficacy of process water treatment and re-use.

ERFN-049	EIS Section 8.1 General	Recycling of process water appears to not be meaningfully incorporated into water balance modelling.	Please clarify and justify how recycled process water was incorporated into surface water quantity / water balance modelling.
ERFN-050	EIS Section 8.1.5 Mitigation Measures	Denison makes “loose” promises with regard to maintenance and monitoring of water control structures, and avoiding sedimentation in local waterbodies/watercourses	Provide a water management plan (WMP) that addresses each phase of the project. Denison notes high confidence in assessments, implying few/no unknowns that would inhibit the creation of a sufficient WMP.
ERFN-051	EIS Section 8.1.9 Surface Water Quality	Notable lack of winter data for stream and lake sites.	Conduct at least 1 winter field visit to verify/refine field data. The focus should be on watercourses adjacent to and directly interacting with the project, and the proposed discharge zone in South Whitefish Lake.
ERFN-052	EIS Section 8.2.3.3; Tables 8.2-2 to 8.2-4 Existing Surface Water Quality	Note these tables use different benchmark/guideline compared to the Water Quality baseline study for Molybdenum and Zinc.	Proponent to provide justification for use of different Water Quality guidelines, or else adjust tables to reflect guidelines used in baseline study.
ERFN-053	Table 8.2-5 Existing Surface Water Quality	Potential project interactions during construction.	<p>(i) What about the potential for a grout/cement spill to the environment?</p> <p>(ii) Proponent should include recognition of potential deleterious interaction of construction materials (notably grout/cement) with the aquatic environment, and appropriate mitigation.</p>
ERFN-054	EIS Section 8.2.4.1.1 Site Water Management	It is noted that the treated effluent holding ponds are designed to hold water for 72 hr. prior to discharge.	<p>What laboratory will be used to test treated effluent samples to provide results within 72 hr? What if the water is deemed unfit to discharge?</p> <p>Please provide a surface water quality monitoring plan that includes clear information regarding sampling and analysis timelines to ensure discharge water is sufficiently tested prior to release. “Emergency release” due to pond capacity overage is unacceptable.</p>

ERFN-055	EIS Section 8.2.4.1.1 Site Water Management	"Loose" commitment to Water Quality monitoring – "Treated water...will be monitored prior to release."	At what locations? How often? Which parameters? Recommend the creation of a draft surface water monitoring plan to ensure appropriate actions are in place.
ERFN-056	EIS Section 8.2.4.1.1 Site Water Management	"Prior to release to a surface waterbody or injected into groundwater via deep well injection." Treated water discharge to South Whitefish Lake, where sufficient dilution of effluent would be anticipated, was the prior commitment. This is the first instance mentioned of deep well injection of effluent. No other aspect of this EIS discusses deep well injection of effluent.	Clarify the proposed effluent discharge method, and if Denison intends to use deep well injection, then the EIS should be updated to reflect the potential interactions associated with this method.
ERFN-057	EIS Section 8.2.4.2 Potential Project-related Effects	(applies elsewhere as well) Section notes that "Whitefish Lake" will receive discharge during operation and decommissioning, however, EIS separates into North and South Whitefish Lake.	Clarify throughout which Whitefish Lake (north or south) will be the receiving environment for effluent discharge.
ERFN-058	EIS Section 8.2.4.2.1 Mobilization of Suspended Materials	"acceptable levels" of TSS is noted as the deciding factor for safe discharge of treated water.	<ul style="list-style-type: none"> <li>(i) What about other chemical constituents? All COPCs in the effluent are predicted to exceed long-term Water Quality Guidelines (CCME).</li> <li>(ii) What about MDMER requirements for the effluent to pass toxicity testing at end-of-pipe?</li> <li>(iii) Clarify whether Denison intends TSS to be the only factor contributing to the safety of effluent for discharge, and how the MDMER requirements for toxicity testing will be met.</li> </ul>

ERFN-059	EIS Section 8.2.4.2.1 Mobilization of Suspended Materials	Salinity does not appear to be included as a factor for considering effluent safe for discharge.	Predicted salinity of effluent is sufficiently high as to possibly result in failure of the acute toxicity testing required under MDMER. (i) Please justify the exclusion of salinity as a factor for considering effluent safe for discharge. (ii) Please ensure the potential impacts of salinity on aquatic VCs are recognized and discussed.
ERFN-060	Table 8.2-10	Sulphate is given 2 different values in the table in the LA-5 well-mixed column (633 and 63.83), but not in other columns.	(iii) Clarify whether this is a typo, or whether these rows are referring to different constituents. (iv) Clarify why predicted sulphate is anticipated to be lower for the lower screening concentration.
ERFN-061	EIS Section 8.2.4.2.3; Table 8.2-11 Near-Field Water Quality Model	Mixing zone modelling.	(i) Why is plume formation in South Whitefish Lake modelled based on mixing zones in rivers? (ii) Justify the use of a lentic mixing model to represent effluent plume formation in a lotic environment.
ERFN-062	EIS Section 8.2.4.2.3 Near-Field Water Quality Model	Mixing zone modelling in winter; there are very minimal data for the receiving waterbody in the winter, other than 1 shallow sampling event in April. Assumption is under-ice temperatures at the diffuser will be 3-4°C, with effluent emerging at 5°C. April sampling event suggests that under-ice temperatures may be closer to 0.5°C.	(i) How much effect will temperature differences between effluent and surrounding water have on mixing? (ii) Please clarify how mixing changes if input current from Iceland R. drops to near zero. (iii) Please clarify the effect of effluent salinity on mixing during winter.
ERFN-063	Table 8.2-11	Average current velocity predicted in South Whitefish Lake at the discharge location is 0.23 m/s. However, in S. 4.3 of the Ecometrix aquatic baseline, average current velocity at S-6 (the	(i) Why are the current velocities used to model the discharge mixing greater than the measured inflow velocities? (ii) Justify the disconnect between the current velocities measured

		channel feeding South Whitefish Lake) is 0.2 m/s.	upstream of the discharge location, and the velocities used to model the mixing zone.
ERFN-064	EIS Section 8.2.7 Cumulative Effects	Meeting Water Quality benchmarks	ERFN recognizes and appreciates Denison's commitment to meeting Water Quality benchmarks within and downstream of South Whitefish Lake. How will "appropriate benchmarks" be determined?
ERFN-065	EIS Section 8.2.8 Monitoring and Follow-up	Monitoring program expectations, guidance, and commitment.	The proposed monitoring seems, on its surface, reasonable. However, as noted above it is important to see a water quality monitoring plan integrated with a water management plan grounded in guidance and regulatory requirements (e.g., MDMER) that includes appropriate triggers, actions, and safeguards.
ERFN-066	EIS Section 8.2.9 Surface Water Quality Summary	Site-specific effluent treatment: the EIS overall is vague about the treatment planned for effluent prior to discharge.	Please provide examples of successful existing effluent treatment, preferably from ISR projects, which will form the basis for the site-specific treatment.
ERFN-067	EIS Section 8.3.1.1 Valued Component Selection	MDMER requirements and deleterious substances.	Per MDMER guidance, please include a recognition that testing for Ammonia (un-ionized) is required under MDMER, and the requirement that effluent (at end-of-pipe, prior to dilution) must pass lethality testing.
ERFN-068	EIS Section 8.3.3.1 Fish Habitat	Fish habitat characterization.	(i) What fish habitat characterization standards were used during field surveys? (ii) Were members of the field teams environmental professionals experienced in the assessment of fish habitat?
ERFN-069	Table 8.3-5	Burbot spawning habitat	What criteria were used to identify Burbot spawning habitat? Based on Burbot habitat preferences, SA-6 (at minimum) should be suitable for spawning.

ERFN-070	Table 8.3-5	Fish species distribution and spawning habitat. Table 8.3-4 suggests the presence of Lake Whitefish in South Whitefish Lake (LA-5).	Clarify fish presence in South Whitefish Lake, specifically Lake Whitefish and Lake Trout. ERFN would like to emphasize the importance of Northern Pike, Lake Whitefish, Lake Trout, Walleye, and White/Longnose Sucker to community members.
ERFN-071	Figure 8.3-8	The proposed effluent discharge point appears to be extremely close to Northern Pike spawning habitat at the north/upstream end of South Whitefish Lake.	Please clarify the measures proposed to ensure effluent discharge does not affect Northern Pike spawning habitat, recognizing that Northern Pike spawning occurs shortly after ice-off, before high water.
ERFN-072	EIS Section 8.3.4.2.1 Construction	First mention of potentially “necessary” releases to the environment during the construction phase.	<ul style="list-style-type: none"> <li>(i) What defines a situation where the release of collected/stored water is “necessary” during construction?</li> <li>(ii) Are there any other parameters other than TSS that will be measured to determine that water collected during construction is “safe”?</li> <li>(iii) Where will the collected water be discharged in the event of a “necessary” release during construction?</li> </ul> <p>ERFN would like to emphasize that a water management plan would address many of these questions.</p>
ERFN-073	EIS Section 8.3.4.2.1 (and elsewhere) Mobilization of Suspended Materials	TSS as the parameter measured to determine the “safety” of effluent prior to discharge. Note that MDMER also requires that effluent at end-of-pipe must pass lethality testing	<ul style="list-style-type: none"> <li>(i) Please provide justification for only considering TSS with respect to the safety of effluent for discharge.</li> <li>(ii) If multiple parameters will be considered, please update the text to reflect this; at minimum, “e.g.” should be used rather than “i.e.”.</li> </ul>
ERFN-074	EIS Section 8.3.4.2 Potential Project-related Effects	Consideration of overprinting as the only potential effect to fish habitat. Defining harm to fish habitat based solely on area.	Effects to the quality/usability of fish habitat should be considered as part of the EIS, rather than simply the surface area covered by project structures.

ERFN-075	EIS Section 8.3.4.2.3 Controlled Discharge to Receiving Environments	"Discharge to the environment is not expected during construction." This directly contradicts the statements in other sections regarding the potential for necessary water releases during construction.	Provide clarification regarding potentially necessary releases during construction.
ERFN-076	EIS Section 8.3.4.2.3 (and elsewhere) Controlled Discharge to Receiving Environments	"Effluent rates during Decommissioning are expected to be less than during Operation." Denison commonly uses "expected" but does not provide elaboration.	Please provide clarity and justification (e.g., examples) for expectations regarding effluent rates.
ERFN-077	EIS Section 8.3.5 Mitigation Measures	Adherence to DFO <i>Interim Code of Practice for Temporary Stream Crossings</i> . The proposed crossings are clear span bridges, which do not classify as temporary crossings.	Based on DFO code of practice guidance, the proposed crossings do not meet the requirements for being "temporary." Please update this section to include adherence to: <i>Code of Practice for Clear Span Bridges</i> and <i>Code of Practice for Culvert Maintenance</i> .
ERFN-078	EIS Section 8.3.5 Mitigation Measures	Monitoring and management of effluent.	Given that discharge is anticipated to trigger MDMER, adherence to the requirements for effluent quality within MDMER should be explicitly recognized as part of mitigation measures.
ERFN-079	EIS Section 8.3.5 Mitigation Measures	Preparation of an environmental code of practice.	<p>(i) Please provide clarification regarding a timeline for the preparation of an environmental code of practice. It is ERFN's preference that this document be in place prior to construction.</p> <p>(ii) Will the environmental code of practice include consideration and planning in the event of malfunctions, as required under S19 of CEAA 2012?</p> <p>(iii) Will the environmental code of practice include and adaptive management plan for effluent discharge and treatment?</p>

ERFN-080	EIS Section 8.3.6.1 Construction	Determination of effluent safety for release to environment.	<p>Note again that earlier sections had asserted that contact water during construction would not be released to environment.</p> <p>Please revise the final sentence of paragraph 2 to be relevant to the fish &amp; fish habitat section, as it currently refers to sediment chemistry and benthic invertebrate communities.</p>	
ERFN-081	EIS Section 8.3.6.1 Construction	Upgrading two stream crossings to clear-span bridges.	ERFN would like to re-emphasize the above comment related to adherence to DFO's <i>Code of Practice for Clear Span Bridges</i> .	
ERFN-082	EIS Section 8.3.6.1 Operation	Continued reference to deep-well injection of effluent.	Provide clarity throughout document on whether effluent will be discharged to South Whitefish Lake, or, to ground via deep well injection. If deep well injection is proposed, please revise EIS to reflect the potential interactions of this method.	
ERFN-083	EIS Section 8.3.6.1 Operation (and elsewhere)	The effluent discharge will be heated to avoid freezing during winter.	<p>(i) What are the implications for mixing during winter, given effluent will likely be considerably warmer than the surrounding water?</p> <p>(ii) How has Denison accounted for the potential for the warmer effluent creating an attractant effect, a reduction in DO, or other interaction that increases the risk of impacts to aquatic biota?</p> <p>(iii) Has Denison collected under-ice thermocline/isocline and in-situ WQ data during winter to support any assertions?</p>	
ERFN-084	EIS Section 8.3.6.1 Operation (and elsewhere)	Effluent discharge point.	Bottom-feeding fish such as White Sucker are in extended contact with and will often ingest sediments. Effects on White Sucker were modelled based on sufficient dilution of effluent. What protections will be built into the effluent discharge outlets to ensure bottom-	



			feeding fish such as White Sucker are sufficiently excluded from the mixing zone?
ERFN-085	Table 8.3-9	The magnitude of residual effect. ERFN disagrees that the parameters and decisions that form the basis for the mixing model and the IMPACT model are sufficient to reliably predict that constituents introduced by project activities will remain below applicable guidelines.	Mixing zone calculations should be revisited to account for actual hydrological conditions at the discharge point in South Whitefish Lake. IMPACT model calculations should be revisited to examine worst-case scenarios (e.g., maximum potential discharge of 81 m <sup>3</sup> /hr. during low-flow and winter) and use more accurate starting points for water quality (existing baseline conditions in South Whitefish Lake rather than a region-wide geometric mean).
ERFN-086	Table 8.3-9	Reversibility. The assertion of fully reversible Water Quality effects relies on the assumption that all COPCs in the effluent are well-mixed and eventually exit South Whitefish Lake.	Please provide clarification and justification for the assumption that COPCs in effluent remains in solution and exit South Whitefish Lake, rather than concentrating over time and/or sequestering in sediments with the potential for future release.
ERFN-087	Table 8.3-10	Magnitude. This row mentions changes to benthic invertebrate habitat.	This table is supposed to be discussing residual effects to fish habitat. Please ensure the residual effect tables include the correct information.
ERFN-088	Table 8.3-10	Magnitude. The assertion of low magnitude relies on defining a change to fish habitat based solely on % of surface area affected.	Recommend revising this table and the associated written section to include discussion relating to potential changes to the <i>quality</i> of fish habitat in addition to the <i>amount</i> .
ERFN-089	EIS Section 8.3.6.2 Significance and Confidence	The judgement of not significant is reliant on successful mitigation measures, and that ecological integrity won't be altered beyond "an acceptable level."	<div>(i) Recommend updating this section upon revision of the mitigation section, per above comments.</div> <div>(ii) What does "ecological integrity" mean? How is it measured? How will it be monitored?</div> <div>(iii) How will "an acceptable level" be determined? Acceptable to whom? ERFN requests that any</div>

			determination of acceptability include consideration of the rights and values of Indigenous Peoples.
ERFN-090	EIS Section 8.3.6.2 Significance and Confidence	"The predicted confidence with respect to the Fish and Fish Habitat VC is high as the mobilization of suspended materials can be readily mitigated."	Please clarify the justification for not considering other Water Quality-related factors (e.g., chemistry) and focusing on TSS mitigation.
ERFN-091	EIS Section 8.3.6.2 Significance and Confidence	Conservative nature and accuracy of Water Quality modelling. Despite assumptions being conservative, the discharge model cannot produce conservative predictions if the inputs are inaccurate.	See above comments for concerns regarding model inputs.
ERFN-092	EIS Section 8.3.6.2 (and elsewhere) Significance and Confidence	Focus on suspended materials. Sulphate in the effluent is predicted to be exceptionally high (almost 4,000 mg/L), with baseline values in South Whitefish Lake <1 mg/L.	Why were potential cascading effects of Water Quality not considered in the residual effects assessment? Very high sulphate in effluent has the potential to instigate eutrophication and/or cyanobacterial blooms through sulphate reduction pathways.
ERFN-093	EIS Section 8.3.6.2 Significance and Confidence	Assertion of conservative assumptions for Water Quality modelling. Year-round discharge at the average rate (36.5 m <sup>3</sup> /hr.) is not conservative.	Please revisit the modelling with sufficiently conservative assumptions, such maximum potential discharge (81 m <sup>3</sup> /hr.) during low-flow and/or winter.
ERFN-094	EIS Section 8.3.6.2 Significance and Confidence	Use of conservative 95 <sup>th</sup> percentile for baseline Water Quality. According to the model documentation provided in the EIS appendices, the geometric mean condition across all regional waterbodies was used to define baseline WQ.	Recommend revisiting the Water Quality modelling using the 95 <sup>th</sup> percentile specifically for South Whitefish Lake (LA-5) as the baseline.
ERFN-095	Table 8.4-2	Based on baseline data, 3 of 5 samples from LA-5 are >75% clay, and 2 of 5 are >70% sand. With only one year of	(i) ERFN recommends Denison collect additional sediment

		data and without knowing where samples were collected in the lakes, it is unlikely that the classifications are truly representative of the average condition and variation of bottom sediments in study lakes.	(ii)	samples to create a sufficient baseline. ERFN recommends that Denison ensure future sediment sampling stations are located such that, at a minimum, sediments at the inlet, outlet, and potential discharge location of South Whitefish Lake are characterized.
ERFN-096	Table 8.4-3	Sediment chemistry tables.		Why is there no standard deviation or standard error associated with the mean values in this table? Note that for LA-5, 3 of 5 samples have chemistry much more similar to the "maximum" values in Table 8.4-3 than the "mean" values.
ERFN-097	Table 8.4-4	Benthic invertebrate endpoints. Note that diversity, evenness, and Bray-Curtis for the 2 of 5 sand-dominated samples from LA-5 are considerably higher than for the 3 of 5 clay-dominated samples. This seems to suggest that some areas in LA-5 are especially sensitive to stressors, as suggested in the above paragraph.	(i) (ii)	Why is there no standard deviation or standard error associated with the mean values in this table? ERFN recommends Denison consider the potentially sensitive areas within the proposed receiving environment (LA-5) in addition to the average condition.
ERFN-098	Table 8.4-4	Benthic invertebrate endpoints for LA-5 appear to be miscalculated. Based on raw benthos baseline data, <b>total family richness</b> at LA-5 across all reps is 22 (however, <b>mean</b> is 13). %Cladocera, the dominant taxon (water fleas) is 65% across all reps (58% avg).	(i) (ii)	Please revisit and confirm the summary calculations for Table 8.4-4. Why were more typically pelagic taxa, such as Cladocera, not excluded from benthic invertebrate community characterizations as is often recommended in analytical guidance?
ERFN-099	EIS Section 8.4.3.2.5 Benthic Invertebrate Chemistry	Use of caddisfly larvae to characterize benthos tissue. Caddisflies are rare across the LSA, and extremely rare in South Whitefish	(i)	Why were caddisfly larvae selected for benthic invertebrate tissue characterizations when they

		Lake (LA-5) based on baseline data (only 4 individuals across all 5 replicates).	(ii) do not appear to be representative of the community? ERFN recommends Denison revisit the characterization of baseline benthic invertebrate tissue using taxa that are more relevant to the project or whole-community samples.
ERFN-100	Table 8.4-5	Benthic invertebrate tissue chemistry summary.	Please include any available tissue chemistry guidelines in this table.
ERFN-101	Table 8.4-5	Benthic invertebrate tissue chemistry summary. One sample per lake, representing only one year of baseline data, is insufficient to characterize baseline conditions.	ERFN recommends Denison conduct at least one additional year of baseline data collection, including the collection of multiple benthic invertebrate tissue samples from South Whitefish Lake.
ERFN-102	EIS Section 8.5.3 Existing Environment	Fish tissue collection.	Why were Lake Whitefish and Walleye not collected for tissue analyses? These species were also identified by ERFN citizens as important resources.
ERFN-103	EIS Section 8.5.3 Existing Environment	Fish tissue collection.	Please provide additional justification for only using 5 fish in a single sample year for the characterization of baseline fish tissue chemistry.
ERFN-104	EIS Section 8.5.3 Existing Environment	Fish tissue collection.	Why were organs, such as livers, discarded? Liver chemistry analyses are commonly recommended in fish tissue characterization guidance.
ERFN-105	EIS Section 8.5.4.2.2 Construction	"Discharge to the environment is not expected during Construction." There appear to be contradictions across sections regarding whether discharge during construction will not occur, or whether it would occur "if necessary." Any discharge, even emergency discharge, would have	Please provide clarity throughout the document with regards to the anticipated effects from discharge (including "if necessary" emergency discharge) during construction.

		implications for the fish health VC and should be considered in this section.	
ERFN-106	EIS Section 8.5.4.2.2 Operation and elsewhere	<p>“The Project was assessed as having...a continuous effluent discharge rate of 81.0 m<sup>3</sup>/hr.”</p> <p>This statement appears to contradict earlier assertions (see comment regarding S 8.3.6.2, above) that the conservative WQ model was based on average discharge of 36.5 m<sup>3</sup>/hr.</p>	<p>Please provide clarification throughout document on whether the assessments were based on the greatest potential effects at a discharge rate of 81 m<sup>3</sup>/hr., or a reduced potential effect at a discharge rate of 36.5 m<sup>3</sup>/hr.</p> <p>If assessments were not conducted based on discharge at 81 m<sup>3</sup>/hr., please provide additional justification for using less-conservative estimates.</p>
ERFN-107	EIS Section 8.5.4.2.2 Operation	“Sediment baseline concentrations were predicted from surface water concentrations.”	Why were sediment baseline concentrations not based on actual sediment baseline data?
ERFN-108	EIS Section 8.5.4.2.2 Operation	<p>“The dw to ww ratio of 0.25 to 1 from CSA N288.1-20 was used.”</p> <p>Note that the recommended ww criterion after conversion, if site-specific data were used, would be closer to 2.28 mg/kg (ww) and White Sucker tissue predictions would exceed this criterion.</p>	Why were site-specific %moisture data not used for this conversion? It would likely be closer to 0.2 to 1 based on actual fish tissue baseline data.
ERFN-109	Figure 8.5-5	<p>Predicted tissue concentrations of selenium in Northern Pike and White Sucker.</p> <p>Based on the IMPACT model report, Northern Pike were exposed to COPCs through water only (despite being used to represent piscivorous predator), and White Sucker were exposed through water and sediments (as it is a bottom-feeder).</p>	<p>Please justify the use of the IMPACT model data for Northern Pike tissue, given that it excludes any pathway related to piscivory.</p> <p>Please justify the use of the IMPACT model data for White Sucker tissue, given that it excludes any pathway related to the consumption of benthic invertebrates in addition to exposure to sediment.</p> <p>Note that studies on the toxicity of effluent to fish at the nearby Cameco Key Lake mine directly implicated dietary selenium.</p>
ERFN-110	EIS Section 8.5.5 Mitigation Measures	“Implement Project-specific monitoring programs...that	Please remove the “if necessary” qualifier; ERFN considers the monitoring mentioned in 8.5.5 and the application of adaptive

		include...and applying adaptive management, if necessary.”	management to be necessary for the successful mitigation of residual effects.
ERFN-111	EIS Section 8.5.6.2 Significance and Confidence in the Assessment	Average effluent discharge rate of 36.5 m <sup>3</sup> /hr.	Please refer to previous comments regarding the clarification of the discharge rate used in the assessment.
ERFN-112	EIS Section 8.5.6.2 Significance and Confidence in the Assessment	“A high degree of confidence was assumed.”	ERFN does not echo the high degree of confidence in this assessment, for multiple reasons including (but not limited to): apparent contradictions in the assessment methods and parameters, distinctly lacking baseline data, unsupported selection of modelling parameters, numerous assumptions without evidence for their validity, no references to contingency planning.
ERFN-113	EIS Section 8.5.8 Monitoring and Follow-Up	Regulatory criteria for monitoring data comparison.	ERFN requests including comparisons to any applicable human health guidelines and/or screening criteria in all monitoring programs.
ERFN-114	EIS Section 8.5.8 Monitoring and Follow-Up	Monitoring locations	ERFN requests the addition of a monitoring site for (at minimum) aquatic sediments, located within the Northern Pike spawning habitat north of the proposed discharge location.
ERFN-115	EIS Section 8.5.8 Monitoring and Follow-Up	<p>“It is recognized that additional collection of pre-mining fish tissue concentrations in Whitefish Lake and a reference area is needed.”</p> <p>ERFN acknowledges and appreciates this recognition, but notes that the majority of baseline data for aquatic biota and sediments is extremely lacking.</p> <p>This also appears to be the only recognition of insufficient baseline data throughout the entire EIS.</p>	Please update the other EIS sections to reflect the data gaps in the baseline sections, and an outline of the plan to address these gaps.
ERFN-116	EIS Appendix 8-D	High-level sample locations are provided, but an appropriate evaluation and characterization of	Please update Table 1-2 to include sampling site coordinates (and replicate coordinates, if

	Baseline Aquatic Environment Study Table 1-2	baseline conditions require targeted sampling in specific areas.	they are different), or, please provide a separate list of precise sample coordinates.	
ERFN-117	EIS Appendix 8-D Baseline Aquatic Environment Study  Figure 1-7	Based on this figure, neither bathymetry nor habitat surveys were completed on South Whitefish Lake (LA-5). Bathymetry and fish habitat are crucial to evaluating potential project impacts in the receiving environment.	(i)  (ii)	If these surveys have been completed, please update Figure 1-7 and provide the location of these data.  If these surveys represent a data gap, ERFN recommends that Denison complete bathymetry and habitat surveys on South Whitefish Lake to sufficiently characterize the effluent discharge receiving environment.
ERFN-118	EIS Appendix 8-D Baseline Aquatic Environment Study  Figure 1-8	Although benthic invertebrate sampling was completed in South Whitefish Lake, based on this figure, the potential inputs from upstream have not been characterized.	ERFN recommends collecting benthic invertebrate samples at SA-6 to characterize the potential upstream inputs to the benthic invertebrate community of the receiving environment.	
ERFN-119	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 2.0	ERFN recognizes that Denison followed standardized or recommended field methodology during the collection of baseline information.	(i)  (ii)  (iii)	What guidance did Denison follow to determine the frequency of baseline sampling? What guidance did Denison follow to determine the number of years that would provide sufficient characterization of the aquatic baseline? What guidance did Denison follow to determine the sampling locations and the number of samples?
ERFN-120	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 3.5.1	The hydrological baseline data are now 8-10 years old. These data are too old to sufficiently characterize the current baseline conditions, especially given that development has occurred in the Project area within that time.	Denison should collect updated hydrological baseline data for South Whitefish Lake, including (but not limited to) water level, ice thickness, and bathymetry.	

ERFN-121	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 3.5.1.3	The South Whitefish Lake bathymetric baseline data collected by Golder in 2012 suggests that the average depth was 1.1 m. This appears to contradict the depth used in the mixing model (~3 m).	Please clarify the data and decisions that contributed to the depth parameter used for the mixing model.
ERFN-122	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 3.5.4	Section suggests a collection of habitat data in South Whitefish Lake was completed in 2012 by Golder, and observations were made during the 2016 field program.	<p>(i) Where are these data? Does Denison have a detailed characterization of the aquatic habitat in South Whitefish Lake available?</p> <p>(ii) ERFN does not agree that high-level observations made during 2016 are sufficient to confirm that aquatic habitat has remained unchanged for the last 10 years.</p>
ERFN-123	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 3.5.5	As referenced in an above comment, the baseline phytoplankton community for South Whitefish Lake is nearly 30% Cyanophyceae, the highest proportion of cyanobacteria in any Project waterbody except Russel Lake. This is likely to influence the risk of eutrophication in the receiving environment.	Please confirm whether the risk of eutrophication in South Whitefish Lake has been considered and justify its exclusion from the EIS.
ERFN-124	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 3.5.7	Fish spawning habitat.	ERFN recognizes the inclusion of Indigenous Knowledge in confirming local fish spawning habitat.
ERFN-125	EIS Appendix 8-D Baseline Aquatic Environment Study  Table 3-7C	Caddisflies comprise <1% of the benthic invertebrate community in the receiving environment.	Please justify the specific selection of caddisflies for characterizing the baseline benthic invertebrate tissue chemistry.



ERFN-126	EIS Appendix 8-D Baseline Aquatic Environment Study  Table 3-8	No tissue chemistry guidelines are provided for benthic invertebrates.	ERFN recommends the inclusion of any available tissue chemistry guidelines for benthic invertebrates, including those from other Canadian jurisdictions, to provide sufficient context for evaluating the baseline data.
ERFN-127	EIS Appendix 8-D Baseline Aquatic Environment Study  Table 3-10	There appears to be a disagreement between the <i>n</i> 's provided in this table, and the description of fish tissue collection methods in the baseline and EIS. The methods section implies that 5 total samples were collected per waterbody, with some samples representing more than 1 fish.	Please clarify the fish tissue collection and analysis methods. Were all fish analyzed separately? Were tissues for each "sample" aggregated if multiple fish were required?
ERFN-128	EIS Appendix 8-D Baseline Aquatic Environment Study  Table 3-10	The table presents the average concentration of parameters, but no indication of variation/accuracy.	Please provide standard deviation and/or standard error for fish tissue chemistry average values.
ERFN-129	EIS Appendix 8-D Baseline Aquatic Environment Study  Figures 3-10 and 3-11	The inclusion of bathymetric and habitat survey data for North Whitefish Lake (LA-6) from 2018 highlights the lack of similar surveys on South Whitefish Lake (LA-5), which is the actual receiving environment.	<ul style="list-style-type: none"> <li>(i) Please justify the lack of current bathymetric and habitat survey data for South Whitefish Lake.</li> <li>(ii) Denison should conduct multibeam sonar surveys on South Whitefish Lake, the receiving environment, to sufficiently characterize bathymetry and aquatic habitat.</li> </ul>
ERFN-130	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 4.6.1	Paragraph two notes that stage-discharge curves were updated in 2019 to account for greater discharge measured during manual surveys in 2019.	<ul style="list-style-type: none"> <li>(i) Were stage-discharge curves adjusted for flows measured in recent years, other than 2019? Were manual measurements collected in any other recent years?</li> <li>(ii) If not, please justify the adjustment of stage-discharge curves based on a single year that had a higher-than-average discharge. How does</li> </ul>

Denison know that flows in 2019 were not abnormally high?

ERFN-131	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 4.6.1.2 and Table 4-1	“In May-early June 2018, the flow at SA-6 was fluctuating around 0.7 m <sup>3</sup> /s until end of May before decreasing.” This appears to imply that freshet flows in 2018 (assumedly high flows for that year) were near the minimum discharge measured from Sept 2016 to Aug 2019 (0.717 m <sup>3</sup> /s).	Were stage-discharge curves updated to reflect the flows in 2018? Please clarify the decisions and data used for updating stage-discharge curves.
ERFN-132	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 4.6.3	“Mean channel wetted width, water depth and water velocity were 14 m, 0.7 m and 0.2 m/s, respectively.”	How does a wide, slow, low-gradient inflow translate to the current velocities used for mixing modelling? Please refer to the earlier comment and justify the assumptions made for the mixing model.
ERFN-133	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 4.6.3	“Snails (Gastropoda), mayfly nymphs (Hexagenia sp.) and dragonfly nymphs were observed.” Field observations do not substitute for sample collection and taxonomy.	As noted in an above comment, ERFN recommends benthic invertebrate sampling at SA-6 to sufficiently characterize the benthic invertebrate community upstream of South Whitefish Lake.
ERFN-134	EIS Appendix 8-D Baseline Aquatic Environment Study  Section 4.6.4	Burbot were recovered at SA-6 but were considered not present in South Whitefish Lake.	Please justify the assertion that burbot are not present in South Whitefish Lake, despite recovering them shortly upstream at SA-6.
ERFN-135	EIS Appendix 10-A, Appendix A: Wheeler River Project IMPACT Model  Figure 2-1	This figure illustrates that absorption from surface water was only source of COPCs investigated for Northern Pike as part of the IMPACT model. Northern Pike was intended to represent piscivorous predators for the purpose of this modelling.	Please justify the results of the IMPACT model for Northern Pike despite not accounting for piscivory or any other feeding. Note that studies on the toxicity of effluent to fish at the nearby Cameco Key Lake mine directly implicated dietary selenium.
ERFN-136	EIS Appendix 10-A, Appendix A: Wheeler	The “Water Baseline” used for the IMPACT model integrates surface water quality from multiple regional	Please revisit the IMPACT model using surface water quality data accurate to the South Whitefish Lake receiving environment.

River Project IMPACT  
Model

Table 3-4

waterbodies. This results in baseline chemistry that is lower (sometimes 10x lower) than the chemistry of South Whitefish Lake, the receiving environment.

## TERRESTRIAL ENVIRONMENT

ERFN-137	EIS Section 9.2.1, 9.3.1, and 9.4.1: Influence of IK, LK and Engagement on VC selection.	Concerns raised by the ERFN during August 2022 engagement sessions (e.g., for subsistence/harvestable foods, important vegetation communities, and wildlife habitat) do not appear to have been considered during VC selection.	Update Section 9 to incorporate concerns raised in the August 2022 submission and demonstrate how these comments have been addressed or considered in the assessment as VCs, or KIs for existing VCs (i.e., wetlands, woodland caribou).
ERFN-138	EIS Section 9.2.1, 9.3.1, and 9.4.1: Influence of IK, LK and Engagement on MP considerations.	Relevant criteria for VC selection according to the EIS includes: “contributing roles to biodiversity, ecosystem function, and maintenance of wildlife habitat,” and “contributions to environmental, socio-economic, and cultural values of Indigenous groups, the public and other Interested Parties” (EIS 9.2.1, 9.3.1, and 9.4.1), among others.	Overall changes in habitat for wildlife and plants of cultural importance within the Project area, LSA and RSA must be considered as a measurable parameter.
ERFN-139	EIS Section 9: Influence of IK, LK and Engagement on Mitigation and Monitoring considerations.	Wetlands were recognized in the EIS as important for multiple reasons and designated a VC. However, the potential impacts and their mitigation and monitoring were not adequately characterized or discussed.	(i) Changes in aerial extent of wetlands as the single MP for this VC is insufficient to monitor all changes in these habitats – they are key lifecycle habitat (breeding/foraging/cover) areas for species of management concern as they relate to both the EIS and ERFN (e.g., small furbearers such as beaver, mink; large ungulates such as moose; game birds/species at risk; supports growth of subsistence foods such as cranberries).

- (ii) Drawdown effects on wetlands were not identified as a potential effect, even though water withdrawal requirements exist for majority of Project timeline, and Project design incorporates an inward hydraulic gradient.
- (iii) Overall changes in habitat for wildlife and plants of cultural importance within the Project area, LSA and RSA must be considered as a measurable parameter.

ERFN-140	EIS Section 9.1.4, (9.2.4, 9.3.4 and 9.4.4): Influence of IK, LK and Engagement on Mitigation and Monitoring considerations.	<p>“Reclamation design planning is at a conceptual or pre-feasibility stage. Presently, most Project features are planned to be reclaimed by re-instating (to the extent practical) predominant topographical contours and drainage features, and preparing the site (e.g., via grading, and scarifying and/or other surface preparations) in a manner that promotes natural revegetation.... Certain Project features (e.g., the clean waste rock pile) may be integrated into the end-landscape... to create a safe, stable, and self-sustaining landscape.” (pp. 9-28)</p> <p>Concerns were raised in engagement sessions about documenting caribou calving locations and participating in mitigating possible effects (SVS, 2022). The loss of wetland areas may reduce the amount of habitat available for moose and caribou calving, as well as other stages of their respective life histories. This interaction will directly</p>	Section 9 and Table 3.5-1 should be updated to reflect recommendations for reclamation priorities identified in the ERA and ERA-annex, in addition to federal recovery strategies (i.e., Woodland caribou, wolverine) mitigations and management recommendations for species at risk, and species-specific IK and LK. Denison must consider all pathways of effects, including those which are indirect, such as the loss or conversion of lands used as habitat by species of cultural importance.
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		impact the availability of this important resource.	
ERFN-141	EIS Section 9.1.3.3: Influence of IK, LK and Engagement on VC selection.	Permafrost was investigated but not adequately characterized to support conclusions made in the EIS. Potential presence is established and engagement concerns were raised “specifically referencing cumulative effects through mention of climate change and the vulnerability of northern environments,” “potential effect of exploration on various characteristics of the biophysical environment” (pp. 4-25); and “possible changes to permafrost on the Wheeler River” (pp. 4-33).	Sections 6 and 9 should be updated to include verification of the presence/absence/extent of permafrost within the Project Area or permafrost interactions with the Project within the CEA.
ERFN-142	EIS Section 9.1.4: Assessment of Project-related Effects.	<p>“Activities during Post-Decommissioning (comprising site inspections, monitoring and on-site engagement with interested parties) were deemed to have no interaction because they do not involve any land clearing, surface preparations or major earthworks” (EIS 9.1.4).</p> <p>Post-Decommissioning activities should incorporate changes issued by regulatory bodies, required mitigations or actions identified through the Denison Environmental Monitoring System/adaptive management process, and/or Indigenous/third party engagement recommendations.</p>	Update Section 9 to include further detail regarding post-decommissioning activities resulting in earthworks for: changes issued by regulatory bodies, required mitigations or actions identified through the Denison Environmental Monitoring System/adaptive management process, and/or Indigenous/third party engagement recommendations.
ERFN-143	EIS Section 9.1.1.1 VC Selection (Terrain, Soil, and Organic Matter/Peat)	Baseline studies for the Terrestrial Environment component of the EIS were conducted from 2017-2019 and were refined in 2019 with a focus on	We appreciate the recognition of a data deficiency and concur that additional rare vascular plant surveys are required in ecosites not sampled previously to fully investigate the

and 9.2.3.2 Listed Plant Species VC

the Phoenix development only. Soil and terrain baseline data was presented at broad scale and coarse resolution (1:20,000) in the original investigations (Appendix 9-B), and baseline vegetation data categorized disturbed forest stands as novel regenerating forest types. This was defined and corrected further by the literature review and mapping contained in Appendix 9-C. Vegetation/wildlife habitat characterization were completed over two surveys in July-Aug 2017 (Appendix 9-B; with no sampling completed for waterbodies/disturbed non-vegetated lands), before the project footprint was altered – in consultation with the SK MOE, the EIS can carry forward with existing information with the condition that additional rare plant pre-disturbance surveys would accompany project approval.

terrestrial environment component of the project and related effects.

As baseline survey efforts focused on mid- and late-season rare vascular species, and further information on wetlands in the RSA is proposed to better characterize wildlife habitat and availability of subsistence harvestable food/medicinal plant resources, early-season surveys that also target wetland habitats are recommended.

ERFN-144	EIS Section 9.2.4.2.2 Change in the Concentrations of COPC in Vegetation	Per the ERA, vegetation and soil collection and chemistry were completed at 10 permanent sample plots in August 2017 – terrestrial lichens, current year's growth of blueberry (leaf, stem, berries), and soil samples were collected. Radionuclide levels are relatively consistent (lichen, blueberry and soils); however, several metal/elemental parameters were elevated when compared to Rio Rinto's Roughrider Project.	The EIS identified Labrador tea and browse as also being estimated for metals/radionuclides COPCs in the ERA – this was not included in the ERA; however, red-backed voles were also tested during the small mammal baseline program (Appendix 9-B). Update section to reflect same.
ERFN-145	EIS Section 9.3.1.1 VC Selection (Ungulates,	This VC list omits several species which have been identified by ERFN as commercially important for trapping	Presence of all ERFN-identified traditionally important species were observed in the baseline winter tracking studies (Appendix 9-

	Furbearers, and Woodland Caribou)	purposes, including Lynx, Muskrat, Fisher, Fox, Otter, and Mink. As noted in the ERFN Traditional Knowledge Study, concern was raised about the impacts of the mine and associated infrastructure on the ability to trap and trapping success. Presence of lynx, fisher, fox, otter, muskrat, beaver and mink were identified in the baseline winter tracking studies (Appendix 9-B).	B). Overall changes in habitat for wildlife and plants of cultural importance within the Project area, LSA and RSA must be considered as a measurable parameter.
ERFN-146	EIS Section 9.4.3 Existing Environment (Raptors, Migratory Breeding Birds, and Bird Species at Risk)	Appendix 9-C identifies knowledge gaps for information to fully describe the wildlife assemblage in the RSA, including avian species of management concern. Species Detection Survey Protocols (SK MOE 2021) were not implemented for the baseline avian surveys. Recommendations for sensitive timing windows and setback distances from high disturbance activities should be considered for rusty blackbird, which may also use the RSA. The baseline survey did not account for early-season breeding species of management concern (i.e., owls, woodpeckers, game birds).	Additional surveys are recommended utilizing appropriate species detection survey protocols to account for VCs and additional species of management concern with the potential to occur in the project area.
ERFN-147	EIS Section 9 (General) VC Selection	Some small mammals were shown to observe elevated levels of select COPCs during baseline studies (Appendix 9-B) but were not discussed in the EIS. Bats and Amphibians were also not considered in the EIS as VC or KIs, even though both bat species and one amphibian species are listed under SARA. Traditional species of cultural importance for gathering and subsistence were also not included.	Provide a rationale why these components were not considered.

ERFN-148	EIS Section 9 (General) VC Selection	Several iterations in the EIS state baseline studies were not designed to establish relative abundance estimates for furbearer VCs, whereas certain baseline surveys (Appendix 9-B) were designed to provide quantitative data on the occurrence and relative abundance (i.e., semi-aquatic furbearer shoreline study, winter track count).	Provide rationale for not incorporating relative abundance.
ERFN-149	EIS Section 9.3.3 Existing Environment; EIS Section 9.3.5 Mitigation Measures	Appendix 9-C identifies knowledge gaps for information to fully describe the wildlife assemblage in the RSA, including ungulates (woodland caribou and moose), but there is no recognition of the implications of these gaps or suggestions to address them.	ERFN notes if recent aerial ungulate survey data are unavailable, the Proponent should consider management and development recommendations available for the region and management areas, in addition to the federal recovery strategy for caribou, as part of the EIS.
ERFN-150	EIS Section 9.3.5 Mitigation Measures	The mitigations for linear disturbances identify ongoing research into the effectiveness of disrupting predator-prey dynamics along linear disturbances. Appendix 9-B includes recommendations for reclamation of linear disturbances around the Project Area.	ERFN acknowledges the efforts by Denison and the recommendations provided in Appendix 9-B for the reclamation of linear disturbances, and requests the Proponent to consider prioritizing progressive reclamation in these areas as a commitment within the EIS, in addition to utilizing ongoing research data to adjust and inform reclamation planning and implementation.
ERFN-151	EIS Section 9.1.5, 9.2.5, 9.3.5, 9.4.5 (General) Mitigation Measures	Spill response plan	It is recommended that monitoring during Project Activities occur to minimize discrete spills wherever possible, per the Spill Response Plan. Spill Response Plan should include reportable quantities, spills report line directly to proponent, and specific procedures for documenting and reporting spills to regulatory bodies.
ERFN-152	EIS Section 9.2.5.2.4 Invasive Plant Management	Additional mitigation measures include use of herbicides or other bio-controls to address invasive species	Denison must provide information on how impacts will be mitigated if herbicides or other bio-controls are used.



		establishment. Denison does not provide evidence discussing the potential impacts to the Terrestrial Environment VCs from the use of herbicides or other bio-controls.	
ERFN-153	EIS Section 9 (General) Wildlife mitigations	Fencing for deterrence of entrapment in certain Project areas	Fencing should be buried deep enough to prevent potential interactions with burrowing animals, and high enough to prevent wildlife movement over the fence. Fencing should be monitored for entrapped wildlife at regular intervals identified within the EMS, and a plan should be in place for the non-lethal removal of trapped wildlife if required.
<b>HUMAN HEALTH</b>			
ERFN-154	EIS Section 10.1.1.2 Key Indicators and Measurable Parameters	Public Health is Identified as a Key Indicator and is informed by Measurable Parameters which include: "Evaluation of risk of exposure to COPCs through use of hazard quotient, incremental lifetime cancer risk, or radiation dose," is a very narrow view of human health as it is affected by this project. This ignores a wide range of physical and psychological factors which may influence the health and wellbeing of ERFN citizens.	Denison should provide additional analysis of the Public Health Key Indicator which includes Measurable Parameters to qualitatively or quantitatively assess mental health, psycho-social factors and wellness as it may be influenced by this project.
ERFN-155	EIS Section 10.1.1.3 Spatial and Temporal Boundaries	The spatial boundaries for the assessment of Human Health are not appropriate as it ignores the many persons who use the area surrounding the project but do not reside within the LSA or RSA catchment area. Most ERFN land users live further south in Patuanak/ Wapachewunak Reserve but use the area around the project to harvest and exercise rights, therefore	Denison reassesses the Public Health KI to include Patuanak/ Wapachewunak Reserve, as the closest population centre.

		must be considered within the geographic scope of the assessment.	
ERFN-156	EIS Section 10.1.3.2 Traditional Foods Diet	Denison note that Walleye and Lake Whitefish are the most commonly consumed fish within the study area to inform the HHRA. While these are important species, they may not be fully representative of the full risks posed by fish. For example, longer-living fish such as Lake Trout are consumed, and as top predators are at a greater risk for bioaccumulation.	Denison should consider bioaccumulation risks associated with other country foods consumed. This includes considering and incorporating species which are both consumed in the greatest quantities, but also are representative of the greatest risk for use in the HHRA.
ERFN-157	EIS Section 10.1.4.1 Potential Interactions Between the Project and Valued Component/Key Indicators	Table 10.1-3 Outlines a list of project phases/activities and an indication of whether they are likely to interact with Public Health. This table, however, fails to provide information about the effects of pathways or how the proposed activities may result in impacts on public health.	We request Denison provide a breakdown of the effects pathways and predicted or plausible impacts for each of the project activities which may influence public health.
ERFN-158	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	As outlined in Appendix 6A, elevated levels of NO2 and Radon are expected to be observed outside of the area established as the LSA and in some cases the RSA to assess human health. Therefore, the assessment of potential project-related effects associated with air emissions during construction, operation, and decommissioning should be considered in complete.	Denison provides a revised assessment of Potential project-related effects as a result of air emissions during construction, operation, and decommissioning in areas beyond the geographical scope of elevated atmospheric emissions are predicted.
ERFN-159	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	Denison note that there are several instances in which exceedances of air quality criteria for NO2, PM10 and uranium are expected, they were not identified for further assessment in the human health risk assessment, "as these COPCs are unlikely to be	We are confused as to why Denison has chosen to dismiss the consideration of COPCs which exceed air quality criteria from further human health risk assessment. By removing these potential risk sources, Denison appears to be picking and choosing which factors are important prior to carrying out any analysis.

		associated with a human health or environmental risk."= The adequate rationale is not provided to dismiss these potential contributors to human health risk, and air quality exceedance of any COPC, should be sufficient rationale within itself to carry forward any factor.	We recommend that Denison amend the Human Health Risk Assessment and include No2, PM10 and uranium as possible human health risk factors until appropriate evidence can be presented to demonstrate that these will not present harm.
ERFN-160	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	Denison notes that "a pond may be constructed beside the clean waste rock pad to collect runoff if required. Any runoff from the clean waste rock pond will be directed to the process water pond". This statement contradicts itself, as in the first sentence, Denison indicates that they may establish a water collection pond to collect runoff from the clean waste rock pile, however, this is followed by stating that runoff will be directed to the process water pond. It is unclear the purpose of this additional pond that may be constructed.	Denison should provide additional information on the rationale for the construction of this additional pond and what role it will play in both mitigating risk to human health and providing overall contact water management.
ERFN-161	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	It is unclear under which circumstances effluent may be discharged to Whitefish Lake as Denison states they intend to process water by circulating it through the injection and recovery wells.	Please provide additional information regarding the source of water to be discharged to Whitefish Lake.
ERFN-162	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	Denison appears to be confusing the application of multiple water quality applications. Specifically, they state: "The most restrictive federal or provincial guidelines for surface water quality, based on Canadian drinking water quality	Denison must be clear as to the guidelines which are being used at all times during the analysis to ensure that they are applied appropriately.

guidelines, are the CCME water quality guidelines for the protection of freshwater aquatic life, the federal environmental quality guidelines, and the Saskatchewan environmental quality guidelines." These are all separate water quality guidelines and apply to different aspects of water quality management.

ERFN-163	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	Denison notes that effluent was assessed using a benchtop model simulation of the material processing and effluent treatment process. Using the derived effluent, a handful of constituents were assessed including cadmium, chromium, selenium, and lead. Other COPCs exist beyond these parameters and should be assessed appropriately.	Denison should perform additional broad-suite analysis of all parameters as set by CCME water quality guidelines for the protection of freshwater aquatic life and the MDMERs.
ERFN-164	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning	TDS within itself is not known to be detrimental to the aquatic environment, however, can have adverse aesthetic impacts. That said, TDS is comprised of many other dissolved constituents, such as chloride, calcium, sodium, potassium, fluoride, and others, which may be harmful in elevated concentrations. Given TDS is expected to exceed the water quality guideline by more than 10-fold, it is necessary to identify the contributing factors before TDS can be ruled out as a potential risk.	Denison should provide an analysis of the constituents which contribute to high TDS and propose a method of reducing TDS to meet water quality guidelines.
ERFN-165	EIS Section 10.1.4.2.1 Air Emissions During Construction, Operation, and Decommissioning; Table 10.1-4	Molybdenum is concerning high. CCME note that the long-term concentration of molybdenum for the protection of aquatic life is 0.073 ug/L which is several orders of magnitude	Denison must demonstrate how it plans to minimize the source effluent of molybdenum and sulphate associated with this project.

		<p>less than what was observed in effluent tests.</p> <p>Similarly, sulphate is also very high, which once released into the environment may influence pH and acidification of the downstream environment.</p>	
ERFN-166	EIS Section 10.1.6.1.1 Human Receptors Selection and Characterization; Table 10.1-6	The human receptors outlined in Table 10.1-6 are not fully representative of land users and those who may be impacted. There is a need to consider other more vulnerable human receptor groups such as youth, Elders, and pregnant females who interact with the land and consume high levels of traditional foods similar to Fisher/Trapper. Similarly, other human health receptors should be considered for permanent residents.	Denison should reanalyze their human health risk assessment including the use of vulnerable personas such as youth, pregnant female, and Elder.
ERFN-167	EIS Section 10.1.6.1.3 Exposure Assessment and Pathway Modelling	In assessing exposure pathways, it is noted that COPCs may travel through multiple ecological receptors before being consumed or otherwise taken up by humans. However, it is unclear whether Denison has considered the potential for bioaccumulation, additive, or synergistic effects when viewing the exposure pathway through a cumulative effects lens.	Denison should provide clarity into all assumptions which went into the pathway modelling including considerations for cumulative effects and bioaccumulation of COPCs en route to human end points.
ERFN-168	EIS Section 10.1.6.1.4 Human Health Risk Assessment Results; Table 10.1-8	Denison does not provide a Hazard Quotient (HQ) for Aquatic Plants. However, aquatic plants may be directly consumed by ERFN land users. As a result, this represents a knowledge gap within the assessment.	Denison should assess the hazard quotients associated with aquatic plant consumption. If no information related to the TVR is available use available proxy (e.g., terrestrial plants) to estimate a conservative hazard quotient.
ERFN-169	EIS Section 10.1.6.1.4 Human Health Risk	Although in most cases project incremental HQ is not on its own a key	For all COPCs where individual or total HQs are above benchmarks, Denison must

	Assessment Results; Table 10.1-8	driver in Project Total HQ exceeding individual or total benchmarks, the high baseline emphasizes the need to minimize additional inputs. ERFN does not accept arguments that suggest that since the baseline is already elevated, any additional inputs are negligible. Rather, any additional inputs only worsen the risks which are already present.	proactively identify solutions for minimizing additional inputs.
ERFN-170	EIS Section 10.2.1.1 Valued Component Selection	Denison notes that unwanted constituents, specifically iron and radium, will be removed from the recovered lixiviant material prior to uranium precipitation. This unwanted precipitate does however contain a valuable amount of uranium and therefore will be stored and shipped to be processed at an eligible licensed facility. It is unclear where this facility may be located, and furthermore, it is unclear whether the impacts of transportation of this material and the potential for accidents or malfunctions has been considered elsewhere in this EIS.	Denison must provide additional information about its plans to move waste products containing radium and uranium offsite for additional processing.
ERFN-171	EIS Section 10.2.4 Mitigation Measures	Mitigation measures should ensure there are redundant protections in place to minimize risk to worker health. Specifically, in any instance where the use of PAPR will be effective in reducing radiation exposure, it should be applied. This then can be made redundant through the use of personal protective equipment such as the use of N95 or a self-contained breathing system.	Denison should take an additive approach rather than an either/or approach to identifying and applying mitigations for limiting radiation exposure to workers.

## LAND AND RESOURCE USE

ERFN-172	Table 3.5-1: How Indigenous Knowledge was Incorporated into Existing Environment and Effects Assessment Sections	Not all of the information in this table explains how the knowledge was incorporated or used to inform the effects assessment sections. Rather, in many instances, it states what the knowledge was instead of how it was used.	Provide a reference table identifying and acknowledging all of the information that was provided by ERFN and indicates how the information was incorporated and weighted into the assessment of the effects. If needed, ERFN can support by providing this information if the TK report is not clear enough.
ERFN-173	4.1.2 Denison's Indigenous Peoples Policy and Investment and Sustainability Philosophy	The EIS states that "Denison is committed to operating the Project in a fully sustainable manner, considering not only the maintenance of high standards of safety and environmental compliance." (p.4-3). It is not clear what "fully sustainable" means or how the definition was informed.	Provide clear definition, with backed-up literature and evidence, as to what "fully sustainable" means. Further, clarify how ERFN values were included in the understanding of "fully sustainable." That is, has this definition been informed by Indigenous Knowledge and worldviews, and if so, then how have project planning and activities adjusted and if not, then provide an explanation as to why.
ERFN-174	General comment	Denison has separated out the quality of life, land and resource use, economics and other VCs as if they can be considered separately.	Provide an explanation as to how land and resource use was considered in quality of life effects assessment.
ERFN-175	11 Land and Resource Use	Repeatedly, Denison states that there is "limited amount of Indigenous uses in proximity to the Project" and it appears these conclusions have been made from Denison's interpretation of ERFN's TK report. It was made clear to Denison that there is extensive use in the area and that the report is limited in scope and is not statistically representative of ERFN rights holders. Further, Denison has failed to frame the EIS from a rights-based approach. The rights of the Indigenous peoples of Canada recognized and affirmed by section 35 of the Constitution Act, 1982 (Section 22(1)(c)) are collective rights, and assuming minimal impact based on the inaccurate understanding of a few land users	ERFN made it clear in their submissions that the information provided was not statistically representative and does not include the entire IK or land use of ERFN members. ERFN's <i>Traditional Knowledge Study &amp; Health and Socio-Economic Study Report</i> states: "the results in this Study showcase the information shared by some of ERFN's land users, trappers and Elders and cannot be considered a complete representation of ERFN knowledge and use in the Study Area. Nevertheless, these results demonstrate that the Project is likely to have significant impacts on ERFN's Aboriginal and Treaty Rights and Interests without appropriate and effective measures including mitigation, accommodation, monitoring/follow-up, environmental management and protection planning, along with an ongoing role in environmental oversight. ERFN continues to

does not adequately assess impacts to Indigenous Rights.

Other instances of inaccurate wording of use include:

- “Overall, given the limited use of the ILRU LSA, adverse effects that are low in magnitude, the limited geographic extents of effects, and the reversibility of effects, the conclusion relative to changes to ILRU is not significant.”
- “The absence of the Key Lake gate and the removal of the process of providing identification will provide recreational users and local Indigenous communities with greater access to the ILRU LSA, **which is not currently used intensively**”( p. 11-70 – emphasis added)
- “Overall, given limited use of the ILRU LSA, adverse effects that are low in magnitude, the limited geographic extents of effects, and the reversibility of effects, the conclusion relative to changes to ILRU is **not significant.**” (p. 11-74)
- “Big game hunting is absent in the Project Area and is sparse and infrequent in the ILRU LSA. Indigenous harvests of terrestrial species are primarily conducted south of the Key Lake gate and/or

assert that it is only through a collaborative and co-production approach to the EA that these measures will be appropriately designed and implemented.”

There remains a disconnect between Denison’s conclusions of impacts and the results that were provided in ERFN’s Traditional Knowledge Study & Health and Socio-Economic Study Report.

Denison must ensure that it considers the collectively held rights of ERFN protected by section 35 of the Constitution Act and Treaty 10. Individual ERFN land users have important interests to be considered, and in some instances, they exercise rights held by the collective. However, such users do not represent the constitutional interests of the collective; the elected Chief and Council bear that critical and all-encompassing responsibility. Denison must recognize that inherent Aboriginal rights or Treaty Rights must not be infringed upon, and where impacts cannot be avoided, accommodation measures must be complete.

- (i) Provide reasoning as to why these statements were made and evidence that Denison understands the impact that these statements have. That is, they belittle the information provided and misrepresent potential impacts on the collective rights of ERFN.
- (ii) Provide adequate funding for ERFN to undertake a comprehensive Rights Impact



closer to communities.” (p. 11-49)

- (iii) Assessment that is led independently by ERFN. It is expected that Denison will remove all of these inaccurate statements, and all other similar statements in the EIS, and re-evaluate impacts based on an understanding of collective rights and recognition of the cumulative impacts of past activities.

ERFN-176	EIS Section 11.1.7 Cumulative Effects	The EIS states, “existing projects were not considered as part of the CEA because they were captured and assessed within baseline conditions” (p. 11-69). However, Denison has not shown how CE from past projects was acknowledged within the baseline of ILRU. Rather, in many instances, as noted above, Denison has misinterpreted ERFN’s <i>Traditional Knowledge Study &amp; Health and Socio-Economic Study Report</i> . There is limited recognition of the discussion on impacts from past projects and how this has altered current baseline conditions, including the likelihood that current baseline conditions have moved beyond ERFN’s acceptable threshold of impact.	Until Section 11.1.7, and Section 11 in general, adequately considers cumulative effects of past projects and impacts to ERFN’s harvesting activities, and ability to access ancestral lands as they were prior to contact from a rights-impacts lens, Section 11.1.7 is considered inadequate and incomplete.
ERFN-177	EIS Section 11.1.5 Mitigation Measures	Denison has stated that there will be no further mitigation or monitoring for Resource Availability, Availability of Lands/Waters, and in general ILRU monitoring. This is unsatisfactory as ERFN is in disagreement that impacts to ILRU will not be significant.	Prior to approval, Denison needs to work with ERFN to develop a program that monitors changes to ERFN’s relationship and use of the area. This needs to be led by ERFN and occur with frequency across all phases of the project. It will provide relevant and useful information to Denison and ERFN to monitor potential changes and impacts from the project and any additional monitoring activities that may need to occur.

ERFN-178	EIS Section 11.1.4.5.1 Aesthetic Experience	Denison states that “to control road dust during summer (May to October), water and/or chemical dust suppressant will be applied to all site roads (Section 6.1.5 in Section 6).” p. 11-56. There is no description of chemical dust suppressant and Section 6.1.5 only indicates that water will be used twice daily as a dust suppressant.	<ul style="list-style-type: none"> <li>(i) Confirm how dust will be managed – is it water or chemical dust suppressant?</li> <li>(ii) If the latter, provide information on the product that will be used and all impacts to plants and wildlife.</li> </ul>
ERFN-179	EIS Section 11.1.4.3 Resource Availability for Subsistence Harvesting	<p>With respect to furbearer habitat, Denison states “effects are predicted to be long-term but reversible because the alteration of available furbearer habitat is expected to be reversed as sensory disturbances diminish with the end of Project Operation activities and subsequent Decommissioning of Project components.” p. 11-50.</p> <p>While there is recognition that this impact may be reversible to furbearing animals, it is not clear how this is a reversible to the used of the area by ERFN. This long-term impact will last for at least a generation. It is clear from past projects, settlements, and colonial activities that a lot of knowledge can be lost within a generation when you remove the access and ability for knowledge transfer.</p>	<p>Provide an explanation as to how predictions across all of section 11.1.4 considered potential for contribution to the degradation of cultural practices and knowledge transfer.</p> <p>Provide analysis on the potential impacts of project activities on knowledge transfer and land use for ERFN citizens who have rights across their entire ancestral territory. This needs to be done with the assumption that removal of an area for land use will result in an impact to ERFN’s collectively held section 35 rights.</p>
ERFN-180	EIS Section 11.1.3.2.1 English River First Nation/Patunuak	There is concern as to how well Denison reviewed the reports from ERFN. For example, in Section 11.1.3.2.1 English River First Nation/Patunuak on p. 11-30 Denison states “no access routes or culture/historical trails were identified as intersecting with the Project site	Denison will need to do a more carefully review of ERFN’s reports and include all information provided in the EIS. That is, all information summarized will need to be confirmed for accuracy and gaps in the information summarized will need to be filled.

		(ERFN and SVS 2022b).” We dispute this statement and urge Denison to re-review ERFN’s report and remind Denison of the information provided in this report: “Participants spoke of using the Fox Lake Road, which runs through the Wheeler River Project site, as an access route for harvesting activities throughout an area stretching from the Key Lake mine to McArthur River mine ... One participant expressed concerns that this route (1018-14) may be blocked by Project activity. Another participant stressed how this entire area (1004-18) is used by ERFN people as a contemporary gathering place.”	
ERFN-181	EIS Section 11.1.3 Existing Environment	This section does not adequately discuss or highlight the history and experience of ERFN. Additional valuable information that frames the existing environment and impacts to land use was provided in ERFN’s Traditional Knowledge Study & Health and Socio-Economic Study Report.	Provide ERFN with the capacity and opportunity to edit and add to this section so that the EIS is framed with additional and relevant information.
ERFN-182	EIS Section 16.6.3 Heritage Resources	Heritage Resource Management Plan	In Section 16.6.3 Denison states that a “Heritage Resources Management Plan (HRMP) has been developed by Denison and outlines the steps that will be taken should anymore archaeological sites be identified Even though they say that these steps include "discussions with local indigenous leadership." this is not evident. Prior to this document being approved, ERFN requests the opportunity to complete a third-party review and provide feedback to Denison.
ERFN-183	EIS Section 16.6.3	Cultural Heritage Monitors	Prior to the approval of the project, Denison must commit to hiring ERFN Cultural Heritage

Monitors who will be present during any construction and/or land disturbance work. This area is still considered to have high potential for archeological sites even if Denison was not able to locate many sites during their assessments.

## QUALITY OF LIFE

ERFN-184	EIS Section 12.1.2.1, 12.2.2.1, 12.3.2.1 Influence of Indigenous Knowledge, Local Knowledge and Engagement on the Assessment, English River First Nation	EIS Section 12.1.2.1, 12.2.2.1, and 12.3.2.1 sets out a list of the submissions and reports provided by ERFN that included Traditional Knowledge and perspectives that have informed Section 12.1, 12.2 and 12.3 of the assessment respectively. ERFN notes that these lists do not include ERFN's submission of comments to Denison on a draft of the EIS provided to ERFN before its submission to CNSC, despite this submission including important information regarding our Traditional Knowledge and perspectives that was meant to inform changes to these sections of the Draft EIS. ERFN notes that as a result, numerous comments on this section of the EIS below are a restatement of concerns raised in our August 2022 submission that remain unaddressed. ERFN also notes that the contents of ERFN's August 2022 submission are also not reflected in Table 4.3-2 which is meant to outline key Issues and Concerns raised English River First Nation in previous engagements and submissions and demonstrate how these comments have been addressed or considered in the Draft EIS.	Section 12 must be updated to incorporate the concerns raised in the August 2022 submission and restated in the comments below. In addition, Table 4.3-2 should be updated to reflect the Key Issues and Concerns raised in ERFN's August 2022 submission and demonstrate how these comments have been addressed or considered in Section 12 of the EIS.
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ERFN-185	EIS Section 12.1.1.2 Key Indicators and Measurable Parameters	<p>Section 12.1.1.2 states that a Key Indicator (KI) "is an important aspect of a VC that may be affected by the Project and its activities" and that a measurable parameter "is the metric associated with the KI that can be used to characterize changes to attributes of the environment that may change as a result of the Project and/or other human developments and natural factors" (p. 12-7).</p> <p>For the valued component of Cultural Expression and this section of the assessment, Table 12.1-1 sets out Denison's selection of KIs to include:</p> <ol style="list-style-type: none"> <li>1. Knowledge Transfer</li> <li>2. Traditional diet</li> </ol> <p>While ERFN is supportive of Cultural Expression being included as an important facet of Quality of Life and identified as a key value component included in the scope of the effects assessment, the KIs and measurable parameters selected by Denison in Section 12.1.1.2 are insufficient and do not reflect a holistic consideration of Cultural Expression, even by Denison's own definition set out in Section 12.1. ERFN notes that concerns have been raised in previous engagement with ERFN and in our August 2022 submission of comments on the Draft EIS regarding the limited scope of these KIs and that additional KIs and measurable parameters must be included to reflect a more holistic understanding of Cultural Expression informed by Indigenous perspectives. Because the selection of these KIs and measurable parameters is a</p>	<p>Section 12.1 should be revised to include an analysis of additional KIs and measurable parameters of Cultural Expression more closely related to values identified for protection by ERFN citizens. These may include:</p> <ul style="list-style-type: none"> <li>• Ability to practice traditional activities</li> <li>• Cultural Identity</li> <li>• Connection to ERFN Traditional Territory</li> <li>• Ability to speak ERFN dialects of Dene and Cree</li> <li>• Intergenerational knowledge transfer</li> <li>• Collecting, processing, using, and sharing traditional medicines</li> <li>• Spiritual and cultural vitality</li> </ul>
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		foundational step in the assessment that informs the scope and approach to the subsequent characterization of existing conditions, assessment of project-related effects, identification of mitigation measures and assessment of residual effects and cumulative effects, the insufficient scope of KIs and measurable parameters selected by Denison therefore results in a fundamental deficiency of Section 12.1 of the assessment of the effects.	
ERFN-186	EIS Section 12.1.4.1 Potential Project – Valued Component and Key Indicator Interactions	<p>Table 12.1-2 outlines potential interactions between project phases and activities, and KIs for Cultural Expression. ERFN notes that Employment and Expenditures are not identified to have potential interactions.</p> <p>ERFN disagrees with this assessment as employment may alter the ability for ERFN citizens to engage in traditional activities and intergenerational knowledge transfer, as citizens will be unable to engage in on-the-land activities and cultural knowledge sharing during rotational work periods.</p>	Denison should revise Table 12.1-2 to recognize potential interactions between employment and KIs for Cultural Expression
ERFN-187	EIS Section 12.1.6 Residual Effects Evaluation	Section 12.1.6 of the EIS defines a significant adverse residual effect on Cultural Expression as “an effect that is highly different from baseline conditions and trends and cannot be managed or mitigated through adjustments to existing programs, policies, or other mitigation.” The EIS goes on to state that “because residual adverse effects on Cultural Expression	Until Section 12.1 is revised to include a more holistic consideration of KIs and measurable parameters for Cultural Expression that ERFN has set out above, Denison’s assessment of the nature of potential Residual Effects should be considered incomplete and deficient. In addition, until ERFN confirms CNSC that Denison and ERFN have reached mutually agreed-upon terms of mitigation and accommodation that address the effects of the

		<p>are not expected to result in this level of change, effects are expected to be not significant for the Project.”</p> <p>ERFN does not agree with this assessment of the potential residual effects of the Project, which is fundamentally deficient based on the limited scope of Kis and measurable parameters that were selected for analysis. ERFN also does not agree that the mitigation measures presented in Section 12.1.5 are sufficient to address effects of the Project on Cultural Expression that will be highly different from baseline conditions.</p>	<p>Project on Cultural Expression, this EIS should not be considered complete or approved by CNSC.</p>
ERFN-188	EIS Section 12.2.1.2 Key Indicators and Measurable Parameters	<p>Section 12.2.1.2 states that a Key Indicator (KI) “is an important aspect of a VC that may be affected by the Project and its activities” and that a measurable parameter “Is the metric associated with the KI that can be used to characterize changes to attributes of the environment that may change as a result of the Project and/or other human developments and natural factors” (p. 12-44).</p> <p>For the valued component of Community Well-Being and this section of the assessment, Table 12.2-1 sets out Denison’s selection of Kis to include:</p> <ol style="list-style-type: none"> <li>1. Population and Demographics (from in/out migration as people seek employment opportunities),</li> <li>2. Income of local workers (from participation in employment and/or contracting activities), and</li> </ol>	<p>ERFN has shared with Denison (ERFN and SVS 2022a), that the four components of ERFN health and well-being, often referred to as the “the medicine wheel,” is the core guiding principle to overall ERFN health and well-being, and include:</p> <ul style="list-style-type: none"> <li>• Physical health</li> <li>• Mental health</li> <li>• Spiritual health</li> <li>• Emotional health</li> </ul> <p>The KIs selected by Denison and subsequent steps of the assessment of the effects must be amended to include more holistic Kis and parameters relevant to these ERFN determinants of Community Well-Being, in collaboration with ERFN and based on the results of studies and submissions provided by ERFN to date. Potential Kis/parameters could include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Food security</li> <li>• Access to traditional foods</li> <li>• Psychosocial Impacts</li> <li>• Spiritual and cultural vitality</li> </ul>

3. Community cohesion (from changes in income and participation in a commuter rotation system).

While ERFN is supportive of Community Well-Being being identified as a key value component and included in the scope of the effects assessment, the KIs and measurable parameters selected by Denison are insufficient and do not reflect a holistic consideration of well-being informed by Indigenous determinants of well-being, despite Denison's acknowledgment that communities in the LSA are predominantly (95.2%) Aboriginal (Section 12.2.3.1, p. 12-56). ERFN notes that concerns have been raised in previous engagement with ERFN and in our August 2022 submission of comments on the Draft EIS regarding the limited scope of these KIs and that additional KIs and measurable parameters must be included to reflect a more holistic understanding of Community Well-Being informed by Indigenous perspectives.

Because the selection of these KIs and measurable parameters is a foundational step in the assessment that informs the scope and approach to the subsequent characterization of existing conditions, assessment of project related effects, identification of mitigation measures and assessment of residual effects and cumulative effects, the insufficient scope of KIs and measurable parameters selected by Denison therefore results in a fundamental

- Ability to practice traditional activities
- Cultural Identity
- Connection to ERFN Traditional Territory
- Ability to speak ERFN dialects of Dene and Cree
- Intergenerational knowledge transfer
- Collecting, processing, using, and sharing traditional medicines



deficiency of Section 12.1 of the assessment of the effects.

ERFN-189	EIS Section 12.2.4.1 Potential Interactions Between the Project and Valued Components/Key Indicators	In Section 12.2.4.1, Denison sets out the assessment of potential interactions between the Project and VC/Kis, based on “IK, LK, discussions with Indigenous groups, government agencies, and the public, KPIs for the Project, the professional judgment of members of the Project team, and consideration of existing conditions in the study areas for the VCs and KIs” (Page 12-73). ERFN notes the only project activities Denison has determined will interact with the VC/Kis considered in this section of the assessment are employment and expenditures, and Denison states that no other construction activities, operation activities, or decommissioning activities are anticipated to have any interactions with Community Well-Being. ERFN does not agree with this assessment of the Project’s potential interactions with Community Well-Being, and it is ERFN’s position that numerous other Project activities will have potential adverse effects on ERFN’s Community Well-Being.	This assessment should be considered incomplete and fundamentally deficient. The assessment must be redone with a more holistic consideration of Kis and pathways to effects developed in collaboration with ERFN and based on the results of studies completed by ERFN to date.
ERFN-190	EIS Section 12.2.4.2 Potential Project Related Effects	While Section 12.2.4.2.1 does consider the effects of population changes related to the Project on demand for housing and general concerns with the in-and-out migration of LSA residents, it doesn’t address the full range of potential impacts associated with a transient workforce.	Section 12.2.4.2 must include an assessment of all potential effects of a transient workforce and changes to population dynamics, including those disproportionately experienced by women and other segments of the population. This should incorporate findings of research like the 2017 study completed by Lake Babine Nation and Nak’azdli Whut’en ( <i>Indigenous Communities and Industrial Camps</i> ), and/or

ERFN-191	EIS Section 12.2.4.2 Potential Project Related Effects	While Section 12.2.4.2.2 does include consideration of the effects of increased income on existing issues for LSA residents including substance abuse and domestic violence, corresponding mitigation measures in Section 12.2.5 are limited to training and programming on the Project site, which is not sufficient to address these potential impacts and should not be considered sufficient to prevent residual effects.	related research in the context of the LSA.  Section 12.2.5 must also include Denison's commitments to support the establishment and improvement of social services and wellness programs located in, led and implemented by each of the Indigenous communities in the LSA through the provision of funding and other resources.
ERFN-192	EIS Section 12.2.4.2 Potential Project-Related Effects	Despite acknowledging in its characterization of the existing environment for income of local workers in Section 12.2.3.2 that "the traditional economy in the LSA provides important non-cash income to citizens and contributes to the overall sense of well-being for communities" (p. 12-64), and that "Wheeler River is a culturally and economically important area for ERFN and a place where fishing, hunting, and trapping occur throughout the year" (p. 12-65), the assessment of potential project related effects for this KI in Section 12.2.4.2 only considers effects on personal income for residents of the LSA through employment on the Project.	The assessment of effects for income and financial well-being must be expanded to include participation in the traditional and subsistence economy, the Project's potential effects on ERFN's fishing, hunting and trapping and the relationship between participation in the traditional economy and the overall sense of well-being for communities, which Denison acknowledges in Section 13.3.2.3.
ERFN-193	EIS Section 12.2.4.2 Potential Project-Related Effects	Despite acknowledging in its characterization of the existing environment for community cohesion in Section 12.2.3.3 that ERFN's practice of traditional activities such as hunting, fishing, trapping and gathering is a crucial component of	The assessment of effects for community cohesion must be expanded to include all the Project's potential effects on ERFN's practice of traditional activities, including fishing, hunting and trapping.

community cohesion and well-being (p. 12-70), Denison's assessment of effects for this KI in Section 14.2.4.2.3 only considers time spent by LSA residents employed by the Project away from their communities and families during work rotation. While employment and participation in the Project by ERFN citizens is optional, the Project has broader direct impacts on the Ancestral Territory, effecting all ERFN citizens. Therefore, regardless of whether employment interferes with aspects of Community Well-Being, the existence of the Project will change the manner in which all ERFN citizens interact with Nuhtsiye-kwi Benéne, and in turn ERFN's overall community cohesion, Community Well-Being and Quality of Life.

ERFN-194

EIS Section 12.2.6  
Residual Effects  
Evaluation

Section 12.1.6 of the EIS defines a significant adverse residual effect on Cultural Expression as "an effect that is highly different from baseline conditions and trends and cannot be managed or mitigated through adjustments to existing programs, policies, or other mitigation." The EIS goes on to state that "because residual adverse effects on Cultural Expression are not expected to result in this level of change, effects are expected to be not significant for the Project." ERFN does not agree with this assessment of the potential residual effects of the Project, which is fundamentally deficient based on the limited scope of Kis and measurable

Until Section 12.2 is revised to include a more holistic consideration of Kis and measurable parameters for Community Well-Being that ERFN has set out above, Denison's assessment of the nature of potential Residual Effects should be considered incomplete and deficient. In addition, until ERFN provides confirmation to CNSC that Denison and ERFN have reached mutually agreed upon terms of mitigation and accommodation that address the effects of the Project on Community Well-Being, this EIS should not be considered complete or approved by CNSC.

parameters that were selected for analysis. ERFN also does not agree that the mitigation measures presented in Section 12.2.5 are sufficient to address effects of the Project on Cultural Expression that will be highly different from baseline conditions.

ERFN-195	EIS Section 12.3.3.1 Methods and Limitations	<p>Traffic volume data for Highways 914 and 165 are based on short term traffic counts conducted over a 48-hour counting period, however, continuous traffic monitoring data and subsequent average daily traffic volume reports are not produced for these highways.</p> <p>This traffic data is infrequently updated and only provides a snapshot of actual traffic conditions which may not be representative of actual conditions. The impacts of the Project to ERFN's rights and interests related to increased traffic and access to the Project area is a crucial concern, and an accurate baseline of traffic data is vital to the integrity of the subsequent assessment of potential effects, development of mitigation measures, residual effects evaluation and characterization of cumulative effects.</p>	Denison should establish long-term traffic monitoring stations along Highway 914 and 165 to provide a more accurate description of existing traffic conditions along these key access routes for the Project.
ERFN-196	EIS Section 12.3.6.1 Residual Effects Characterization	Denison states a significant effect on the Infrastructure and Services VC (including the measurable parameters of traffic and community infrastructure and services, and emergency services) would result if projected demands are above the current capacity, are routinely above the current levels for an extended	Denison must demonstrate plans to be largely self-reliant on internal emergency response measures, and able to sustain emergency management until transportation is available to or from the Project area either by air or ground.

period of time, are unlikely to return to existing conditions, and cannot be mitigated through adjustments to programs, policies, plans, or through other mitigations. Local and regional emergency services are limited and could be easily overwhelmed by even moderate scale emergencies.

ERFN-197	EIS 12.3.4.2.1 Potential Effect 1 – Change in Traffic	While Section 12.3.4.2.1 describes Denison’s assessment of changes to traffic volume during Project construction, operation and decommissioning, this section of the EIS does not go on to describe how the effects of increased traffic may interact with traditional land use and Quality of Life, which is the overall valued component considered in Section 12 of the EIS.	Section 12.3.4.2.1 should be modified to include an analysis of how the Project’s change to traffic conditions and road use will result in effects to traditional land use and Quality of Life, and include mitigation measures to address these potential effects.
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## ECONOMICS

ERFN-198	EIS Section 13.1 Scope of the Assessment	The guiding questions are narrowly focused and could be expanded to understand impacts from a GBA+ perspective. The questions do not ask how the Project will help to retain economic benefits for LSA communities.	The assessment could be enhanced by reviewing the findings from a GBA+ perspective. The assessment should make clear recommendations to help LSA maximize potential economic effects.
ERFN-199	EIS Section 13.1 Scope of the Assessment	“Characterize existing conditions”; This could be enhanced by forecasting the baseline conditions without the project to match the temporal boundaries of the project, as well as characterizing existing conditions.	Forecasting key indicators and measurable parameters without the project based on trends and existing conditions could enhance the assessment.
ERFN-200	EIS Section 13.1.2 Key Indicators and Measurable Parameters	Based on the Terms of Reference, the Traditional Economy could be a separate VC. However, the Draft EIS	Given the importance of the Traditional Economy to ERFN, selecting it as a separate VC with a set of Key Indicators could enhance the

		considers Traditional Economy as a Key Indicator (KI).	assessment and monitoring of the potential Project's effects.
ERFN-201	EIS Section 13.1.2 Key Indicators and Measurable Parameters	Typo, the Economy VC is comprised of five, not four KIs.	Fix typo.
ERFN-202	EIS Section 13.1.2 Key Indicators and Measurable Parameters	Direct/Indirect/Induced for employment and income – Direct employment/income could be outside of the LSA or RSA.	Acknowledge that Direct employment in this assessment is limited to the direct employment by Denison and contractors in the Study areas
ERFN-203	EIS Section 13.1.2 Key Indicators and Measurable Parameters	Indirect/Induced for employment; the suggested measure for indirect and induced employment is aggregated employment and unemployment rates; Input-output modelling could be used to estimate indirect and induced employment.	Enhance measurement of indirect and induced employment through input-output modelling. This would help understand the other enabled employment impacts of the project.
ERFN-204	Table 13.1-1: Key Indicators and Measurable Parameters for Economy	<p>Measurable parameters employment and training; employment is limited to direct project-related employment opportunities. There are 2 issues:</p> <ol style="list-style-type: none"> <li>1. It is implied that many of these opportunities will be captured by fly-in/fly-out workers that won't impact the LSA.</li> <li>2. There's no estimating of the quantity of indirect and induced employment. Indirect and induced employment can often represent the same number of jobs provincially as direct employment.</li> </ol> <p>The question for all these jobs is how many of them will be captured in the LSA and RSA.</p>	<p>Recommendations 1. Estimate indirect and induced employment impacts using input-output modelling.</p> <p>Recommendation 2. Estimate the number of direct and indirect jobs that will be captured in the LSA and RSA vs. out of the study area. Induced jobs in the study areas could be proportional to the percentage of total direct and indirect jobs captured in the study areas. Regardless of the methodology Denison uses, an estimate of the economic impact on local employment in the LSA and RSA would add to the assessment.</p>
ERFN-205	Table 13.1-1: Key Indicators and Measurable Parameters for Economy	Measurable parameters – Income; Wages and salaries paid by Denison are only part of the income impact in the study areas. Not all the income	Income impacts in the community should be based on the same employment capture assumptions that are used for capturing employment.

		will be captured in the study areas, and some income will be generated through indirect and induced activities.	
ERFN-206	Table 13.1-1: Key Indicators and Measurable Parameters for Economy	Measurable parameters – Income; Income disparity is not included in the measurable parameters; Projects that can create relatively high-paying jobs for some of the residents in a community can create income disparity. This can result in increases in household costs for all residents. The impact of the project on income disparity could be important.	Consider adding income disparity as a measurable parameter of the Income key indicator.
ERFN-207	Table 13.1-1: Key Indicators and Measurable Parameters for Economy	Business opportunities does not look at the impact of the project on the labour supply for existing businesses. Relatively high-paying jobs associated with the project could result in existing businesses not being able to hire and retain the employees necessary to operate their businesses.	The assessment could be enhanced by including impact on labour for existing businesses as a measurable parameter for the Business Opportunities Key Indicator.
ERFN-208	Table 13.1-1: Key Indicators and Measurable Parameters for Economy	Measurable parameters: Doesn't specify that measurable parameters will be looked at in a disaggregated fashion.	The assessment could be enhanced by collecting disaggregated data on these measurable parameters when it was available. Project impacts of the key indicators are likely not homogeneous across all demographic factors.
ERFN-209	EIS Section 13.1.3.2 Temporal Boundaries	The existing environment focuses on the past three census periods (2006, 2011, 2016). The assessment would benefit from reviewing and incorporating data from the latest census.	Incorporate demographic and economic data from the 2021 Census.
ERFN-210	EIS Section 13.1.3.2 Temporal Boundaries	The temporal boundaries seem appropriate, but the existing conditions without the project do not	Forecast baseline measurable indicators without the project for the temporal boundaries presented in the assessment.

		forecast what the measurable indicators will be without the project.	
ERFN-211	EIS Section 13.2 Existing Environment	Most of the data presented in 13.2.1.4/13.2.1.5/13.2.1.6 only shows percentages of participation. The associated nominal values are unclear.	Because the nominal values are important for understanding the scale of impact of the project, add nominal values throughout the sections. This is important because the entire LSA has only 875 people in their labour force. How is that spread across the different communities? Small changes in these variables could be material to the different communities.
ERFN-212	EIS Section 13.2.1 Key Indicator: Employment and Training	The Draft EIS stated, “due to the small populations of La Plonge and Patuanak, data from Statistics Canada have been suppressed to protect confidentiality. Accordingly, data for the LSA are not fully representative, but the effect on reported statistics is believed to be minimal at the LSA level, given the low population of those two localities” (p. 13-18).	The random rounding for small populations makes the census data unreliable as an absolute indicator. Denison has done a good job using qualitative interview data to add to the baseline understanding of unemployment. Given the challenges in the census at capturing unemployment for these small populations, specific details for measuring unemployment as part of the monitoring plan would be valuable.
ERFN-213	EIS Section 13.2.1 Key Indicator: Employment and Training (all indicators)	The data are not presented from a GBA+ perspective, limiting the assessment’s estimate of the Project adverse or disproportionate impacts separated based on gender, sexual orientation, race, or other factors which have historically been used to disadvantage populations interacting with mining projects.	Complete the assessment using a GBA+ framework.
ERFN-214	EIS Section 13.2.1.5 Employment by Sector	The employment by industry sector shows that the LSA has a higher concentration of employment in mining than the RSA and the province as a whole. This suggests that not all the jobs associated with the project will go to a fly-in/fly-out work force. Employment in the LSA could be	Do not rule out effects due to the fly-in/fly-out nature of the project (municipal revenue, indirect and induced employment, and income).



		impacted by the project: Many workers are already in the mining industry.	
ERFN-215	Figure 13.2-5: Employment by Industry Sectors for the Local Study Area by Sex, 2016	Participation in the industry by gender was presented. This aids in understanding employment in a disaggregated manner.	Good addition to help understand the potential for disproportionate effects of the project on different genders in the LSA.
ERFN-216	EIS Section 13.2.2.1 Total Personal Income	Personal Income data is presented for the LSA for Indigenous and non-Indigenous individuals, but the make-up of the population (Indigenous vs non-Indigenous) was not presented.	Include nominal values to show the size of the Indigenous and non-Indigenous populations in the LSA.
ERFN-217	EIS Section 13.2.2.1 Total Personal Income	Income disparity was discussed and presented (average to median income assessment). This was positive as it set up the potential for estimating the impacts of the project on income disparity.	This was a good addition to help understand baseline income disparity.
ERFN-218	EIS Section 13.2.3 Key Indicator: Traditional Economy	Some baseline data is missing from this section. Traditional economy baseline data is presented in the project's effects section for the first time. Specifically, the commercial harvester who had traplines near the project site was not identified in this section, nor was the typical locations of non-commercial harvesting identified. These are referenced in the effects section. It would be helpful if they were previously introduced.	Add the baseline elements of the Traditional Economy referenced in the effects section to the baseline section.
ERFN-219	EIS Section 13.2.3 Key Indicator: Traditional Economy	Kineepik M é tis Local and Pinehouse Lake member concerns and thoughts about the impact of the project should likely be in the effects section, not the baseline.	Move information related to the effects of the project to the project effects section.

ERFN-220	EIS Section 13.2.4 Key Indicator: Business Opportunities	There is no discussion on challenges local businesses have in finding labour to operate their businesses.	Adding the challenges of local businesses to finding labour would enhance this section.
ERFN-221	Table 13.3-1: Potential Project Interactions for Economy	The Traditional Economy may have interactions with other phases/activities of the Project, and the interactions are not limited to only employment and expenditures. Project activities and the presence of the Project may interact with current and future Traditional users.	Work with traditional users and Knowledge Holders to review the approach of outcomes of the assessment to the Traditional Economy.
ERFN-222	EIS Section 13.3.2 Potential Project-related Effects	The assessment does not quantify anticipated effects for LSA communities and relies on a qualitative and subjective assessment.	Review existing baseline data and run scenarios (best, likely, worst case) to estimate potential capture with the LSA for economic benefits. Denison should conduct an analysis to estimate KI changes in LSA and RSA.
ERFN-223	EIS Section 13.3.2.1 Potential Effect 1 – Employment and Training (p.13-61)	The Draft EIS states, “training programming will be determined in consultation with COI and are anticipated to involve existing training facilities and programs (Process Operation Technical [SIIT] Meadow Lake, Chemical Technology [Saskatchewan Polytechnic]) as well as specific ISR training, where required. Denison will initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities” (p. 13-61). However, Denison has not made firm commitments as of now.	(i) Clarify how Denison plans to prioritize Indigenous and non-Indigenous local communities in terms of employment and training. (ii) Establishing a local recruitment and training centre within a nearby community would enhance the positive impacts of the Project on Employment and Training.
ERFN-224	EIS Section 13.3.2.1 Potential Effect 1 – Employment and Training	Presentation of historic baseline participation and employment rates in the effects section. The effects of the project on these measurable indicators are missing.	Remove the presentation of baseline data of these indicators. Add the estimated effects of the project on these indicators

ERFN-225	EIS Section 13.3.2.1 Potential Effect 1 – Employment and Training	The draft EIS states, “training opportunities are anticipated to be delivered by institutions in northern Saskatchewan or Saskatchewan more broadly and will be determined in consultation with LSA communities” (p. 13-64)	Supporting local hiring practices through the establishment of a local recruitment and training centre within a nearby community for ensuring Indigenous and non-Indigenous members have a pathway to having higher quality positions than general labour or junior positions. This would enhance the positive Project impact on Employment and Training.
ERFN-226	EIS Section 13.3.2.3 Potential Effect 3- Traditional Economy	The potential effects on the Traditional Economy are likely underestimated. . The erosion of traditional economic practices resulting from the cumulative effects of resource projects is a concern voiced by ERFN.	Work with traditional users and Knowledge Holders to develop a robust compensation plan, considering future users.
ERFN-227	EIS Section 13.3.2.4 Potential Effect 4 – Business Opportunities	The economic impact of the sustaining capital and operating spending in the LSA and RSA is not estimated.	Forecast the economic impact of the sustaining capital and operating spending in the LSA and RSA using input-output modelling, or other techniques based on assumptions about the percentage of spending captured by local businesses in the LSA and RSA.
ERFN-228	EIS Section 13.3.2.4 Potential Effect 4 – Business Opportunities	The impact of the project on business to hire and retain labour to support existing business operations has not been addressed.	Forecast the impact of the project on existing businesses access to labour to support existing operations.
ERFN-229	EIS Section 13.3.2.4 Potential Effect 4 – Business Opportunities	The Draft EIS states, “Denison has established an internal procurement approach that requires the procurement of all goods and services for the Project to first consider businesses based within the LSA communities prior to looking elsewhere in northern Saskatchewan, southern Saskatchewan, and/or outside of Saskatchewan throughout all phases of the Project” (p. 13-68). There were limited specifics associated with this commitment.	Clarify how Denison plans to develop procurement strategies that favour local works and businesses. Engage Indigenous and non-Indigenous businesses in the development of these procurement strategies.

ERFN-230	EIS Section 13.4 Mitigation and Enhancement Measures	Mitigation measures are vague and require more clarity. How Indigenous and local hiring will be prioritized and maximized, the likelihood and type of local procurement and training opportunities should be clearly outlined.	Develop a robust and clear set of actions to maximize potential benefits to LSA.
ERFN-231	EIS Section 13.4 Mitigation and Enhancement Measures	The workforce transition plan will be a key mitigation measure to protect the LSA communities against any boom-bust effects of the Project. More clarity on this plan, including financial commitments to ensure the long-term economic benefits for the LSA, are needed. This plan should also address transition planning for any local businesses working with the Project.	Provide details with financial commitments in the workforce transition plan. This should be developed prior to Project approvals and should be revisited on an ongoing basis.
ERFN-232	EIS Section 13.5.1 Residual Effects Characterization	The residual impacts on employment are said to be positive and low to moderate, without quantifying the impact. At points in the analysis, it is said that there will be little impact on employment and residency due to the fly-in/fly-out nature of the project. Then in this section it is said that the impact on employment could have a moderate effect on the economy. This could cascade to a moderate impact on income disparity, business access to labour, and municipal government cost driven by community growth.	Quantify the impacts on employment. Cascade the impacts on employment to impacts on income, business opportunity and government finance.
ERFN-233	EIS Section 13.5.1.2 Income	The residual impact on Income is seen as positive and moderate. This analysis does not consider the impact on income inequality and how that could impact the LSA and RSA. This might change to direction of the impact.	Include income disparity as a measurable impact in the analysis and determine if it changes the direction of the impact of the project on Income.

ERFN-234	EIS Section 13.5.1.3 Traditional Economy	The residual impact of the project on the traditional economy is seen as having a magnitude of negligible to low. The characterization of the ability of the workforce to participate in the traditional economy as being minimal or low does not seem to be supported by the evidence presented. Evidence presented indicated that some workers at other similar facilities felt that their ability to participate in the traditional economy had been negatively impacted (13-67).	Provide additional evidence to support the magnitude of the impact as being negligible to low or adjust the magnitude of the impact.  The magnitude of the negative impact could potentially be reduced if Denison proposed additional time off be granted to workers to participate in traditional seasonal harvesting activities.
ERFN-235	EIS Section 13.5.1.3 Traditional Economy	The residual impact of the project on the traditional economy is seen as having a reversibility as fully reversible. The assessment doesn't address the contribution of participating in the traditional economy's impact on social customs and relationships. This effect was identified in the baseline (p. 13-51), but not assessed in section 13.3.2.3. If there is a more than low impact on the traditional economy, this could have a lasting impact on social customs and relationships. This might make return to the traditional economy not as fully reversible as the analysis proposes.	Provide additional evidence as to how impacts to the traditional economy won't impact the social customs and relationships, or how if it does these will be able to be reversed after decommissioning.
ERFN-236	EIS Section 13.5.1.4 Business Opportunities	The residual impact of the project on business opportunities has a direction of positive. The assessment does not include the impact of the project of existing businesses' access to labour to support ongoing business operations. If the project negatively impacts existing businesses' access to labour the direction of the impact on business opportunity could change.	Assess the impact of the project on existing businesses access to labour. Re-assess the direction of the residual impact if necessary.

ERFN-237	EIS Section 13.5.1.4 Business Opportunities	The residual impact of the project on business opportunities has a direction of positive. The assessment doesn't include the impact of the project of existing businesses' access to labour to support ongoing business operations. If the project negatively impacts existing businesses' access to labour the direction of the impact on business opportunity could change.	Assess the impact of the project on existing businesses access to labour. Re-assess the direction of the residual impact if necessary.
ERFN-238	EIS Section 13.5.2. Summary of Project-related Residual Adverse Effects on Economy	The effects of the Traditional Economy are likely underestimated. The effects from a GBA+ perspective are unknown. The potential boom-bust effects of the Project are not considered.	See above
ERFN-239	EIS Section 13.5.2 Summary of Project-related Residual Adverse Effects on Economy	The residual adverse effects and economy summary may need to be updated if some of the additional analysis is done.	Re-assess the residual adverse effects on the economy after updating the residual effects on the other key indicators. Revise as necessary the Economy Summary.
ERFN-240	EIS Section 13.7 Monitoring and Follow-up	There is very little information on how the economic environment will be monitored.	Develop a clear monitoring and follow-up plan with ERFN, addressing each of the Key Indicators and outlining the measurements and reporting that will be undertaken.

## ACCIDENTS AND MALFUNCTIONS

ERFN-241	EIS Section 14.2 Scope, Scale, and Objectives of the Assessment	Denison notes that the overall objective of Section 14 Accidents and Malfunctions is to "evaluate the potential effects to human health or the biophysical environment resulting from radiological and conventional accidents and malfunctions in consideration of proposed environmental protection measures" however, continue to state that "some hazards related to work safety were identified; however, worker safety	Denison must include assessment and consideration of all worker safety risks and consequences associated with accidents and malfunctions for this section to be considered complete. Without this section reviewers are unable assess the broader impacts of the projects and the overall risks to both the environment and society in which this project is set. This request is in alignment with REGDOC-2.9.1 Section A.3.4 which notes that "[t]he applicant should provide an assessment of potential health and environmental effects
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		<p>(i.e., risks and consequences) is beyond the scope of this assessment."</p> <p>The lack of full consideration of worker safety with respect to radiological hazards suggests that Denison have failed to identify and consider the full range of accidents, as many of the greatest risks with this project are directly related to worker health and safety, and expand well beyond the health of any one individual (e.g., impacts to worker health and safety may have direct impacts on aquatic or terrestrial conditions, as well as socio-economic perceptions of the mine).</p>	<p>resulting from postulated radiological and conventional malfunctions or accidents." Our interpretation of this wording is that it applies to both environmental and human health which includes both public and worker health.</p>
ERFN-242	EIS Section 14.4 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment	<p>Examples of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment outlined in section 14.4 only demonstrate that concerns were raised during engagement activities, however, Denison fails to demonstrate how it included specific Traditional Knowledge both in the assessment of Accidents and Malfunctions, as well as how Traditional Knowledge would be used in monitoring and or response in the event of an accident or malfunction. As a result, we assert that Denison has done a poor job of meaningfully considering the input from ERFN and others.</p>	<p>Denison must demonstrate how Traditional Knowledge, not only community concerns, was considered in the assessment of accidents and malfunction including risks, monitoring, and proposed interventions and mitigations.</p>
ERFN-243	EIS Section 14.4 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on	<p>Table 14.4-1 outlines a summary of engagement records related to accidents and malfunctions; however, Denison does not provide sufficient information regarding the concern</p>	<p>Denison must provide complete engagement records outlining full comments/concerns with the context in which they were presented in order to demonstrate that these concerns were</p>

	the Assessment; Table 14.4-1	which was actually raised and context in which it was raised. Specifically, in many cases, Denison only present a handful of words as the "comment" and then speaks to assessment consideration, but reviewers are unable to identify the concern which is actually being raised in most cases. As a result, Denison is able to present a solution for assessment consideration to a concern which is not identified.	indeed appropriately considered in relation to the assessment of accidents and malfunctions.
ERFN-244	EIS Section 14.4 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment; Table 14.4-1	Table 14.4-1 outlines many of the concerns raised through engagement with ERFN and others, however, Denison only point to these concerns being addressed and considered in the Emergency Response Plan and other documents which have not yet been drafted. We find it inappropriate for Denison to continue to defer meaningful discussions about potential impacts and ability to respond beyond the EIS stage. It is necessary to fully understand Denison's mitigation and response for all foreseeable events at this stage in order to evaluate possible residual effects of this project.	Denison must provide a draft version of the Emergency Response Plan which outlines all foreseeable effects pathways associated with accident or malfunction, monitoring options to ensure accidents or malfunctions are appropriately detected, and possible consequences and interventions as a result of an accident or malfunction.
ERFN-245	EIS Section 14.5.1 Overview	Denison has identified several risk scenarios as part of the accidents and malfunctions analysis; however, it has not conducted an effects pathway assessment with ERFN directly, allowing Denison and ERFN citizens to communicate concerns associated with the project and potential accidents and malfunctions. As a result, we see that Denison's accidents and malfunctions assessment to be	Denison should provide appropriate capacity and support to enable ERFN to engage Denison in establishing an effects pathway assessment to ensure that monitoring, mitigation, and intervention associated with all potential environmental impacts appropriately consider ERFN TK and input, based on how the land is used and the societal impacts of this project.



		narrow in scope and only speak to western science perspectives.	
ERFN-246	EIS Section 14.5.2 Process Hazards Analysis	Denison note that while there are standards and regulatory documents which govern the assessment of risk and probability for an accident or malfunction associated with a reactor facility, similar REGDOCs do not exist for a mining environment. ERFN agree that REGDOCs focusing on risk and probability assessment for a reactor facility is not overly appropriate to a uranium mine facility. However, there remain additional hazards which do not occur at non-nuclear facilities (e.g., non-uranium metal mines), that should be considered.	Denison should demonstrate how it utilized lessons learned from other uranium mines in the regional context (e.g., McClean Lake, Cigar Lake, and McArthur River), as well as other ISR facilities in the United States and elsewhere to ground the Hazards Analysis.
ERFN-247	EIS Section 14.5.2 Process Hazards Analysis; Figure 14.5-2	Denison outlines in Figure 14.5-2 a matrix considering likelihood and consequence severity of an accident or malfunction. This approach is used widely in environmental assessment, however, the definitions used to delineate consequence are not appropriately framed through the lens of ERFN land users who live near the facility and use the lands resources which would be affected to exercise rights and traditional practices. As a result, we find the term consequence severity to be superficial.	Denison must consider, in its hazard analysis risk matrix, not only the potential impacts to human and environmental health, but also consider by extension the impacts to society, land use, traditional and non-traditional economic factors, and importantly, perceptions in the event of an accident or malfunction. For example, while an accident or malfunction may only have a narrow physical footprint in which the environment is impacted, this incident ,especially if associated with a radiological event, could have a much larger perceived area of impact. As a result, the consequence severity may be much greater when viewed through the perspective of ERFN land users rather than what is measurable through western scientific methods.
ERFN-248	EIS Section 14.5.4 General Design and Mitigation Considerations	Section 14.5.4 outlines general design and mitigation considerations for the project. In the preface for this subsection, Denison outline intentions and commitments to "setting high	Denison must do more to appropriately identify, assess, and proactively propose meaningful options for mitigations to be considered. Specifically, ERFN expects that Denison outline specific hazards, and

standards for various aspects of its operations, which will serve to mitigate potential Project-related effects." However, only provide a generic overview of measures and features which they are considering. They do not present options and analysis for the consideration of these measures and therefore ERFN are unable to conduct any sort of meaningful assessment of whether they will be effective.

discussion on measures which will proactively prevent impact and alternative measures to serve as contingency.

ERFN-249	EIS Section 14.5.4 General Design and Mitigation Considerations	Denison note that "the processing plant will be designed with expert consideration of potential environmental and health and safety effects to mitigate interactions to the extent possible." While we do not suspect that this wording implies that other aspects of the project will not be designed with expert consideration of potential environmental and health and safety effects in mind, this statement perfectly exemplifies the frustration ERFN faces in meaningfully evaluating the potential mitigation measures, which are absent.	ERFN requests that Denison provide detailed design and activity options based on each identified risk such that the effectiveness and appropriateness of each measure can be adequately assessed.
ERFN-250	EIS Section 14.5.6 Definition of Bounding Scenarios	Denison notes that "the processing plant will be designed with expert consideration of potential environmental and health and safety effects to mitigate interactions to the extent possible." While we do not suspect that this wording implies that other aspects of the project will not be designed with expert consideration of potential environmental and health and safety effects in mind, this statement perfectly exemplifies the	We request that Denison provide detailed design and activity options based on each identified risk such that the effectiveness and appropriateness of each measure can be adequately assessed.

frustration ERFN faces in meaningfully evaluating the potential mitigation measures, which are absent.

ERFN-251	EIS Section 14.5.6 Definition of Bounding Scenarios; Table 14.5-2	Loss of freeze capacity is identified as High Risk. Based on the risk matrix outlined in Figure 14.5-2 the overall risk is based on both likelihood and consequence severity. It is however unclear the circumstance which led the loss of the freeze capacity to be evaluated as high risk (similarly, failure of the freeze wall is identified as moderate risk, however, again the factors which led to this initial risk characterization are not discussed). ERFN agrees that the consequence severity for loss of freeze capacity and failure of freeze wall to be amongst the greatest for this project, however, what is unclear is whether Denison is suggesting the likelihood is also elevated.	ERFN requests that Denison provides an overview of factors which led them to the characterization of risk as presented, including both likelihood, consequence severity, and rational for why those risks were determined to fall within each respective likelihood and consequence severity levels.
ERFN-252	EIS Section 14.6.1.1.1 Release Characterization	<p>ERFN questions the approach used to assess the dissolution rate of uranium on a number of factors.</p> <p>a) Denison uses concentrate samples from the McClean Lake operation as a proxy for yellow cake produced at the Wheeler River project, without providing discussion as to whether these are truly interchangeable for the purposes of assessing solubility. Given the significant differences in processing, it is unclear whether McClean Lake samples are an appropriate proxy.</p>	Denison must provide additional information regarding the methods used to model possible uranium flow, including providing a particle dispersion map of the downstream environment to illustrate expected movement and areas which could be effected in the event of an accident and spill.

b) The information provided outlining the rate at which uranium will come out solution is not clear. Specifically, we raise concerns that solubility (4,800 ug/L) is used directly to measure the rate of dissolution. Solubility and dissolution rate should have an inversely proportionate relationship.

c) Denison make an assumption that only dissolved (soluble) uranium will be mobilized by water. This is not accurate as flowing water can mobilized material which is not dissolved either as bed load or as suspended load, which may travel significantly downstream.

d) Denison indicates that "that most (98% of the mass) of the uranium concentrate is expected to settle within a short distance of the release (i.e., within approximately 20 m of the release point), even under high flow conditions in the Wheeler River due to a relatively slow water velocity (<0.8 m/s)." This is a very narrow range of expected impacts; however, insufficient information has been made available to understand the spatial modelling that has been conducted to support this assertion.

ERFN-253	EIS Section 14.6.1.3 Evaluation of Probability	Generalized national or provincial transportation accident statistics is not an appropriate proxy given the unique conditions which face transportation of material from the Wheeler River site. Specifically,	Denison must consider the additive or interactive effects of the road conditions unique to the Wheeler River project, which may increase accident rates beyond that of conventional roadway accident statistics.
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		generalize statistics do not consider the increased risks of driving on a remote roadway, that is poorly lit and has frequent encounters with wildlife.	
ERFN-254	EIS Section 14.6.1.4.2 Exposure Assessment	The assessment of risk associated with a vehicular accident in which uranium is spilled into Wheeler River does not consider either the psychological/perceived impacts of the spill, in which ERFN citizens may be less likely to want to interact with the river following an accident regardless of whether the spill was appropriately cleaned up, or the impacts to fish and aquatic habitat as a result of cleanup efforts. Given the need to clean the physical substrate significant amounts of fish habitat would be destroyed in order to effectively remediate a spill site.	Denison must consider the secondary implications of mitigation measures and interventions in the event there is an accident resulting in a spill.
ERFN-255	EIS Section 14.6.3.1 Scenario Description	Denison note that the freeze wall will require a minimum of 12 months to thaw in the event of freezing system failure. It is unclear where this value originated from and the factors which contribute to such a slow thawing cycle.	ERFN requests that Denison provide modelling data for the thawing rates of freeze wall based on the geological properties to be encountered by the freeze wall.
ERFN-256	EIS Section 14.6.3.3 Evaluation of Probability	Denison notes that a probability value of $1 \times 10^{-7}$ was established for the likelihood of loss of freeze capacity based on professional judgement. ERFN contests this value as entirely speculative and offered without substance. There are a wide range of factors that may contribute to short and long-term reductions or losses in freeze capacity (e.g., power failure, equipment failure, maintenance), which are not discussed.	Denison must provide a more meaningful assessment of specific factors which could lead to the loss or reduction of freeze capacity, demonstrating how they may contribute to an overall likelihood of loss of freeze capacity.

ERFN-257	EIS Section 14.6.3.4 Evaluation of Consequences	Denison argues in sections 14.6.3.1, 14.6.3.3 and 14.6.3.4 without substance that the risk of groundwater contamination due to the loss of freeze capacity is very unlikely. The lack of evidence presented to substantiate these claims is alarming to ERFN. We agree that under normal circumstances the likelihood of the freeze wall failing allowing for groundwater contamination is on the lower end of the likelihood spectrum, however, we are not currently assessing effectiveness under normal circumstances, but rather as a result of accident or malfunction. Based on the discussion provided in section 14.6.3.4, there is great concern to ERFN that Denison would be a) able to detect the failure of a freeze wall and b) identify the exposure pathway to enable Denison to take appropriate action before catastrophic environmental impacts are observed.	ERFN is gravely concerned about the information put forward by Denison in section 14.6.3 regarding the risk assessment associated with likelihood and consequences of failure by the freeze wall. Denison has not presented a viable method to monitor the effectiveness of the freeze wall. Additionally, Denison indicates that there are no viable methods of detecting impacts or intervening until they are observed, indicating failure of the freeze wall. Finally, when speaking to the likelihood of an accident or malfunction, Denison only offer a best guess.  ERFN requests that CSNC and Denison take seriously the possible threat to the environment and by extension ERFN Rights and interests associated with the failure of the freeze wall. We cannot overstate the need to provide additional analysis of contingency measures to avoid containment in the event the freeze wall fails to contain mining fluids and other sources of groundwater contamination associated with Wheeler River activities.
ERFN-258	EIS Section 14.6.4.1 Scenario Description	Denison suggests that the "low temperature of the formation in and around the compromised section of the freeze wall would most likely cause the fluids to freeze and seal or partially seal the opening, further reducing the rate of contamination." It is unclear how mining fluids may influence the freezing point of groundwater, and therefore allow mining fluids to either thaw the freeze wall or be immune to subsequent freezing by surrounding materials.	We request Denison provide a breakdown of expected freezing points for mining fluids or other liquids within the mining theatre which may interact with the freeze wall.

ERFN-259	EIS Section 14.6.4.1 Scenario Description	<p>Denison speculates that migration of fluids from the mining theatre beyond a compromised freeze wall section would be slow due to low temperatures.</p> <p>a) This assertion is not supported by ground water modelling or other evidence accounting for groundwater flow, especially as liquids are being injected and extracted via ISR mine operations.</p> <p>b) If migration is indeed slow, it would imply that the detection of impacts would also be slow. This may mean that impacts from a compromised freeze wall may not be observed until after the mine has completed its production life. ERFN is therefore concerned that the inability to detect impacts may result in a legacy of contamination which may not be the responsibility of Denison if they are not detected until after the mine has completed closure and reclamation activities.</p>	<p>(i) Denison should provide detailed scenario based modelling to demonstrate expected flow rather beyond a compromised freeze wall.</p> <p>(ii) Denison should include an appropriate groundwater monitoring program surrounding the project to run throughout the entire lifecycle of the mine to best capture potential contamination and migration of mining fluids.</p>
ERFN-260	EIS Section 14.6.5.2 Design and Mitigation Considerations	Radon is an odorless, colourless gas. While a burst pipe of vessel under pressure may result in obvious signs of a leak, leaky valves and or fittings may allow for radon to escape undetected.	Denison should identify measures to ensure that valves and fittings are inspected and maintained in routine intervals. Also, we recommend that radon detectors be installed and monitored near all enclosed infrastructure where radon gas may escape.
ERFN-261	EIS Section 14.6.6.1.1 Release Characterization	Denison assumes that in the event of an explosion 90% of the uranium would be trapped within the damaged dryer unit, however, fail to substantiate this assumption.	Denison should base assumptions on maximum risk scenarios rather than minimum or probable risk scenarios. As a result, we request that the LPF be equated to 1 rather than 0.1.

ERFN-262	EIS Section 14.6.6.2 Design and Mitigation Considerations	In speaking to design and mitigation considerations Denison only make hypothetical or aspirational commitments (e.g. "Denison would make sure that the design of the plant includes control measures to reduce exposure levels to workers and members of the public to levels that are as low as achievable.") These are not specific design considerations or hard commitments.	Denison should commit to best practices, including the implementation of specific measures rather than simply stating plans to commit the implementation of design and mitigation considerations.
ERFN-263	EIS Section 14.8 Key Findings and Conclusions	Denison has presented an accidents and malfunctions assessment that speaks only to a handful of concerns, while presenting in many cases minimal evidence to substantiate its assertions and assumptions. ERFN is very concerned by the lack of consideration for contingency planning associated with the identified risks.	ERFN does not consider section 14 sufficiently comprehensive or meaningful for the purposes of assessing risks.

#### EFFECTS OF THE ENVIRONMENT ON THE PROJECT

ERFN-264	EIS Section 15.2.1. Existing Environmental Conditions	We agree that the probability of a significant seismic event effecting the project site is low, however, it is not zero. Further, given the inherent design of the project, which relies on the establishment of multiple closely spaced deep wells to be drilled for injection and extraction, well design must be such that it can withstand significant sheer forces associated with horizontal movement. Denison presents an inconclusive outline of design considerations to be incorporated to minimize risks to well structures, and the freeze wall as a result of a significant seismic event.	We request Denison provide an analysis looking at other similar projects to identify specific design considerations to mitigate risks to below-ground infrastructure as a result of seismic activity.
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ERFN-265	EIS Section 15.2.1. Existing Environmental Conditions	Human induced seismic activity has been observed in association with the use of injection wells. This have been most notably observed in association with. hydraulic fracturing in the extraction of shale gas, where high-pressure fluid liquid is forced into geological formations with the intention of fracturing the rock to release trapped gasses. However, similar human induced seismic activity has been observed in other instances where injection wells are used, resulting in large changes of water or gas form underground reservoirs, creation of voids space, changes in pore-pressure, all have been associated with increases in seismic activity (Ellsworth, 2013). ERFN is concerned that similar human induced seismic activity may increase as a result of the extraction process being proposed by Denison.	We request that Denison provide evidence using examples of other in situ recovery uranium mines around the world to discuss the potential risks of increased seismic activity as a result of the proposed activity.
ERFN-266	EIS Section 15.2.2. Effects on the Project	Although seismic activity is unlikely, it is still possible. Given the inherent hazards associated with this project there is a need to ensure that project infrastructure can withstand all likely seismic events.	We request that Denison provide information on the magnitude and duration of a seismic event for which infrastructure will be designed to withstand. Included should be an analysis of the likelihood of such and event to occur at the project site.
ERFN-267	EIS Section 15.3.2 Effects on the Project	Denison notes that although potential exists for forest fires to occur during the life of the Project, fire is not expected to have a detrimental effect on the Project given the design features and mitigation measures that Denison with have in place with the Fire Protection Program, which will be developed specifically for the Project and based on proven programs at	(i) We request that Denison provide additional information on fire mitigation and suppression measures that are to be established and maintained to minimize the risk of fire to the project. Specifically, more information is needed to describe how infrastructure used in the extraction, handling, processing, and storage of uranium ore and products will be

existing northern sites. Denison does not provide additional information on what mitigations will be included in the Fire Protection Program, nor does it provide information on which existing programs they will be based on.

safeguarded against fire (such as the use of fire proof building materials).

(ii) Additional information is requested on the existing northern sites used to inform the development of the Fire Protection Program.

Forest fires present perhaps one of the greatest environmental threats to the safe operation of this project, as fires are frequent in the region, inherently difficult to control, and likely to increase as a result of climate change.

(iii) Denison does not contemplate risks or consequences of an uncontrolled fire affecting the project site. We request that additional information be provided modelling atmospheric dispersal potential of radioactive material from stockpiles and facilities in the event fire were to impact the project footprint.

ERFN-268	EIS Section 15.3.2 Effects on the Project	Denison notes that the potential for increased forest fire frequency and severity due to climate change in the coming decade, referencing Section 15.3.2. However, no additional information about the potential interplay between forest fires and climate change is discussed in this section beyond this sentence.	ERFN requests that Denison revise this section to either accurately cite the appropriate section reference or provide additional discussion on the potential impacts of increase forest fire frequency and severity on the project as a result of climate change.
ERFN-269	EIS Section 15.4.2 Effects on the Project Table 15.4-1	Denison notes that in response to major precipitation events, suitable equipment and design systems will be selected for the project to operate under heavy precipitation conditions, however, do not specify what design standard will be selected.	Given that climate change has the potential to increase the frequency and severity of heavy precipitation events, we request that Denison specify a design standard which outlines the return period for an event (e.g., 1 in 100, 1 in 500 event).
ERFN-270	EIS Section 15.4.2 Effects on the Project Table 15.4-1	Non-contact surface runoff may include water which contains elevated amounts of suspended solids or other water quality constituents which are greater than allowable for discharge	Please provide an outline of how Denison plans to monitor and appropriately intervene in instances where non-contact surface water runoff does not meet appropriate water quality

		to the environment as a result of contact with roadway surfaces, or modified landcover. The likelihood of poor water quality is greater in surface runoff during extreme and prolonged precipitation or melt events.	standards as a result of an extreme or prolonged precipitation or melt event.
ERFN-271	EIS Section 15.4.2 Effects on the Project Table 15.4-1	While it is logical for the water management infrastructure to be designed to allow for water to be transferred from pond to pond as required, during a significant or prolonged precipitation or melt event, water storage ponds are likely to all rise proportionately, making this mitigation potentially fruitless.	Please identify design considerations including maximum storage capacity, operational freeboard, spillway location and design, and excess treatment capacity which may allow for additional treated effluent discharge to environment in the event total pond capacity is exceeded.
ERFN-272	EIS Section 15.4.2 Effects on the Project Table 15.4-1	Denison notes that the system as proposed is designed to recycle a significant amount of the process water encountered, minimizing the amount of water that is needed to be withdrawn from Whitefish Lake. However, it is unclear from the description provided whether or not operational plan to be developed include considerations for minimum or maximum water levels within the storage ponds.	Please outline whether water storage ponds require a minimum amount of water to maintain operations of mine processes and function of the ponds themselves.
ERFN-273	EIS Section 15.4.2 Effects on the Project Table 15.4-1	Water takings and recycle may be effected during periods of extended drought. Increased water taking from Whitefish Lake may impact the water level in the lake, fish habitat, and use.	Please outline total water balance including maximum expected water takings from Whitefish Lake.
ERFN-274	EIS Section 15.4.2 Effects on the Project Table 15.4-1	The use of additional energy generation on site as a result of air conditioning will increase the carbon footprint of the project.	<p>(i) Please provide analysis of how increased air temperatures will alter the overall carbon emissions to be produced by this project.</p> <p>(ii) In the event that diesel generators are required as a result of a power</p>

			<p>outage, please provide a synopsis of how operations may be impacted, including a reduction in operations to minimize carbon emissions associated with running generators.</p> <p>(iii) It is recommended that during summer months, alternative energy options are utilized rather than diesel generators to provide backup power. This will minimize the carbon and nitrogen dioxide footprint.</p> <p>Please provide information on how the use of emergency diesel backup generators has been included into the predicted nitrogen dioxide and carbon emissions/air quality assessment.</p>
ERFN-275	EIS Section 15.4.2 Effects on the Project Table 15.4-1	Denison do not provide a discussion on the potential impacts of wind erosion on stockpiles or other dry-stacked materials during an extremely high wind event.	<p>(i) We recommend that PM15, metals, and radioactive material be modelled under extreme wind conditions, demonstrating potential dispersal, and associated implications.</p> <p>(ii) We request that Denison develop appropriate mitigation plans for minimizing dust from roadways, stockpiles, and dry-stacked materials as a result of extremely high winds - including those associated with tornadic events.</p>
ERFN-276	EIS Section 15.5 Climate Change	Denison notes that concerns related to climate change were raised during engagement and consultation activities, however, these concerns pertain to climate change rather than GHG emissions specifically. While this may be technically accurate, climate change and the release of GHG	Denison must recognize the inherent connectedness between its operation and climate change. Further, it is necessary that Denison implement meaningful and realistic approaches to minimizing its GHG emissions and contributions to climate change.

		<p>emissions should be considered as synonymous as the cause-and-effect relationship is well established.</p> <p>Denison will be responsible for the emission of significant amounts of GHG, which although are difficult to quantify in their impact on the local and regional environment, contribute to climate change which is experienced at local, regional, and global levels.</p>		
ERFN-277	EIS Section 15.5.3 Effects on the Project	Throughout much of the assessment on the effects of the environment on the project, Denison downplays the potential uncertainty due to natural events. This includes providing minimal discussion on the potential for flooding, excess snowfall, and tornadic events, as well as insufficient discussion on planned mitigation options for addressing effects of the environment identified.	<p>(i)</p> <p>(ii)</p>	<p>Denison should provide analysis of potential effects of the environment on the project as a result of surface water flooding, excess snowfall events, and tornados on the project.</p> <p>Denison should provide additional information linking mitigation measures to possible effects of the environment, including specific design standards to demonstrate the project will be designed to minimize risks.</p>
ERFN-278	EIS Section 15 General	<p>The Wheeler River project is located in an area of discontinuous permafrost. This aspect is not identified or examined with respect to the potential impacts of the environment on this project.</p> <p>(i) We see this as a potential significant oversight as works conducted and infrastructure constructed on discontinuous permafrost may be impacted by</p>	<p>(i)</p> <p>(ii)</p>	<p>Denison must provide discussion on the presence or absence of discontinuous permafrost in RSA, and whether that permafrost will be impacted by project activities.</p> <p>Where permafrost may be impacted, Denison must quantify the amount of GHG that will be released from melting or disturbed permafrost areas.</p>

- permafrost melt. As frost heave and slumping may adversely impact the project site.
- (ii) Permafrost has an ability to trap methane and other GHGs from escaping into the environment. Permafrost which is melted or disturbed may release those gases. If permafrost will be disrupted by project activities, Denison must consider GHGs to be released as part of its impacts on the environment.

# **APPENDIX B: TECHNICAL MEMORANDUM – COMMENTS ON WHEELER RIVER PROJECT ENVIRONMENTAL IMPACT STATEMENT FROM SOURCE ENVIRONMENTAL ASSOCIATES**

## TECHNICAL MEMORANDUM

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**Date:** February 12, 2023

**To:** Cheyenna Campbell, English River First Nation

**From:** Patrick Littlejohn, Ph.D., P.Eng., Rina Freed, Ph.D., P.Eng., Farzad Mohamm, Ph.D., P.Eng., Pauline Mengote, B.A.Sc., EIT, Mike Lapointe

**Subject:** Comments on Wheeler River Project Environmental Impact Statement

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Source Environmental Associates (Source) was requested to review the Draft Environmental Impact Statement for the Wheeler River Project (hereafter, the EIS) on behalf of English River First Nation (ERFN). Source was requested to focus on mine water management of the Project as well as issues related to groundwater and groundwater contamination.

The main EIS document and associated appendices were retrieved from the Impact Assessment Agency of Canada's portal in January 2023<sup>3</sup>.

The most critical topics identified through this review are what in Source's opinion is use of inappropriate groundwater remediation targets to allow for safe decommissioning of the project, the lack of incorporation of water recycle into quantitative water balance/water quality modeling, and the potential for predicted effluent of the Industrial Wastewater Treatment Plant to contravene the Fisheries Act/Canadian Metal and Diamond Mine Effluent Regulations.

Comments are divided by subject area but do not reflect an order of priority.

## Freeze-wall/Leach Decommissioning

### 1. Decommissioning Objectives

Section 2.3.3.1.1 states that "the mining area decommissioning objectives have been developed through groundwater modelling work and are achievable based on metallurgical testing," Section 7.6.2.1 refers to decommissioning objectives. The objectives are not appropriate for environmental protection. Table 2.3-3 decommissioning objectives represents water quality that represents a substantial environmental risk and would need generations of monitoring to assess migration of this highly impacted plume. pH 4 is highly acidic and metal/radiation levels are concerning (200 Bq/l radium is 200 to 1000 times safe

limits). For species where baseline levels are higher than safe levels, baseline levels should be used a target.

<sup>3</sup> <https://iaac-aeic.gc.ca/050/evaluations/proj/80178?culture=en-CA>



Further effort should be taken to define the remediation goals that are achievable with best available technology and a commitment should be made to remediate to the maximum extent possible (until baseline levels are reached or the water is deemed suitable with not risk or need to monitor further). Funds spent to remediate will reduce the need for multi-generational monitoring and an unreasonable burden and risk on future generations (to monitor for a very long period of time).

An options assessment for decommissioning objectives should be conducted based on Best Available Technologies (BAT) for treatment of contaminated groundwater and non-degradation approaches for the decommissioning objectives. Consultation on decommissioning objectives is required. Please revise the project closure plan to reflect updated decommissioning objectives.

## **2. Groundwater Protection – Decommissioning Targets for Groundwater Remediation**

To determine groundwater targets for decommissioning, the levels for groundwater protection from contaminated sites should be used for this project. This would involve use of typical numerical standards rather than the risk-based approach used in the EIS. A minimum level of protection is to define baseline groundwater levels where baseline is greater than WQGs for groundwater. It is acceptable to use the higher value as the target, with baseline being defined as 95% background.

As a point of reference, any groundwater decommissioning objective should be compared to the 95% background levels and/or numerical groundwater standards for contaminated sites at the depth of impact compared.

## **3. Groundwater Remediation by Replacement of Alkali**

Over the course of the project, a certain mass of acid will be added into solutions for injection into the formation. Use of peroxide/ferric may indirectly add acid load via oxidation of sulphide minerals or other oxidation-reduction reactions. Some of the acid used in the project will be neutralized on surface as part of water treatment and discharge. The difference between total acid added to the formation and acid neutralized on surface through treatment represents the net acid load added to the formation and left underground. The EIS describes one mitigation for the leach area as being pumping alkali solution (i.e. caustic) into the leach formation to neutralize residual acid. The mass load of alkali used during decommissioning should be commensurate with the net acid load added to the formation throughout the Project. Mitigation planning along these lines is recommended for consideration to support development of more environmentally responsible decommissioning targets.

## **4. Achievability of Proposed Decommissioning Objectives**

Section 2.3.3.1.1 on decommissioning and remediation of the mine area is vague and should be expanded. For example, certain reagents “may” be used, freshwater will be mixed with contaminated water as a remediation method, and remediation plans will be further refined.

Without prejudice to previous comments on the suitability of proposed decommissioning objectives (i.e. Table 2.3-3), the EIS requires a more specific plan on how decommissioning objectives will be achieved and how remediation targets will be assessed to be met.

## **5. Timing of Development of Decommissioning Targets**

To be able to plan for decommissioning, targets are essential to be developed now at the EIS stage. Otherwise, the project could be unacceptable to communities in the long term and there is no recourse. Mitigation planning to meet the closure targets must be outlined conceptually so that bonding can be put in place to ensure the targets are met and the project is acceptable. With that in mind, development of targets and an approach to achieve these targets is required at the EIS level and should not be deferred.

## **6. Freeze Wall Decommissioning**

The EIS states that the freeze wall will be allowed to thaw once recovered water meets the proposed mining decommissioning groundwater quality objectives and have demonstrated to be “stable over sufficient time”. The freeze wall should be maintained until there is no longer a groundwater plume. It is not environmentally responsible to leave the risk in the ground to monitor for many generations with the optimistic assumption that such a plume will not reach receiving environments. There is no precedent in Canada for the approach of purposefully leaving heavily impacted mine water injected underground with the expectation that it will not reach surface water. Modeling of such a plume is inherently uncertain and the highly impacted water represents a significant environmental hazard/liability. The approach should be to fully mitigate the groundwater zone impacted until the targets are reached. The stress on communities is too high if a groundwater plume of acidity is left in the ground. Adequate neutralization is critical for the groundwater impact zone so that a plume does not develop. Similar to regulation of contaminated sites source areas and plumes, the site is not remediated until it meets this standard of care.

It is unclear from the EIS how it will be determined that the freeze wall is no longer required at the site. ERFN must be engaged in decision-making for thawing of the freeze wall after Decommissioning objectives have been met.

## **7. Risks of Reliance on Long Term Monitoring Post-Decommissioning**

Section 7.8.2.2.4 groundwater monitoring, post-decommissioning outlines that monitoring will continue indefinitely, until “transfer of the site into the provincial institutional control program...” This ongoing monitoring requirement and stress on the communities and ongoing governance should be avoided or minimized to the extent possible by increasing the amount of remediation of the fluids to background levels. Purposely avoiding remediation efforts by passing the responsibility to ongoing monitoring adds significant uncertainty that objectives will be achieved, and should further mitigation be required, funds for execution would not be available from the closed project. Monitoring should be done as a last approach after all effort have been made to maximize remediation and minimize/remove the groundwater plume. For this project, the timelines and risks are too great to avoid mitigation measure for source control. The freeze wall, remediation pumping and treatment should continue until no further improvements are possible or targets are reached that reduce the need for long-term plume monitoring.

## **8. Groundwater Monitoring Locations**

Please clarify what changes to the groundwater monitoring network established during Operations will be anticipated during Decommissioning, including potential pathways of water from the mine site to the receiving environment. Figure 7.8-2 on PDF page 618 of the EIS is meant to illustrate the conceptual groundwater monitoring network during Decommissioning; however the figure does not show the proposed monitoring locations. A conceptual map similar to Figure 7.8-1 would be valuable and aid ERFN in determining the adequacy of the monitoring network and assessing potential impacts to important water courses.

### **9. Application of Progressive Reclamation to Groundwater**

The EIS mentions progressive reclamation in general terms. The concept of progressive reclamation is recommended to be applied to remediation of groundwater in the different zones of the leach field after leaching of the zone is complete. For example, progressive reclamation/remediation of the Phase 1 and 3 could be started while leaching of Phase 4 and 5 is underway.

## **Water Management**

### **10. Incorporation of Water Recycle into Project Planning**

The way water recycle is discussed and assessed in the EIS is inconsistent.

Section 2.2.1.4.6 states *“Once [Uranium Bearing Solution] UBS is recovered to surface, it will be pumped from the wellfield into the processing plant where uranium will be removed from the UBS (Section 2.2.2). The treated solution created can be refortified with reagents as required and pumped back into the mining area to maximize water recycling during the life of the mine..... No water recycling has been included in the water balances, although it is expected to occur.”*

Similarly, Section 2.2.3 states, *“Denison intends to recycle process water to the greatest extent possible, thereby reducing the demand for freshwater supply and volume of treated effluent. To develop a conservative assessment basis for the EA, the water recycled flows from the industrial wastewater treatment plant back into the processing plant and wellfield have not been incorporated into the estimates for freshwater withdrawal and treated effluent discharge.”* All models must be updated to include the operational strategy employed by Denison and actual conditions to occur during operations as best as possible.

From the perspective of fresh water withdrawal from the environment, evaluating the project water balance with the assumption that no water is recycled is conservative. However, from a water management and water treatment perspective the opposite is true as use of water recycle reduces risks by reducing the total amount of solution requiring management, reducing the rate of discharge of treated effluent and associated contaminant load going to Whitefish Lake.

The EIS should incorporate assessment of water recycling into a separate case for the water balance/water quality model (similar to the way base/upper case modeling is used for other phenomenon). The EIS should discuss limits of water recycling, such as the minimum amount of water

required to operate the project or the potential for contaminant accumulation in leachate that prevents effective recycle.

Further, recycling all or portion of the process water may increase the concentration of contaminants reporting to the IWWTP and may impact the effluent quality achievable. Accumulation of contaminants in the recycled solution and its impact on the performance of the IWWTP and effluent quality must be assessed and discussed. Incorporating water recycle may reduce the amount of process water requiring treatment and discharge and so may help ameliorate the concern with the high salinity of treated water as discussed in comment 19 of this document.

#### **11. Process Water Pond Design Basis**

The EIS describes several water storage ponds on surface including precipitate ponds and process water ponds. The design basis for these ponds in terms of how much solution storage is required is not clear in the EIS. The EIS should discuss the sizing basis for these ponds in more detail, including storage capacity for probable-maximum-flood, pond capacity used by precipitate, freeboard volume, and normal operations volume. This should also be discussed in the context of the total amount of solution requiring management at a given time (underground and on surface) and the extent of water recycle achievable. The ability to safely manage process water on surface is a critical mitigation measure for the project and so understanding the design basis for these features is required to assess risk to the environment.

#### **12. Process Water Storage Methods**

Figure 2.2-13, the Processing Plant Overview shows the 5000 m<sup>3</sup> uranium solution holding area would include tanks. This is incongruent with Section 2.2.2.2.1, which states that the UBS holding area will be contained by a double composite liner system with leak detection adjacent to the processing plant and under a fabric tension building system. It is unclear if Figure 2.2-13 shows what is currently being considered for the design.

## **Leachfield Design and Operation**

#### **13. Upwards Migration of Leach Solution**

Section 7.4.2 and section 7.6.2.1 describe scenarios for upward migration of acidic, impacted mining waters and include discussion of upward migration distances of 11 to 50 m. The basis for these scenarios is not made clear in the work uncertain and the rationale for why these scenarios are conservative is not sufficient. Upward migration could be a real risk for the project. For example, current and decommissioned boreholes for monitoring could be a pathway for migration of acidic, contaminated fluids to the surface. The EIS should provide a compelling case for the conservatism of the current approach and/or more rigorously assess the impact of substantive upward migration of leach solution.

#### **14. Freeze-wall Geometry**

Section 2.2.1.3 states “Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).” This is

20 m smaller than maximum extent of the area approximated to be influenced by mining around the deposit (50 m). This increases the risk of contaminants leakage from the mining affected area with potentially negative impacts on the receiving environment especially considering that the primary means of containing containment within the leaching zone relies on maintaining an inward hydraulic gradient by recovering more solution than what is being injected (1%). This is subject planned and unplanned operational downtime due to maintenance or other reasons. Please explain the rationale for the selection of a 30-m thick freeze wall and how it ensures the containment of contaminants as predicted under a variety of different site and mining conditions.

#### **15. Leakage of Freeze-wall Solution**

The ammoniacal solution will be used in the freeze plant to maintain the freeze wall in place for the execution of mining activities. Section 2.2.1.3.1 states that “The freeze plant will be designed with ammonia safety in mind to monitor for and minimize risks to workers and the environment from potential leakages”. However, no information is provided on potential underground leakages and assessment of potential negative impacts on water quality/balance as well as any appropriate mitigation measures. This is important because as stated in the Application, “the sandstone hosting the uranium deposit is permeable and groundwater can flow horizontally through the deposit.” Has the freeze-wall brine been evaluated as a potential source of groundwater contamination? How would leakage of freeze-wall liquid be detected or assessed?

#### **16. Impact of Power Outages on Freeze-wall, Solution Injection/Recovery**

Section 2.2.6.2 of the EIS states that “*to provide electrical service during times of utility outages, diesel generators will be installed to service the site and maintain essential functions. The generators will be used to maintain power to the processing plant and the camp, as well as to maintain other essential services as required.*”. Given the importance of maintaining the freeze wall as well as a negative water balance in the ISR area are key to the mitigation of environmental impacts, a plan must be developed for maintaining the operation of the ISR pumping and freeze systems during power outages. The EIS should discuss the impact of short term power outages on freeze-wall operation and efficacy and on the water balance associated with solution injection/recovery.

## **Water Treatment**

#### **17. Water Treatment Discussion**

An important aspect of the project to prevent environmental impacts is the industrial wastewater treatment plant (IWWTP) that is to treat excess process water and surface runoff. The EIS provides limited information about this system, its design basis, the Project specific testing conducted, or how the predicted effluent quality provided in Table 2.2-1 of the EIS was developed. Section 2.2.3.8 states, “*A metallurgical test program was completed at SRC to help define the IWWTP design and performance criteria.*”. However, no reference is provided to this program, nor its results or conclusions have been discussed in the Application. This is a key part of the mine design and is important for review to understand and evaluate the efficacy of the proposed mitigation measures.

Table 2.2-1 in Section 2.2.3.9 outlines the upper bound effluent quality proposed for the Project and states, “*the effluent quality was determined to be achievable through laboratory test results conducted by Denison at SRC.*”. However, this section does not provide a comparison of the concentrations achieved at the bench scale with the upper bound limits.

#### **18. Water Treatment Analogue Sites**

The IWWTP process appears to use similar process as other waste water treatment sites in the Canadian uranium mining sector. It would be useful if the EIS discussed the IWWTP relative to analogue sites in terms of the treatment technologies used and the quality of effluent achieved at other sites. How does the predicted effluent quality shown in section 2.2.3.9 compare to effluent from analogue sites in the Canadian uranium sector, for example water treatment systems at Cameco and Orano’s projects in the region?

#### **19. Water Treatment Objectives and the Fisheries Act, MDMER**

Table 2.2-1 of the EIS shows predicted effluent quality for the IWWTP. This table includes a prediction that the total dissolved solids in effluent is predicted to be 6,420 mg/L, with 600 mg/L chloride and 3,915 mg/L sulphate. The table also includes predicted effluent for copper of 0.042 mg/L. These levels approach the BC’s water quality guidelines associated with acute toxicity and so may be acutely toxic at the end-of-pipe (i.e. prior to discharge via diffuser in Whitefish Lake and subsequent dilution). Section 36.3 of the Fisheries Act specifies that, “...no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish...”<sup>4</sup> The Canadian Metal and Diamond Mining Effluent Regulations (MDMER) includes a definition of deleterious substance as effluent that is acutely lethal to several commonly tested species of fish and aquatic life.

Guidelines are not prescriptive and so the predicted effluent may or may not be acutely toxic, but since the levels of contaminants in predicted effluent are relatively high, it is recommended that the risk of acutely toxic effluent at end-of-pipe be assessed to support the EIS. Specifically, it is recommended that acute toxicity tests as described by MDMER be conducted on water quality matching the predicted effluent presented in the EIS.

#### **20. Use of Best Available Technology for Water Treatment**

Sections 2.2.3.8 and 2.2.3.9 of the EIS describe the IWWTP and note that the design of the system is being informed by an ongoing Best Available Technology (BAT) study. The EIS is not clear if the system as described in the EIS is a reflection of application of BAT or if this is an interim design pending completion of the BAT study.

Given the predicted effluent quality in 2.2.3.9 and the relatively high predicted levels of copper, it is recommended that this BAT study include assessment of use of organosulphide reagents (i.e. trimercapto-triazine). This type of chemical is a common and inexpensive method of removing heavy metals such as copper and cadmium from water. Use of organosulphide is commonly incorporated into

<sup>4</sup> <https://laws-lois.justice.gc.ca/eng/acts/F-14/page-5.html#docCont>



mine water treatment systems and is generally recognized as part of BAT treatment of mine water<sup>5</sup>. Copper levels in the range of single digit part per billion (ppb) are achievable, below the 22 ppb predicted effluent quality.

Similarly, the EIS notes the use of zero valent iron (ZVI) as a treatment reagent but it is not apparent how this is to be used in the process. ZVI can be a very effective method for removing metals and metalloids from mine water, particularly for relatively small treatment systems. Source supports the inclusion of this reagent in the process but requests additional information on how it is to be used. The predicted level of selenium in effluent (42 ppb) can likely be improved on through better application of ZVI.

Finally, the impact of different treatment technologies on TDS of effluent should be considered given the previous comment about potential for acute toxicity with the predicted effluent quality. Salt removal systems should be evaluated.

Overall, Source supports the use of a BAT study to inform design of the IWWTP and recommends that further bench testing be conducted in the future following the BAT study to improve on the predicted effluent quality presented in the EIS.

## **21. Integration of Water Treatment with Water Recycle**

According to the IWWTP flowsheet shown in section 2.2.3.8 of the EIS, treated effluent will be recycled. Considering that the leach is acidic and the IWWTP involves acid neutralization, it is recommended that considering drawing water for recycle from earlier in the treatment process be considered. This would reduce reagent demands from unnecessary acidification/neutralization as well as the amount of radionuclide and metals-laden treatment by-products that will have to be used and managed.

## **22. Environmental Exceedances at Upper Bound Discharge Rate**

Section 2.2.3.9 of the EIS states, "*The effluent quality was determined to be achievable through laboratory test results conducted by Denison at SRC.*". However, Section 6.2 of Appendix 10-A (Sensitivity Analysis) states, "*If treated effluent is released at the maximum upper bound discharge rate, cadmium concentration in Whitefish Middle/South and McGowan Lake (LA-1) would exceed its surface water quality guideline of 0.00004 mg/L, and chromium concentration in Whitefish Middle/South would exceed its surface water quality guideline of 0.001 mg/L. The modelled concentrations of other COPCs are expected to be below their corresponding surface water quality guidelines.*" Methods of preventing these exceedances should be explored and incorporated into the project. For example, alternative treatment technology may reduce metal loading with treated effluent, and greater water recycle would reduce the volume of treated water discharged, reducing the load of metal introduced to Whitefish Lake via treated effluent.

<sup>5</sup> <https://mend-nedem.org/wp-content/uploads/MEND3.50.1BATEAAppAD.pdf>

More generally, these exceedances caused by a higher rate of discharge is an example of how the assumption to exclude water recycling from water balance predictions is not entirely conservative.

## Geochemistry and Water Quality Source Terms

### 23. Geochemical Source Terms

The Application lacks a clear discussion of the various source terms that were considered for water quality modelling. Most reagents utilized for the ISR process include highly soluble contents and must be considered for modelling purposes. The Application is lacking a clear discussion of the various source terms and information geochemical stability of various sources that were considered for water quality modelling. Please clearly describe the sources of various contaminants in process water and how they inform water management/water treatment design. Distinguish between contaminants found in natural groundwater, contaminants released through leaching, and contaminants introduced as mill reagents (i.e. sulphate, TDS).

### 24. Propellant Permeability Enhancement

Section 2.2.1.4.3 lists options considered for enhancing leach solution permeability in the leaching zone and includes potential for use of *propellant permeability enhancement*. How does this material compare to common blasting explosives (i.e. ANFO) in terms of potential for water soluble explosive residue to be left behind after use? ANFO is commonly an environmentally relevant source of ammonia, nitrite and nitrate at mine sites. Please discuss the potential impact of propellant permeability enhancement products as a source of contaminants.

### 25. Leach Testing Program

Section 2.2.2 states “Denison’s processing plans are based on numerous metallurgical tests completed as part of engineering activities. A detailed metallurgical testing program was developed and implemented in collaboration with the Saskatchewan Research Council (SRC) under the supervision of several third-party consultants and Denison. Around 1,000 L of UBS was produced by leaching over 64 kg of core samples recovered from the Phoenix deposit and the UBS produced was tested using variations of several parameters to define the processing plant design and its components.” This work is critical for informing levels of contaminants expected to be leached in the in-situ process which in turn require treatment and management. This work is not discussed substantially in the EIS. The EIS should discuss how this work was carried out, a summary of key conclusions including estimates of freshwater and recycled water use, recoveries expected, reagents consumed, waste produced and steady-state contaminant concentrations.

### 26. Waste Rock Geochemistry

Section 2.2.4.8 states that approximately 7,800 m<sup>3</sup> of clean waste rock will be generated because of mining activities and Section 2.2.3.6 states that “a pond may be constructed beside the clean waste rock pad (Section 2.2.4.8) to collect runoff if required. The pond would be a single geomembrane-lined pond (Figure 2.2-26). Water collected in the clean waste rock pond would be routed to the process water



pond.". The Application however does not provide information on the geochemical stability of the waste rock and how waste rock is expected to impact water quality of runoff/pond inflow.

## 27. Process and Treatment Precipitate

Section 2.2.3.8 states that *"the majority of the IWWTP precipitates formed during the second stage of treatment are gypsum and these precipitates are not expected to be radioactive."* How much radioactivity is expected in these solids? Did the metallurgical test program include testing these solids for radioactivity and if available have these results been considered in the long-term management strategy for these solids?

## 28. Geochemical Stability of Precipitates

Figures 2.2-15 and 2.2-16 show that water from the IWWTP process precipitate pond will be recycled to the process pond at a rate of 5.35 m<sup>3</sup>/h that then primarily reports back to the IWWTP for treatment with some used for drilling. The water from the IWWTP precipitate pond forms ~ 65% and 41% of the flow rate reporting to the IWWTP for treatment during the operations and Decommissioning phases, respectively, so this is a significant source of feed water to the IWWTP. The geochemical stability of the precipitates in the two ponds should be evaluated and incorporated as source terms in water quality modeling. This should be discussed in the EIS.

# Environmental Management Planning

## 29. Care and Maintenance

The EIS does not provide information on the mine's plans for events of care and maintenance (C&M) or temporary closure. C&M is an important potential phase of mine life that warrant assessment of potential impacts. During C&M, changes to the site-wide water balance would be expected, potentially requiring modifications to the water management strategies at the site. In particular, it is important that a conceptual plan for how solution would be recovered/injected/managed on surface during a period of care and maintenance.

The EIS should include a conceptual description of how each major piece of mine infrastructure would be operated during C&M maintenance and how risk of environmental impact would be mitigated under these conditions. The following topics are recommended for discussion in C&M planning at the EIS level:

- (vi) Any significant changes to the water management strategies at the site, including whether the Industrial Wastewater Treatment Plant would be expected to continue operating during C&M.
- (vii) Any significant changes in how the freeze wall would be operated.
- (viii) Discussion of how leachate and process solution would be managed, i.e. would injection/recovery continue or cease, would any recovered solution be subjected to uranium recovery, how solution would be managed on surface if re-injection ceased.
- (ix) If monitoring activities would change during care and maintenance.
- (x) If any new mitigation measures are required to address C&M specific risks.

The development of the Care and Maintenance Plan should include input from ERFN.

### 30. Environmental Management Plan Minimum Content

Section 2.9.1 includes discussion of several environmental management plans. As a general comment, Source recommends that requirements for any project plan, include the following at a minimum in addition to plan specific topics:

- (vii) purpose and objectives of the plan;
- (viii) roles and responsibilities of staff including identification of Qualified Professionals(s);
- (ix) schedule for implementing the plan through relevant project phases;
- (x) means by which the effectiveness of the mitigation measures will be evaluated including the schedule for evaluating effectiveness;
- (xi) schedules and methods for the submission of reporting to specific regulatory agencies, ERFN, and the public and the required form and content of those reports;
- (xii) process and timing for updating and revising the plan including consultation with regulatory agencies and ERFN that would occur in connection with such updates and revisions.

Further, following the development of a plan, the plan should be provided to regulatory agencies and ERFN for review and consultation. Consultation should include invitation for agencies and ERFN to provide their views on the content of the plan in a reasonable timeframe. Subsequently, the Proponent should provide a written explanation to each party that provided comments describing how the views and information provided by the party has been considered in the revised plan or why such views and information were not addressed in a revised plan.

### 31. Emergency Response Planning

Section 2.9.1 of the EIS discusses environmental management activities including emergency response. As written, this section of the EIS focuses on the roles and responsibilities of Project staff. Communication to ERFN in the event of a mine emergency is critical for ERFN to evaluate potential impacts to rights and interests. Some mines in Canada overlook the importance of this communication and erode important partnerships with their Indigenous hosts by communicating information late or without transparency. Recommendations for inclusion in the Plan include a communication protocol based on emergency risk ratings and communications with Nation representatives for high consequence near miss incidents (i.e. near miss incidents that could have resulted in major environmental impacts or medical emergencies), as these can be valuable opportunities to improve training and operating practices. It is recommended that management plans and emergency response planning include communication protocol with ERFN so that ERFN is alerted to any incident in a timely fashion. Collaboration with ERFN in plan development, communication protocol, involvement of ERFN members in monitoring/response planning is recommended.

## Radiation and Waste Potentially Containing Radionuclides

### 32. Contingency Planning for Process Precipitates

Section 2.2.4.5 states *“The precipitates generated in the processing plant will be transferred to the process precipitate pond....this pond design will allow the precipitate totes to be stacked below ground level.....any runoff collected in the pond will be directed to the process water pond and recycled through the plant.”*. The Application also states that the waste stored in this pond contains 2-3% uranium rendering

it potentially economic for resale and recovery. A plan for managing this material should reprocessing it not be economically viable should be prepared and discussed in the EIS.

### **33. Industrial Landfill**

Section 2.2.4.3.2 discusses the industrial landfill that accepts industrial waste including radiologically contaminated waste. Leachate from this landfill will be collected and sent to the leachate collection pond immediately north of the landfill and eventually to the process water pond. Although the Application states that “upon closure of the site, the industrial landfill will be covered with an engineered impermeable liner system to minimize infiltration of precipitation into the containment system”, the leachate is not expected to stop. The Application however does not provide information on the management of the leachate from the industrial landfill post-closure. Considering the limited life of the double liner system used for the landfill area, management of radiologically contaminated waste and its impact on the receiving environment for all phases of the project must be discussed in the EIS.

### **34. Radon Purge Tank**

Section 2.2.2.2.1 states “The radon purge tank will contain a mechanical ventilation system to facilitate the aeration of the solution and the removal of radon gas from the UBS to the air outside of the plant.”. Is radon stripping on the exhaust proposed or is it to be directed into the atmosphere? Has exposure outside the building been evaluated?

## **Conclusion**

Thank you for the opportunity to provide technical review on the Wheeler River project on behalf of English River First Nation. To discuss further please contact the undersigned.

Yours sincerely,

**Source Environmental Associates Inc.**  
**per:**

Signature Redacted

Patrick Littlejohn, Ph.D., P.Eng  
Senior Chemical Engineer, Mining

# MN-S Denison Wheeler River Project

## Technical Review

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### Draft Environmental Impact Statement

March 4, 2023

Project No.: 261-04

#### Prepared For

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**Document details**

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## EXECUTIVE SUMMARY

This document summarizes a third-party review of Denison Mines Corp's (Denison) Draft Wheeler River Project (Project) Environmental Impact Statement (Draft EIS). This third-party review was conducted by Okane Consultants (Okane), Kiyano Ventures, and Two Worlds Consulting (TWC) on behalf of Métis Nation-Saskatchewan (MN-S) and considered:

- Reporting consistency and logic;
- Impact assessment and engagement best practices;
- Alignment with regulatory requirements set out for the Project;
- Alignment with Section 35(2) of the *Constitution Act* (1982);
- Alignment with Métis interests under the *1994 Métis Land Claim*, which covers the Project's geographical area and which the Government of Canada and MN-S agreed to address through the *2018 Framework Agreement*;
- Alignment with MN-S' *Duty to Consult and Accommodate Policy and Principles*;
- Acknowledgement and appropriate consideration of potential Project-related effects to MN-S, Northern Region 1 (NR1) communities, and Northern Region 3 (NR3) communities;
- Acknowledgement and appropriate consideration of Métis Knowledge;
- Acknowledgement of legacy resource development impacts to Métis;
- Alignment with the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP) and the Truth and Reconciliation Commission's (TRC) *Calls to Action*; and,
- MN-S' expectations for the Final EIS and Denison's engagement approach going forward.



### *Métis of Saskatchewan*

The MN-S is a democratically elected government that represents Métis citizens across the Métis Homeland in Saskatchewan. MN-S is mandated to implement Métis inherent right to self-determination and falls under the Métis Nation Legislative Assembly (MN-S n.d.). NR1 and NR3 are regional bodies within MN-S that have constitutional structure for the provision of delegated programs and services. Each region within MN-S has a Regional Director and encompasses local, part-time volunteer Métis groups ("Locals") comprising the local councils of Métis communities. Locals are entities that must be consulted.

**"The Métis culture will continue to be lived and celebrated when we pass our knowledge on to the generations who follow us" (MN-S 2023 Pg.1)**

MN-S works with Locals to support Métis consultation and engagement during the Environmental Assessment process. Consultation and engagement with Métis cannot be limited to Local and Regional governance bodies. The governance structure also requires consultation and engagement with MN-S who are responsible for broader Métis interests.

Métis citizens and communities continue to be affected by past and existing resource development projects. This technical review reflects Métis of Saskatchewan valued interests and expectations.

### *Engagement*

#### **MN-S considers the engagement and consultation record and level of effort as deficient.**

In completing the third-party review of Denison's Draft EIS, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- CNSC correspondence (Appendix A) indicating that consultation and engagement was expected to be with NR1 Locals, NR2 Locals, NR3 Locals, and MN-S. Given NR2's involvement in NexGen and Fission, MN-S limited its engagement and consultation expectations to NR1 Locals, NR3 Locals, and itself.
- The Glossary on page 3-iv states that an *Indigenous Community of Interest* is *A community whose traditional land or potential or established Aboriginal and/ or Treaty rights are in proximity to the Project or has existing transportation infrastructure that would be used by the Project. An Indigenous Community of Interest is more likely to experience impacts from the Project.*
- Métis Nation-Saskatchewan principles concerning engagement, consultation, and accommodation (<https://metisnationsk.com/land/#duty>)
- Core values and best practices established by the International Association for Public Participation (IAP2) (Core Values - International Association for Public Participation).
- Expertise of technical reviewers.



Key issues identified during the third-party review of Denison's Draft EIS related to engagement include:

- Denison definition of Indigenous Community does not meet Métis standards and the Draft EIS does not list MN-S or all NR1 communities and NR3 communities as an Indigenous Community of Interest.
- Denison had limited engagement with MN-S, NR1 Locals, and NR3 Locals in the exploration phase of the Project.
- Denison had limited engagement with MN-S, NR1 Locals, and NR3 Locals in the development of their Draft EIS and related studies.
- Denison has relied on one-way information sharing versus collaborative involvement for the Métis.
- Denison assumed public engagement with Métis attendance was the same as Métis-specific engagement.

To adequately engage NR1 Locals, NR3 Locals, and MN-S in the Project, Denison was expected to create ongoing collaborative Métis involvement opportunities during all phases of the Project including exploration phases. This depth of engagement allows for the development of familiarity with the proposed Project including identifying opportunities at community, technical, and leadership levels. Engagement and consultation were expected to include an exchange of ideas and expectations and meaningful resolution of issues that were identified. Open-houses and information sessions are the most minimal form of engagement and are not considered sufficient.

Project-related Métis engagement needed to be inclusive of all potentially impacted NR1 communities, NR3 communities, and MN-S and separate from all public engagement activities. For example, a public engagement open house event or an Eastern Athabasca Environmental Quality Committee (EQC) meeting with Métis citizens in attendance is not considered to be Métis engagement on the Project. This is especially important because some Métis citizens represent municipalities through their employment and therefore their feedback provided at that time should be considered from their employment/public perspective versus Métis perspective. Métis-specific engagement is the only engagement that MN-S would consider as reliable and valid.



Denison was expected to engage NR1 Locals, NR3 Locals, and MN-S to develop a communication and notification strategy that outlines a process for sharing Project information, valued component identification, and effects resolution and management. This strategy should have been developed jointly with MN-S. See MN-S' *Duty to Consult and Accommodate Policy and Principles* for more information.

Denison was expected to maintain a comprehensive record of contact that meets best practices. The Indigenous Engagement Record of contact should include:

- All phone call and email communications between Denison and/ or NR1 Locals/NR3 Locals/MN-S/Métis citizens
- Summary descriptions of details shared via email
- Summary descriptions of discussions had at meetings or via phone call
- Who attended meetings between Denison and NR1 Locals/NR3 Locals/MN-S/Métis citizens
- Identify any issues/interests shared by NR1 Locals/NR3 Locals/MN-S/Métis citizens during all communications (i.e., phone call, email meetings)
- Identify if phone calls, emails, or meetings fall under Denison's engagement program versus delegated procedural aspects of consultation requirements
- Meetings with NR1 Locals/NR3 Locals/MN-S where issues were discussed related to the proposed Project including project design and efforts to find resolution

The Indigenous Record of Contact should be shared with NR1 Locals/NR3 Locals/MN-S/Métis citizens for review and confirmation after each event.

Denison needs to update the Final EIS to reflect NR1 Locals, NR3 Locals, MN-S' citizens engagement expectations and preferences.



*Métis Knowledge and Traditional Land Use***MN-S considers the current Métis Knowledge and Traditional Land Use incorporation to be incomplete.**

In completing the review, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- The proximate Métis communities to the proposed Project in NR1 and NR3 other than Kineepik Local #9 (Pinehouse).
- Method by which Métis Knowledge / Indigenous Knowledge / Local Knowledge was included in the effects evaluation and best practice standards.
- Expertise of technical reviewers.

MN-S does acknowledge that its Métis Knowledge Study with NR1 and NR3 is in the works and was funded by Denison.

The Métis knowledge incorporation in the Draft EIS is consistent with practices of relating Indigenous Knowledge and Western Science baseline knowledge. The Draft EIS does include a summary of Indigenous Knowledge use in the Draft EIS document (Table 3.5-1) and how it was incorporated. The Draft EIS also includes perspectives on *Lands Taken Up from an Indigenous Perspective* was part of the cumulative effects assessment. While more detail and effort could have been done with effects thresholds from an Indigenous perspective and mitigation creation, the MN-S Métis Knowledge Study can likely assist with expanding on specific points of concern.

MN-S expects to see the inclusion of its Indigenous Knowledge in the Final EIS.

*Economic Benefits***MN-S considers the economic evaluation and economic benefits limited**

In completing the review, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- Expertise of technical reviewers.

The Draft EIS references Employment and Training, Income, Traditional Economy, Government Revenues and Business Opportunities as the valued components. The deficiency highlights are:

- The baseline information for the effects analysis is not the latest information since it does not include that latest information from and survey from Statistics Canada.
- The analysis also lacks an acknowledgement of the effect of Covid-29 in Denison's ambitions for employment and training, and business opportunities and what efforts will be done to counter that effect to maximize benefits.
- Employment and training, and business opportunities are limited benefits and from the text it is unclear how much of this benefit will be left in the north. The plan is only to pick-up in two communities as well as Saskatoon. With over 55% of the positions



requiring highly technical skills, it is likely that these positions will not be found in the north according to the data. Therefore, communities will be left with unskilled labour positions. The short time of the operations will also confine opportunities to advance. Overall, the section offers benefit types but only does limited evaluation of delivery in northern communities.

- Lack of concrete benefits is missing as mitigation in the Economic section. For example, NR1 and NR3 Métis recall early recommendations for revenue sharing to address socio-economic concerns and that further activity not proceed *until a form of revenue sharing, acceptable to the majority of impacted communities, has been agreed upon*<sup>1</sup>. Revenue sharing is not a new idea but it is increasingly part of project approvals packages especially when other benefits are limited. Overall, the section infers that further arrangements are forthcoming, and these will address the limitations of the current mitigation measures.
- The section introduces the idea of local study area (LSA) communities that do not seem to align with earlier Indigenous Community of Interest. This change is unexplained.



The Final EIS needs to include much more detailed analysis of the strength of the benefits to northern communities and alternate means of offsetting impacts and providing benefits that more closely align the Métis aspirations in the 21<sup>st</sup> century.

### *Monitoring and Effects Management*

#### **MN-S considers Denison's monitoring and effects management plans and programs as deficient.**

In completing the third-party review of Denison's Draft EIS, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- The consideration of Métis involvement in the Project's monitoring and effects management plans and programs.
- The method by which Métis Knowledge will be used to inform the design of the Project's monitoring and effects management plans and programs.
- Expertise of technical reviewers.

Key issues identified during the third-party review of Denison's Draft EIS related to monitoring and effects management include:

- The monitoring and effects management plans lack detail and still need to be developed.
- The discussion for plans development lacks details on how the Métis will be involved in the development, implementation, and reporting of monitoring and effects management plans and programs.

<sup>1</sup> [https://publications.gc.ca/collections/collection\\_2017/acee-ceaa/En106-21-1993-eng.pdf](https://publications.gc.ca/collections/collection_2017/acee-ceaa/En106-21-1993-eng.pdf)

- Denison shared during recent meetings with NR1 and NR3 that the Project could use the EQC model for the Project's monitoring and effects management. It needs to be noted that the EQC has lacked Métis involvement to date.
- Denison does not commit to sharing plain language findings of environmental and effects monitoring and maintenance plans and programs with MN-S, NR1 Locals, and NR3 Locals to support the dissemination of these findings at the community-level.
- The Draft EIS does not identify opportunities for Métis-led data collection alongside Denison's biophysical surveying teams. This type of data collection will enhance the Project's environmental and effects management and monitoring plans and programs to better reflect local Métis Knowledge, ways of knowing, and doing.

In the Final EIS, Denison is expected to have completed detailed monitoring and effects management plans that align with adaptive management practices. The plans need to show how NR1 Locals, NR3 Locals, and MN-S were involved in development to be consistent with Section 3 of the Draft EIS and include of Indigenous Knowledge (e.g., data collection alongside Denison's surveying teams). Denison is expected to provide plain language summaries, posters/handouts, and presentations on monitoring and effects management plans and programs to MN-S, NR1 Locals, and NR3 Locals. Finally, if the EQC is expected to be part of monitoring, then means need to be put in place to ensure Métis continuing involvement.



### *Project Design*

#### **MN-S considers Denison's mitigations to avoid, or limit identified adverse effects resulting from the Project design as deficient.**

In completing the third-party review of Denison's Draft EIS, the following points were taken into account:

- Feedback shared by NR1 Locals, NR3 Locals, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- Potential impacts to Métis as a result of Project design-related effects to the receiving environment.
- Expertise of technical reviewers.

Key issues identified during the third-party review of Denison's Draft EIS related to Project design include:

- The Project design relies on two existing technological processes that have never been used together to extract and process uranium (i.e., in-situ recovery (ISR) and freeze walls).
- The Draft EIS lacks sufficient detail on measures and monitoring to ensure stability through post-decommissioning (e.g., actions to ensure no Project-related effects to water quality during the thawing of the freeze walls).
- The Draft EIS has not considered the benefit of additional source term control(s) instead of focusing on managing contaminants along the pathway before they enter the receiving environment.
- The Draft EIS does not include a Project-specific climate change model database.

- The Draft EIS does not include cumulative effects considerations important to NR1 Locals, NR3 Locals, and MN-S.

The satisfy MN-S, NR1 Locals, and NR3 Locals, Denison is expected to update the Final EIS to include appropriate mitigations to avoid or limit identified adverse effects caused by Project design. Further, the detailed plan development needs to include NR1 Locals, NR3 Locals, and MN-S.

Denison is expected to complete simulations to evaluate the benefit of additional source term control(s) (i.e., actions that control pollutants and prevent contamination) instead of focusing on managing contaminants along the pathway before they enter the receiving environment and include in the Final EIS.

Denison to develop a Project-specific climate change model database, or include in the Final EIS for review.

Finally, the cumulative effects considerations will need to be revised throughout to include input from NR1 Locals, NR3 Locals, and MN-S in the Final EIS.



### *Aquatic Ecosystems*

#### **MN-S considers the assessment of and mitigations to address potential Project-related effects to aquatic ecosystems as deficient.**

In completing the third-party review of Denison's Draft EIS, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- The method by which Métis Knowledge will be used to inform assessment of potential Project-related effects to the aquatic environment.
- Potential impacts to Métis as a result of Project-related effects to aquatic ecosystems.
- Expertise of technical reviewers.

Key issues identified during the third-party review of Denison's Draft EIS related to aquatic ecosystems include:

- Russell Lake was not identified as a location to monitor fish health. This lake will help detect cumulative effects from the Key Lake operation to fish health.
- Whitefish Lake North is being used as a reference area to monitor fish health. Denison did not identify if there is a physical barrier between Whitefish Lake South and Whitefish Lake North. Without a barrier, fish may move between both lakes and therefore monitoring results will not show if potential effects to fish health are caused by the Project.
- No modelling has been conducted to confirm at the time of decommissioning that there is "large assimilative capacity" of the groundwater system, to manage risk in Whitefish Lake.
- It is unclear if groundwater recharge rates in the Draft EIS were adjusted to account for potential groundwater recharge impacts from climate change.

- Denison assumes it is “conservative” to supply all water for the Project from outside the ore zone and assumes minimal use of recycled / treated water.

Denison is expected to revise the fish and fish habitat section to sufficiently incorporate Métis Knowledge from the MKS in the Final EIS.

Denison is expected to include Russell Lake in the aquatic monitoring program as cumulative effects from the Key Lake operation will be detected in this waterbody.

Denison needs to confirm fish movements between Whitefish Lake North and Whitefish Lake South and if Whitefish Lake North is an appropriate reference lake. If it is not appropriate, then another reference lake such as Kochichowsky Lake may need to be considered.

The Final EIS is expected to sufficiently incorporate Métis Knowledge from the Métis Knowledge Study (MKS) currently being completed.

### *Terrestrial Ecosystems*

#### **MN-S considers the assessment of and mitigations to address potential Project-related effects to terrestrial ecosystems as deficient.**



In completing the third-party review of Denison’s Draft EIS, the following points were taken into account:

- Feedback shared by NR1, NR3, and MN-S based on their legacy experience with other resource development projects in the Métis Homeland.
- The method by which Métis Knowledge will be used to inform assessment of potential Project-related effects to the terrestrial environment.
- Potential impacts to Métis as a result of Project-related effects to aquatic ecosystems.
- Expertise of technical reviewers.

Key issues identified during the third-party review of Denison’s Draft EIS related to terrestrial ecosystems include:

- The terrestrial Regional Study Area (RSA) seems small in consideration of woodland caribou habitat and determining the impacts of the Project to the SK1 caribou population.
- Potential short-term or long-term Project impacts on the overall health of the terrestrial ecosystem are not clearly outlined in the Draft EIS.
- Reliance on non-Indigenous hunter data from the southern portion of the province to inform the Draft EIS assumptions for harvesting numbers and success.
- The duration of habitat changes that may interfere with predator/prey densities was not confirmed in the Draft EIS.
- No rationale was provided on why large terrestrial mammals that are harvested in the Local Study Area (LSA) are not found in sufficient abundance.
- The Draft EIS does not include a moose-specific monitoring and management plan.

Denison, as best practice, should extend terrestrial RSA boundaries in the Final EIS in recognition of the range of SK1 woodland caribou and caribou habitat to better analyze for cumulative effects.

Denison to assess the cumulative impact of all the individual changes to the vegetation on the entire terrestrial ecosystem.

Denison to include Métis harvesting patterns identified in the MKS in the Final EIS.

Denison to work with NR1 Locals, NR3 Locals, and MN-S to co-develop monitoring and effects management plans such as the Woodland Caribou Management Plan.

Denison to co-develop and implement a moose-specific monitoring and management plan with the Métis.



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## ABBREVIATIONS

Abbreviations	Name
BC	British Columbia
CEA	cumulative effects assessment
CNSC	Canadian Nuclear Safety Commission
COI	community of interest
COPC	constituent of potential concern
Draft EIS	Draft Environmental Impact Statement
Denison	Denison Mines Corp
EA	environmental assessment
ECCC	Environment and Climate Change Canada
EIS	environmental impact statement
EMS	Environmental Management System
EPP	Environmental Protection Plan
ERFN	English River First Nation
Final EIS	Final Environmental Impact Statement
FPIC	free, prior, and informed consent
GQSC	groundwater quality screening criteria
IK	Indigenous Knowledge
ILRU	Indigenous Land and Resource Use
IPP	Indigenous Peoples Policy
ISR	in situ recovery
KI	Key Indicator
Kiyano	Kiyano Ventures
KML	Kineepik Metis Local #9
KPI	key person interview
LK	Local Knowledge
LSA	Local Study Area
MKS	Métis Knowledge Study
MLTC	Meadow Lake Tribal Council
MN-S	Métis Nation-Saskatchewan
NAD	Northern Administration District
NR1	Métis Northern Region 1
NR3	Métis Northern Region 3
Okane	Okane Consultants
OLRU	Other Land and Resource Use





Abbreviations	Name
PAGC	Prince Albert Grand Council
PML	Patuanak Métis Local
Project	Denison Wheeler River
RAP	Reconciliation Action Plan
RESPEC	RESPEC Company LLC
RSA	Regional Study Area
SK	Saskatchewan
SML	Sipishik Métis Local
SSP	shared socioeconomic pathway
TRC	Truth and Reconciliation Commission
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
VC	valued component
YNLR	Ya'thi Néné Lands and Resource Office



## HOW TO READ THIS REPORT

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Please note authors of this report reference document page numbers, not PDF page numbers.

Please note authors of this report used the arrow bullet to indicate concern(s) with identified EIS quote.

### 1. INTRODUCTION

Denison Mines Corp (Denison) is proposing to construct, operate, and decommission an *in situ* recovery (ISR) uranium mine and processing plant, the Wheeler River Project (Project), in Métis Homeland. Specifically, the Project is in Métis Northern Region 1 (NR1) with effects into Northern Region 3 (NR3) and is anticipated to last 38 years (Denison 2022).

The Project is subject to a coordinated environmental assessment (EA) process between the Saskatchewan Ministry of Environment's Environmental Assessment and Stewardship Branch, and the Canadian Nuclear Safety Commission (CNSC). The EA is meeting the requirements of both the *Canadian Environmental Assessment Act, 2012* and Saskatchewan's *Environmental Assessment Act* (1980).

On behalf of Métis Nation-Saskatchewan (MN-S), Two Worlds Consulting undertook a third-party review of the Draft Environmental Impact Statement (EIS) with the support of Okane Consultants (Okane) and Kiyano Ventures.

This Technical Review Report ("report") was prepared for submission to the CNSC and documents issues, concerns, and recommendations for the Final EIS.

#### 1.1 Consulting Firms

##### 1.1.1 Two Worlds Consulting (TWC)

TWC is a Canada-wide social and environmental consultancy. We partner with Indigenous Nations, governments, and the private sector to support rigorous process, informed decision-making, and shared prosperity. TWC originated as a Certified Aboriginal Business based in Victoria, BC. Launched by Jennifer Campbell in 2016, TWC has evolved into a thriving consulting firm with reach from coast to coast to coast.

"Guidance with Integrity" is our brand promise and an internal call to action that governs all our work. At TWC, integrity is inherent in everything we do. In our role as project advisors, we use our experience and technical expertise to help project leaders and participants respectfully navigate complex processes, regulatory requirements, and decision-making that yields shared value.

#### TWC Reviewers

Heidi Klein, MES, reviewed the Project's Draft EIS and supporting documents. Ms. Klein has over 30 years of experience in the practice of environmental assessment, including legislation advisor, project assessment, socio-economic impact assessment, Indigenous knowledge



collection and documentation, cumulative effects assessment, and Indigenous and stakeholder relations.

Eliza Bethune, MPPGA, reviewed the Project's Draft EIS and supporting documents.

Ms. Bethune has 5 years designing, executing, and evaluating effective engagement programs for public and private sector clients and Indigenous Nations. Eliza has experience leading and supporting Indigenous, public, and stakeholder engagement programs for oil and gas, mining, road and rail, policy, contaminated sites, aluminum, and infrastructure projects, spanning a variety of regulatory jurisdictions.

Emily DiTomaso, BA, reviewed the Project's Draft EIS and supporting documents. Ms. DiTomaso has over 10 years experience with Indigenous engagement, proponent and stakeholder relations, Indigenous knowledge collection and documentation, environmental assessment, as well as archaeology and heritage management. Her experience includes working in a variety of sectors such as mining, transportation, oil and gas, and renewable energy throughout western Canada within a variety of regulatory jurisdictions.



Daryl Harrison, BA, ADP GIS, reviewed the Project's Draft EIS and supporting documents. Mr. Harrison has over 15 years' experience with resource development, land use planning and environmental assessments. He has contributed to a number of socio-economic impact assessments in western Canada, Ontario, and internationally with a focus on land and marine resource use, visual quality, and socio-community components.

### **1.1.2 Okane Consultants (Okane)**

Okane helps mining companies to return the land responsibly and safely at the end of a mine's lifecycle. We believe in challenging the status quo and advocate for meaningful partnerships and positive outcomes for community stakeholders and Indigenous rightsholders. Our solutions help our clients achieve positive financial, environmental, and social outcomes from feasibility through to relinquishment.

#### **Okane Reviewers**

Mike O'Kane M.Sc., P. Eng. Senior Technical Advisor is the founder of Okane Consultants. Mike works with the company as a senior technical advisor applying technical expertise and knowledge on risk management best practices as tools for development and communication of project objectives and designs. He provides peer review for numerous government and private agencies while also being a member of multiple advisory panels. Mike serves as a director of the Landform Design Institute and chair of its Technical Advisory Panel.

Marty Sangster B.Sc., P.Eng. is a Senior Geotechnical Engineer with 19 years' industry and consulting experience. He is an accredited Professional Engineer in several constituencies in Canada and Australia. Marty's professional experience includes design and construction supervision of mine tailings earthwork structures, numerical modelling for consolidation and slope stability, development of geotechnical sampling, testing, and monitoring programs.

Lachlan Ashby M.Sc. P.Biol is a Senior Scientist and project manager with over 15 years in Australia and Canada. He has an extensive consulting background within the resources and energy industries. His professional experience consists of regulatory engagement, project leadership, technical coordination of environmental studies and specialists, and contaminated site remediation.

### **1.1.3 Kiyano Ventures (Kiyano)**

Kiyano Ventures is an Indigenous-owned joint venture between the Saskatchewan First Nations Natural Resource Centre of Excellence and RESPEC Consulting Inc. Providing services throughout North America, Kiyano specializes in sustainable engagement strategies that combat historical gaps between Indigenous Peoples and the natural resource industry. We support informed decision making through digital data work products such as natural resource mapping, land use and occupancy mapping, impact assessments and other technical reviews backed by subject matter expertise. Kiyano is championing a world in which informed consent, equitable participation, and collaborative capacity building produce sustainable and economic opportunities for Indigenous Peoples.



#### **Kiyano Reviewers:**

Sheldon Wuttunee provided Indigenous knowledge and client relations expertise to the project team. As Co-Founder of Kiyano Ventures and President and CEO of the Saskatchewan First Nation Natural Resource Center of Excellence, Sheldon leads and supports 74 First Nations in developing sound decisions regarding the sustainable natural resource development of their lands. Mr. Wuttunee has 25 years of experience in consistently managing, negotiating, and consulting to advance the interests of Saskatchewan Indigenous Peoples across a broad scope of natural resources including oil and gas, uranium, potash, and forestry. He has extensive involvement in the Saskatchewan/Federal Government Duty to Consult processes.

Ms. Debra Shewfelt, M.Sc., P.Geo, provided project management expertise to the EIS review. As Co-Founder of Kiyano Ventures and Co-President, Board member, and Senior Geologist of RESPEC Consulting Inc., Ms. Shewfelt draws on two decades of career experience in the natural resource sector, including flagship Saskatchewan commodities such as potash and uranium. Her work on clean energy and climate projects, as well as impact assessments for rural and remote communities, demonstrate her passion for environmental stewardship and sustainability.

Ms. Sheri Stark, B.Sc., PMP, reviewed the Project's Draft EIS and supporting documents. Ms. Stark has over 15 years in the environment industry. The majority of her experience has been within Saskatchewan, supporting mining projects. These include the uranium mining industry, potash mining and gold mining. She has lead and executed environmental assessments for new mining projects, as well as expansion projects that have triggered the federal and/or provincial environmental assessment processes.

1.2 Documents Reviewed

Denison Mines Corp. “Wheeler River Project Draft Environmental Impact Statement”. 2022.

1.3 Methodology

The technical review of the Draft EIS and selection of relevant sections was guided by areas of primary interest to Métis, feedback shared by NR1 and NR3, and letters exchanged between MN-S’ Legal Team and the CNSC (**Appendix A**), and available funding. Therefore, the third-party review only focused on 13 Draft EIS sections:

Table 1: Sections Reviewed

Denison Mines – Wheeler River Project Draft Environmental Impact Statement	
1.0 Introduction	9.0 Terrestrial Environment
2.0 Project Description	11.0 Land and Resource Use
3.0 Indigenous and Local Knowledge	12.0 Quality of Life
4.0 Engagement	13.0 Economics
5.0 Approach and Methodology of the Assessment	15.0 Effects of the Environment on the Project
7.0 Hydrogeology	16.0 Assessment Summary and Conclusions
8.0 Aquatic Environment	



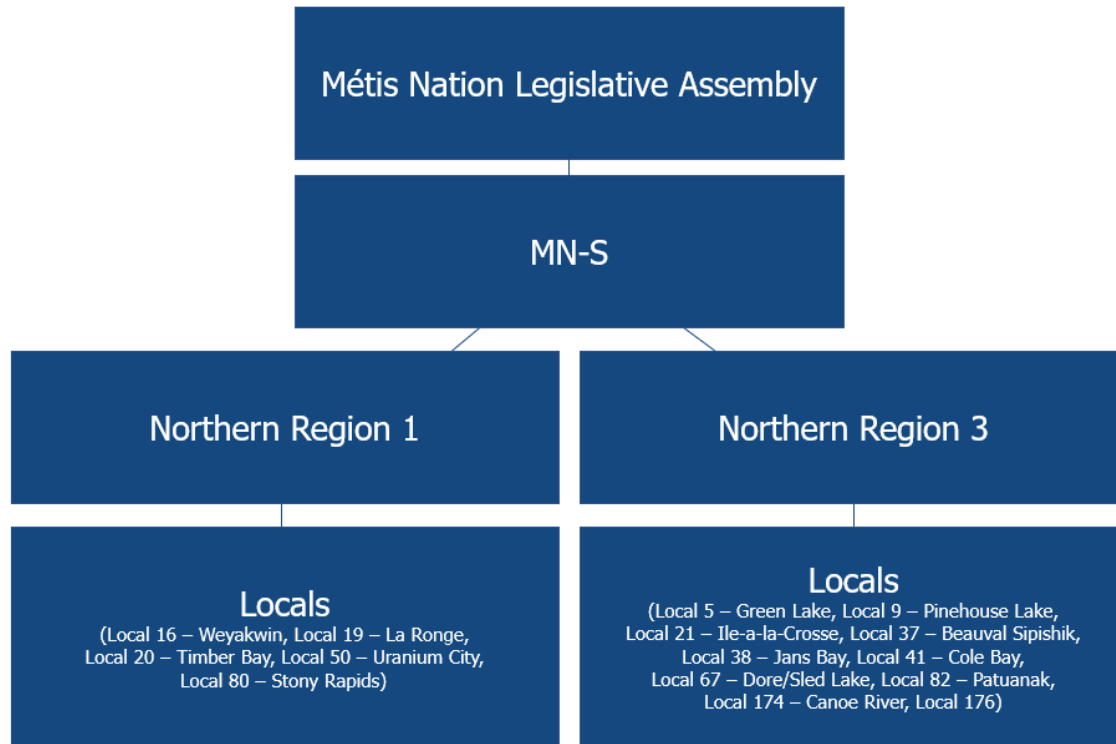
Should additional funds be made available, MN-S reserves the right to review the remaining sections of the Draft EIS.

2. WHO ARE MÉTIS

Métis are distinct peoples that emerged during the 18<sup>th</sup> and 19<sup>th</sup> centuries and are recognized under *Section 35* of the *Constitution Act* (MN-S n.d.). Métis peoples have a shared history and common culture (song, dance, dress, and national symbols) arising from the union of European fur traders and Indigenous women. They have a unique language (Michif, with various regional dialects), extensive kinship connections, distinct way of life, and a defined traditional territory across the Canadian Western prairies and parts of British Columbia, Ontario, Northwest Territories, North Dakota, and Montana (MN-S 2023 Pg.1). Like other Indigenous groups across Canada, the effects of colonization significantly impacted the Métis. Despite challenges and barriers stemming from colonization, Métis peoples have persevered and continue to share, celebrate, and honour historical and contemporary Métis ways of knowing and doing today such as the Back to Batoche Festival in July 2022 (MN-S 2023).

The MN-S is a democratically elected government that represents Métis citizens across the Métis Homeland in Saskatchewan. MN-S is mandated to implement Métis inherent right to self-determination and falls under the Métis Nation Legislative Assembly (MN-S n.d.). Northern Region 1 (NR1) and Northern Region 3 (NR3) are regional bodies within MN-S that have

constitutional structure for the provision of delegated programs and services. Each region within MN-S has a Regional Director and encompasses local, part-time volunteer Métis groups ("Locals") comprising the local councils of Métis communities. Locals are entities that must be consulted. Figure 1 below illustrates the Métis governance structure in Saskatchewan.



*Figure 1: Métis Governance Structure in Saskatchewan*

MN-S works with Locals to support Métis consultation and engagement during the Environmental Assessment process. Consultation and engagement with Métis cannot be limited to Local and Regional governance bodies. The governance structure also requires consultation and engagement with MN-S who are responsible for broader Métis interests.

Métis citizens and communities continue to be affected by past and existing resource development projects. This technical review reflects Métis of Saskatchewan valued interests and expectations.

### 3. DETAILED REVIEW

#### 3.1 Executive Summary

Issue #	Concerns	Recommendations
ES-001	<p><b>2 Project Overview (p. 2)</b></p> <p>"The use of a collaborative approach to engagement and advancement of the Project is exemplified by the input these groups have provided to influence both Project designs and the EA in various ways."</p> <ul style="list-style-type: none"> <li>→ Denison's engagement approach to date has not been collaborative.</li> <li>→ Denison has not engaged all potentially impacted Métis communities.</li> </ul>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to engage NR1 Locals, and NR3 Locals, in addition to Kineepik Metis Local #9, throughout the life of the Project.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.</p>
ES-002	<p><b>3 Project Setting (p. 4)</b></p> <p>"The Project falls within the boundaries of Treaty 10, in the Nuhtsiye-kwi Benéne (Ancestral Lands) of English River First Nation (ERFN), in the traditional territory of the Kineepik Métis Local #9, in the homeland of the Métis, and within Nuhenéné."</p> <ul style="list-style-type: none"> <li>→ Denison does not acknowledge that the Project falls within the MN-S Homeland.</li> </ul>	<p>Denison needs to revise the Final EIS Executive Summary to note that the Project falls within the Homeland of MN-S, NR1 Locals, and NR3 Locals. Denison needs to apply this change throughout the EIS, where applicable.</p>
ES-003	<p><b>3 Project Setting (p. 6)</b></p> <p>"The closest traditional resource user lease is approximately 12 km away."</p> <ul style="list-style-type: none"> <li>→ Denison did not engage MN-S on potential Project-related effects to Métis traditional use activities and therefore may not be aware of potential traditional use activities conducted by Métis peoples in and around the Project. Denison's reliance on reviewing traditional resource user leases is not an appropriate</li> </ul>	<p>Denison needs to incorporate Métis Knowledge from the Métis Knowledge Study (MKS) into their discipline-specific effects assessment, the Final EIS, and all monitoring plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to determine the appropriate funding, process, and timeline to conduct the MKS.</p>



Issue #	Concerns	Recommendations
	<p>way to determine Métis traditional resource use in and around the Project.</p>	<p>Denison to acknowledge that lease review data is not an appropriate way to determine Métis traditional resource use in and around the Project in the Final EIS.</p>
ES-004	<p><b>3.4.2.4 Waste Management (p. 20)</b></p> <p>"Hazardous wastes will be stored temporarily on this pad before being taken off site by waste management service providers for proper recycling or disposal."</p> <p>→ Denison EIS does not outline where hazardous waste will be taken for proper recycling or disposal.</p>	<p>Denison needs to share where hazardous waste will be taken for proper recycling and disposal with MN-S, NR1 Locals, and NR3 Locals.</p>
ES-005	<p><b>3.4.3 Proposed Schedule and Activities (p. 21)</b></p> <p><i>Table 1: Project Phase, Year, and Associated Activities</i></p> <p>Phase and Year: Construction Year 1 to 3 and Operation Year 3 to 18</p> <p>Description of Activities: "Engagement - site visits from Interested Parties"</p> <p>→ Per Denison's definition, MN-S, NR1, and NR3 are an Indigenous Community of Interest. Denison notes site visits as the only engagement-associated activities in each Project Phase. Additional involvement opportunities should be provided to MN-S throughout the life of the Project.</p>	<p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals as an Indigenous Community of Interest throughout the life of the Project.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals, to understand their preferred level of involvement throughout the life of the Project.</p>
ES-006	<p><b>3.4.4 Management Systems (p. 22 to p. 23)</b></p> <p>"In addition, the EMS [Environmental Management System] establishes expectations (and associated mechanisms) for contractors and sub-contractors to comply with environmental commitments and policies including auditing and enforcement programs.</p> <p>Denison is responsible for, and committed to providing, sufficient resources to: develop and implement the EMS to meet statutory/regulatory requirements; meet its corporate</p>	<p>N/A</p>





Issue #	Concerns	Recommendations
	<p>expectations with respect to environment performance; meet the expectations of its Interested Parties, including Indigenous communities, with respect to environment performance; and fulfill any commitments made through the EA process and beyond through all Project phases."</p> <p>→ MN-S appreciates Denison's recognition to reflect MN-S to develop and implement the EMS to MN-S expectations.</p>	
ES-007	<p><b>3.4.8 Indigenous Knowledge (p. 26)</b></p> <p>"Denison has brought this Indigenous Knowledge and Traditional Knowledge together with western science throughout the EA process. Additionally, Denison is supporting several processes to aid community-led collection of IK. These processes are at different stages of completion. Denison will continue to consider and integrate results from any forthcoming materials provided by communities as it advances the EIS process."</p> <p>→ Denison did not engage MN-S on potential Project-related effects to Métis traditional use activities such as (but not limited to): hunting, trapping, and fishing.</p>	<p>Denison needs to incorporate Métis Knowledge from the Métis Knowledge Study (MKS) into their discipline-specific effects assessment, the Final EIS, and all monitoring plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to determine the appropriate funding, process, and timeline to conduct the MKS.</p>
ES-008	<p><b>4 Summary of Engagement</b></p> <p><b>4.1 Introduction (p. 27)</b></p> <p>"Since 2016, Denison has engaged with Interested Parties to develop meaningful relationships and facilitate a collaborative approach to engagement and the advancement of the project."</p> <p>→ Denison has not engaged all potentially impacted Métis communities. Denison's engagement to date has not included Métis communities in NR1.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to engage all NR1 and NR3 communities, in addition to Kineepik Metis Local #9, throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p> <p>To facilitate a collaborative approach to engagement, Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.</p>



Issue #	Concerns	Recommendations
ES-009	<p><b>4.1 Introduction (p. 27)</b></p> <p>"Denison has developed and implemented an engagement plan to guide and structure engagement activities related to the Project."</p> <p>→ MN-S has not had an opportunity to review Denison's engagement plan.</p>	<p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for review and comment.</p>
ES-010	<p><b>4.2 Engagement Approach (p. 28)</b></p> <p>"Engagement is defined as the sharing and gathering of project-related information from Interested Parties, and the collaboration with Interested Parties, in good faith, with the goal of developing mutually acceptable resolutions to issues identified. Developing authentic relationships with Interested Parties to facilitate productive engagement is expected to play an integral role in the long-term success of the Project."</p> <p>→ Denison has not engaged all potentially impacted Métis communities. Denison's engagement to date has not included Métis communities in NR1.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to equally engage all NR1 and NR3 communities, in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p> <p>To facilitate a collaborative approach to engagement, Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.</p>
ES-011	<p><b>4.2 Engagement Approach (p. 28)</b></p> <p>"For each engagement activity, any perspectives that were shared by an Interested Party were recorded and consolidated into a single Engagement Database."</p> <p>→ There are only two entries related to engagement with Métis communities (with exclusion to Kineepik Metis Local #9) in <i>Appendix 2A: Section 2 – Engagement Database Summary Table – Project Description</i>. Kineepik Metis Local #9 This record demonstrates little engagement was conducted with Métis communities in NR1 and NR3.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to equally engage all NR1 and NR3 Locals in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p> <p>To facilitate a collaborative approach to engagement, Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and</p>



Issue #	Concerns	Recommendations
		Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.
ES-012	<p><b>4.3 Engagement with Indigenous Groups (p. 29)</b></p> <p>"Denison identified the following Indigenous Communities of Interest:</p> <ul style="list-style-type: none"> <li>• English River First Nation (ERFN);</li> <li>• Kineepik Métis Local #9 (KML);</li> <li>• Sipishik Métis Local #37; and</li> <li>• Patuanak Métis Local #82."</li> </ul> <p>→ Per Denison's definition, MN-S, NR1 Locals, and NR3 Locals should be considered an Indigenous Community of Interest.</p>	<p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals as an Indigenous Community of Interest throughout the life of the Project.</p> <p>Denison needs to acknowledge MN-S, NR1 Locals, and NR3 Locals as an Indigenous Community of Interest in the Final EIS.</p>
ES-013	<p><b>4.3 Engagement with Indigenous Groups (p. 30)</b></p> <p>"Denison also recognizes certain Indigenous organizations offer a single point of contact to member communities to facilitate information sharing and collection. In many cases these organizations have been delegated the right to represent an Indigenous community or group of Indigenous communities in connection with the Project. The four Indigenous organizations that have been identified include the Métis Nation – Saskatchewan (MN-S), Ya'thi Néné Lands and Resource Office (YNLR), Meadow Lake Tribal Council (MLTC), and Prince Albert Grand Council (PAGC)."</p> <p>→ MN-S is listed under Indigenous Organizations instead of Indigenous Communities of Interest.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to engage all NR1 and NR3 communities, in addition to Kineepik Metis Local #9, throughout the life of the Project. Denison needs to include MN-S and all Métis communities under Indigenous Communities of Interest.</p> <p>To facilitate a collaborative approach to engagement, Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.</p>
ES-014	<p><b>5 Overview of the Environmental Assessment</b></p> <p><b>5.1.2 Spatial Boundaries (p. 39)</b></p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p>



Issue #	Concerns	Recommendations
	<p>“When determining the spatial boundaries, the following information was considered, as appropriate and available:</p> <ul style="list-style-type: none"> <li>• Indigenous and local knowledge and engagement;”</li> </ul> <p>→ Denison did not engage MN-S on potential Project-related effects to Métis traditional use activities such as (but not limited to): hunting, trapping, and fishing. No Métis Knowledge was used to inform the Project’s spatial boundaries.</p>	<p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to determine the appropriate funding, process, and timeline to conduct the MKS.</p>
ES-015	<p><b>5.2 Atmospheric and Acoustic Environment</b></p> <p><b>5.2.1 Air Quality (p. 41)</b></p> <p>“The air emissions monitoring plan will evaluate the effectiveness of the dust management plan.”</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project’s environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to determine the appropriate funding, process, and timeline to conduct the MKS.</p>
ES-016	<p><b>5.2.2 Noise (p. 42)</b></p> <p>“A noise monitoring program has been recommended to evaluate the effectiveness of mitigation measures and predictions made in the assessment.”</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project’s environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to provide plain language summaries, posters/handouts, and presentations on monitoring and effects management plans and programs to MN-S, NR1 Locals, and NR3 Locals.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for review and comment.</p>



Issue #	Concerns	Recommendations
		Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).
ES-017	<p><b>5.3 Geology and Groundwater</b></p> <p><b>5.3.1 Geology (p. 43)</b></p> <p>“As part of the mining operations, detailed monitoring activities will be completed to assess the performance of various components of the Project associated with engineering mining designs, subsidence, performance, and infrastructure designs to protect the Geology VC. Subsidence at ground surface within the wellfield will be evaluated from Construction through to Decommissioning, by monitoring the elevation of collars (top of pipe) for wells within the wellfield. Contingency plans, including measures for adaptive management and emergency preparedness plans, will be designed to safeguard the local environment.”</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project’s environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for review and comment.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>
ES-018	<p><b>5.3.2 Groundwater (p. 45)</b></p> <p>“Groundwater Quantity and Quality will be monitored from pre-Construction through Operation to assess the performance of the engineering mining designs and performance and infrastructure designs put in place to protect the Groundwater VC. During Decommissioning, monitoring will focus on demonstrating that groundwater remediation within the ISR mining zone meets decommissioning objectives. In Post-Decommissioning, the primary objectives of monitoring will be to demonstrate that</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to provide plain language summaries, posters/handouts, and presentations on monitoring and effects management plans and programs to MN-S, NR1 Locals, and NR3 Locals.</p>



Issue #	Concerns	Recommendations
	<p>natural flow conditions are re-established, and that chemical stability has been achieved with respect to groundwater quality. Chemical stability will be demonstrated by verifying groundwater reactive transport of constituents of potential concern in remediated groundwater aligns with the predictive model. A groundwater monitoring plan including an excursion contingency plan and measures for adaptive management will be implemented for the Project.”</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for review and comment.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>
ES-019	<p><b>5.4 Aquatic Environment</b></p> <p><b>5.4.1 Surface Water Quantity (p. 46)</b></p> <p>“Monitoring programs will be established for confirming the predictions made in the assessment. The programs should remain consistent with the historical long-term monitoring study to facilitate continued establishment of long-term streamflow trends at the site through relationships to long-term, government-operated hydrometric gauging stations in the same watersheds.”</p> <p>→ Métis Knowledge should inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison and MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>MN-S would like the opportunity to review applicable Project management documents that provide information that is relative to the potential impacts of the Project on traditional land use activities, these include, but are not limited to the following: Preliminary Decommissioning Plan, Status of the Environment reports, Environmental Effects Monitoring reports, annual reports, updated environmental risk assessments and the Final Decommissioning.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>



Issue #	Concerns	Recommendations
ES-020	<p><b>5.4.2 Surface Water Quality (p. 47)</b></p> <p>“Monitoring programs will confirm the effectiveness of mitigation measures and predictions made in the assessment and will include measurement of radiological and non-radiological water quality parameters to meet regulatory criteria. Monitoring will occur within the collection ponds and the receiving water (i.e., Whitefish Lake). In consultation with Indigenous communities, relevant federal and provincial agencies, and other Interested Parties, in the development and implementation of this VC-specific program, specific monitoring and follow-up plans will be prepared to refine and finalize the monitoring approach.”</p> <ul style="list-style-type: none"> <li>→ Information to be gathered during the MKS will contribute to the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</li> <li>→ The Draft EIS does not clarify the influence of groundwater temperature on Whitefish Lake.</li> </ul>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>MN-S would like the opportunity to review applicable Project management documents that provide information that is relative to the potential impacts of the Project on traditional land use activities, these include, but are not limited to the following: Preliminary Decommissioning Plan, Status of the Environment reports, Environmental Effects Monitoring reports, Annual reports, updated environmental risk assessments and the Final Decommissioning.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p> <p>Denison needs to confirm the influence of groundwater temperature on Whitefish Lake in the Final EIS.</p>
ES-021	<p><b>5.4.3 Sediment Quality and Benthic Invertebrates (p. 49)</b></p> <p>“Monitoring and follow-up are recommended for the Sediment Quality and Benthic Invertebrate VCs to verify the accuracy of the predicted effects and effectiveness of proposed mitigation measures. The sediment quality and benthic invertebrate monitoring program will be considered in conjunction with the surface water quantity (hydrology) and surface water quality monitoring programs as they are specifically tied to these programs from the perspective of pathways of effects. Monitoring</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p>





Issue #	Concerns	Recommendations
	<p>of total suspended solids in the effluent monitoring ponds and other catchment ponds, prior to discharge to the environment, will be important in providing context to further evaluate Project-related effects to Sediment Quality and Benthic Invertebrates in the receiving water environment (Whitefish Lake or LA-5)."</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>MN-S would like the opportunity to review applicable Project management documents that provide information that is relative to the potential impacts of the Project on traditional land use activities, these include, but are not limited to the following: Preliminary Decommissioning Plan, Status of the Environment reports, Environmental Effects Monitoring reports, Annual reports, updated environmental risk assessments and the Final Decommissioning.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>
ES-022	<p><b>5.4.4 Fish and Fish Habitat (p. 51)</b></p> <p>"Monitoring for the Fish and Fish Habitat VC will occur to verify the accuracy of the predicted effects and the effectiveness of the proposed mitigation measures. Effluent and receiving water quality monitoring will be conducted as per federal and provincial regulations and will include radiological and non-radiological parameters. Monitoring of the biological environment will be undertaken to meet federal and provincial regulations (e.g., Metal and Diamond Mining Effluent Regulations Environmental Effects Monitoring program) and will occur in consultation with Indigenous groups."</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>MN-S would like the opportunity to review applicable Project management documents that provide information that is relative to the potential impacts of the Project on traditional land use activities, these include, but are not limited to the following: Preliminary Decommissioning Plan, Status of the Environment reports, Environmental Effects Monitoring reports, Annual reports, updated environmental risk assessments and the Final Decommissioning</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language</p>





Issue #	Concerns	Recommendations
		summaries, annual monitoring report, community meetings etc.).
ES-023	<p><b>5.4.5 Fish Health (p. 53)</b></p> <p>"A monitoring program for Fish Health is recommended to confirm the effectiveness of mitigation measures and predications made in the assessment. The program will involve the collection of multiple fish species to assess changes in fish tissue concentration of constituents of interest."</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>MN-S would like the opportunity to review applicable Project management documents that provide information that is relative to the potential impacts of the Project on traditional land use activities, these include, but are not limited to the following: Preliminary Decommissioning Plan, Status of the Environment reports, Environmental Effects Monitoring reports, Annual reports, updated environmental risk assessments and the Final Decommissioning.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>
ES-024	<p><b>5.6 Human Health</b></p> <p><b>5.6.1 Human Health (p. 57)</b></p> <p>"Monitoring programs are outlined to confirm the effectiveness of mitigation measures and verifying and improving model predictions made in the assessment. Environmental monitoring would follow requirements and guidance in CSA N288.4-19 and would be informed by the results of engagement activities. Examples of monitoring include surface water, sediment, and soil</p>	<p>Denison needs to incorporate Métis Knowledge from the MKS into their discipline-specific effects assessment, the Final EIS, and all monitoring and management plans for the Project, where applicable.</p> <p>Denison needs to provide plain language summaries, posters/handouts, and presentations on monitoring and effects management plans and programs to MN-S, NR1 Locals, and NR3 Locals.</p>



Issue #	Concerns	Recommendations
	<p>samples, as well as fish tissue, benthic invertebrate tissue, and country food samples such as blueberries from Whitefish Lake, McGowan Lake, Russell Lake, and reference locations, as applicable."</p> <p>→ Denison has not engaged MN-S to understand Métis Knowledge to inform the development of the Project's environmental monitoring and management plans (e.g., Caribou Management Plan).</p>	<p>Denison needs to engage MN-S to determine the appropriate funding, process, and timeline to conduct the MKS.</p> <p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for input, review and comment.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to better understand how they would like to be informed of monitoring results (e.g., 1-page plain language summaries, annual monitoring report, community meetings etc.).</p>

### 3.2 Section 1 Introduction

Reviewed, no issues identified.

### 3.3 Section 2 Project Description

Issue #	Concerns	Recommendations
2-001	<p><b>2.2.1 Mining (p. 2-3)</b></p> <p>"Denison discussed potential mining methods early in the engagement process for the Project. In 2018, Denison organized a series of workshops with Communities of Interest and stakeholders."</p> <p>→ Denison has not had meetings to introduce the Project, share information on Project alternatives and options, Valued Components, the ISR mining method and proposed freezing method, or any other topics of interest to the MN-S and Métis communities in NR1. These communities also did not receive a VC survey to identify VCs of importance to Citizens and/or other interests and concerns related to the Project.</p>	<p>Denison needs to equally engage all NR1 and NR3 Locals, in addition to Kineepik Metis Local #9 throughout the life of the Project.</p> <p>Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and include in the Final EIS how it proposes to incorporate and feature Métis Knowledge into Project reports, plans, and processes.</p>



Issue #	Concerns	Recommendations
2-002	<p><b>2.2.1.3.2 Freeze Wall Timeline (p. 2-14)</b></p> <p>"The removal of the freeze wall will allow groundwater to re-establish its original flow path through the area (22-EN-VB/ERFNLP-619.6)."</p> <p>→ This may cause increased migration of constituents that could cause environmental release to the receiving environment unintentionally.</p>	<p>Denison needs to clarify the following with MN-S, NR1 Locals, and NR3 Locals:</p> <ul style="list-style-type: none"> <li>a.) the freezing effects on the Upper and Lower barrier zones post mining, and</li> <li>b.) if the freeze thaw process could cause increased fracturing potential within these zones.</li> </ul>
2-003	<p><b>2.3.4 Post-Decommissioning (p. 2-85)</b></p> <p>"The Post-Decommissioning monitoring program will be designed and conducted in accordance with the provincial and federal regulations and licence conditions. The monitoring program will be conducted until the site-specific decommissioning and reclamation objectives for the Project are met. Monitoring reports will be developed and submitted to both the provincial and federal regulators, in accordance with licence conditions."</p> <p>→ Denison does not acknowledge MN-S, NR1, or NR3 involvement in the design and implementation of the post-decommissioning monitoring program.</p>	<p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals in the design and implementation of decommissioning planning and all subsequent monitoring programs for the Project. This will allow Métis to share their interests in the long-term state of the land and incorporate Métis knowledge. It will also create opportunities for Métis youth and Elders to participate in monitoring programs.</p>
2-004	<p><b>2.3.5 Ancillary Projects (p. 2-85)</b></p> <p>"SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection."</p> <p>→ Denison's EIS suggests SaskPower's work related to the extension of an existing 138 kV line will be independent from work led by Denison.</p>	<p>Denison needs to clarify whether the additional 138 kV line was factored into the cumulative effects evaluation.</p> <p>Denison needs to clarify whether the proposed Project can proceed without the 138 kV line construction.</p> <p>Denison needs to clarify the timing of the construction of the line and Wheeler River Project construction.</p> <p>Denison needs to confirm that SaskPower will engage with MN-S, NR1 Locals, and NR3 Locals on line routing and design.</p> <p>Denison needs to confirm if/when the 138 kV line will be decommissioned.</p>



Issue #	Concerns	Recommendations
2-005	<p><b>2.7 Project Benefits (p. 2-92)</b></p> <p>"Positions expected throughout Construction and Operation of the Project include supervisory and management positions, trade positions, professional and technical positions, and labour positions (with a Grade 12 requirement and in-house training programs). Training for various positions is offered through Saskatchewan Indian Institute of Technologies, Saskatchewan Polytechnic, and other institutes in northern Saskatchewan. Specific training for the Project will be developed on an identified needs basis."</p> <p>→ Denison notes some jobs will require a Grade 12 education in addition to in-house training programs, but does not offer to support Métis peoples obtain Grade 12 education to access available positions.</p>	<p>Denison needs to confirm what kind of education and training support it will make available to maximize employment from Communities of Interest.</p> <p>Denison needs to support Métis training opportunities through Northlands College.</p> <p>Denison needs to provide additional detail on which roles will need Grade 12, and how many roles are available for people without Grade 12.</p>
2-006	<p><b>2.7 Project Benefits (p. 2-92)</b></p> <p>"The need for goods and services during Construction, Operation, and Decommissioning will generate business opportunities throughout the life of the Project..... Examples of anticipated operating goods and services include catering, housekeeping, food, freight, and bulk materials such as fuel, propane, and reagents."</p> <p>→ Denison does not specify the goods and services during Construction, Operation, and Decommissioning. MN-S is interested in sharing potential goods and services opportunities for Métis peoples (e.g., chefs and artisans).</p>	<p>Denison needs to provide specific information on the goods and services opportunity available to Métis as per labour force and business analysis.</p>
2-007	<p><b>2.7 Project Benefits (p. 2-92 to 2-93)</b></p> <p>"As outlined in Denison's Indigenous Peoples Policy, Denison recognizes the critical necessity of advancing reconciliation with Indigenous peoples in Canada and the important role of Canadian business in the reconciliation process. Denison is</p>	<p>Denison needs to clarify how it has made MN-S, NR1, and NR3 Locals aware of the procurement approach and opportunities, and how it will keep them informed through the life of the Project.</p>



Issue #	Concerns	Recommendations
	<p>committed to providing Indigenous people and businesses with sustainable economic opportunities and benefits and sharing the economic benefits of Denison's business activities" (Denison Mines 2022).</p> <p>Denison has established a procurement approach that requires the procurement of all goods and services for the Project to first consider businesses based within the Communities of Interest prior to looking elsewhere in northern Saskatchewan, southern Saskatchewan, and/or outside of Saskatchewan. Throughout all phases of the Project, Denison will prioritize procurement efforts within the immediate vicinity and region."</p> <p>→ Denison has not specified how it is transmitting knowledge nor provided an explanation of the procurement approach.</p>	
2-008	<p><b>2.9.1.3.1 Environmental Protection Program (p. 2-101)</b></p> <p>"An Environmental Protection Program would be established to provide an overarching framework for key environmental monitoring and management plans and to ensure a means to demonstrate compliance with applicable environmental regulatory requirements and other performance targets that Denison may set."</p> <p>→ The Draft EIS does not include a draft Environmental Protection Plan (EPP) or a summary of how the EPP will be developed.</p>	<p>Denison needs to provide an Environmental Protection Plan with the Final EIS.</p> <p>Denison needs to involve MN-S, NR1 Locals, and NR3 Locals in the development and implementation of the Environmental Protection Program so that Métis can ensure their interests and Métis Knowledge are included.</p>
2-009	<p><b>2.9.1.3.1 Environmental Protection Program (p. 2-101 to 2-104)</b></p> <p><u>"Management and Monitoring of Emissions . . .</u></p> <p><u>Liquid Effluent Monitoring Plan . . .</u></p> <p><u>Air Emissions Monitoring Plan . . .</u></p> <p><u>Groundwater Monitoring Plan . . .</u></p>	<p>Denison needs to involve Métis (MN-S, NR1 and NR3) in the development of monitoring plans and be allowed to review how their own knowledge is being used and how it informed the plan.</p> <p>Denison needs to share all engagement plans and reports of interest to MN-S, NR1 Locals, and NR3 Locals for input, review and comment.</p>



Issue #	Concerns	Recommendations
	<p><u>Environmental Monitoring Plan . . .</u></p> <p><u>Woodland and Caribou Management Plan . . .</u></p> <p>monitoring plan would be informed by existing local and traditional knowledge, ongoing engagement activities with interested parties, information generated by development of EIS and its supporting documents, [as well as] relevant guidance..."</p> <p>→ The Métis Knowledge Study is yet to be completed and these plans should not be completed without considering the Métis Knowledge Study.</p> <p>→ Draft monitoring plans were not available for review to confirm how Denison plans to inform plans with existing local and traditional knowledge.</p>	<p>Denison needs to include an implementation and reporting plan with the monitoring plans.</p>
2-010	<p><b>2.9.1.3.5 Emergency Preparedness and Response Program (p. 2-105)</b></p> <p>"The Emergency Preparedness and Response Program would identify how the Project will prepare for and addresses emergencies that may affect the health and safety of persons, the environment, and the protection of property. The objectives of the program would include the following:</p> <ul style="list-style-type: none"> <li>• identification of accidents and emergencies and the actions and responsibilities in the event of an emergency;</li> <li>• Project requirements for emergency response equipment and personnel;</li> <li>• internal incident command structure to effectively manage complex, lengthy, and large scale emergencies;</li> <li>• required communications with external emergency services, statutory bodies, and public, Indigenous groups, and regulatory agencies;</li> </ul>	<p>Denison needs to include an Emergency Preparedness and Response Program in the Final EIS for review.</p> <p>Denison to include information on transportation accidents within the Emergency Preparedness and Response Program.</p>



Issue #	Concerns	Recommendations
	<ul style="list-style-type: none"> <li>• development of appropriate emergency procedures; and</li> <li>• assurance of availability of vital information during an emergency."</li> </ul> <p>→ No Emergency Preparedness and Response Program was available for review.</p>	

### 3.4 Section 3 Indigenous and Local Knowledge

Issue #	Concerns	Recommendations
3-001	<p><b>3.4.2.3 Métis Nation - Saskatchewan (p. 3-10)</b></p> <p>"The parties have specifically agreed to a process between each other that will be funded by Denison and undertaken on behalf of the MN-S in connection with the EA of the Project: a Métis Knowledge Study, meetings to focus on VCs and preliminary effects, and regular meetings and associated costs for hosting such meetings."</p> <p>→ The Draft EIS does not yet include Métis Knowledge from NR1 and NR 3 other than Kineepik.</p> <p>→ The Draft EIS does not include information on how Denison intends to include the outcome of the Métis Knowledge Study</p>	<p>Denison needs to provide a clear indication of how the MKS findings were included in the Final EIS (e.g., effects analysis, cumulative effects analysis, mitigation measures, etc.) including confirming use with MN-S.</p> <p>The Assessment should not be considered complete until the Métis Knowledge Study is finished and factored in.</p>
3-002	<p><b>3.4.8 Lands Taken Up from an Indigenous Perspective (p. 3-18)</b></p> <p>"Among the sources of information to consider, the federal guidance notes the importance of <i>'Aboriginal traditional knowledge, community knowledge and scientific knowledge, or simply an expression of concern regarding potential cumulative effects to a particular VC'</i> (Government of Canada 2019). All sources of information were considered by discipline leads as described in this EIS section and Section 4 Engagement. The CEA for all VCs completed for the Project incorporated, as</p>	<p>Denison needs to provide a clear indication of how the MKS findings were included in the Final EIS (e.g., effects analysis, cumulative effects analysis, mitigation measures, etc.) including confirming use with MN-S.</p> <p>The Assessment should not be considered complete until the Métis Knowledge Study is finished and factored in.</p>



Issue #	Concerns	Recommendations
	<p>appropriate, the characterization of activities/events that have shaped the existing environment and continue to influence the VCs used for the EIS.”</p> <p>→ Perspectives on cumulative impacts have only been considered for English River First Nation and Kineepik Metis. This has resulted in an absence of MN-S perspective regarding cumulative impacts within the Project and surrounding areas.</p>	
3-003	<p><b>3.4.6 Addressing Divergence Between Indigenous Knowledge and Western Scientific Knowledge Systems (p. 3-14)</b></p> <p>“Discrepancies among IK and western scientific information provide an opportunity for Denison needs to take a precautionary approach. Examples of concrete actions to address uncertainty in cases where IK and LK have differing conclusions on predicted Project effects include addressing uncertainty through monitoring and follow-up programs and communicating results of those monitoring and follow-up programs to demonstrate they have been responsive to the IK shared.”</p> <p>→ Details are not provided regarding how these programs and plans will be developed and implemented, or how they will integrate the needs of all the Indigenous and Métis communities.</p>	<p>Denison needs to clarify whether discrepancies will only be addressed by follow-up and monitoring.</p> <p>Denison needs to involve MN-S, NR1 and NR3 in determining other means for examining divergences and informing follow-up and monitoring (e.g., collaborative field studies).</p>



### 3.5 Section 4 Engagement

Issue #	Concerns	Recommendations
4-001	<p><b>Glossary (p. 4-vii)</b></p> <p>“Indigenous Community of Interest: A community whose traditional land or potential or established Aboriginal and/ or Treaty rights are in proximity to the Project or has existing transportation infrastructure that would be used by the Project.</p>	<p>Denison needs to revise their Indigenous Community of Interest definition in the Final EIS to reflect the uniqueness of Métis governance structures. Specifically, a definition that recognizes Métis Locals proximate to the Project, MN-S, and MN-S regional leadership.</p>



Issue #	Concerns	Recommendations
	<p>An Indigenous Community of Interest is more likely to experience impacts from the Project.</p> <p>Indigenous community: An Indigenous community with a potential interest in the Project, including any Indigenous community identified by a Regulatory Agency as having a potential interest in the Project."</p> <p>→ Per Denison's definition, MN-S, NR1 Locals, and NR3 Locals should be considered an Indigenous Community of Interest.</p>	
4-002	<p><b>4.1.2 Denison's Indigenous Peoples Policy and Investment and Sustainability Philosophy (p. 4-3)</b></p> <p>"In 2021, Denison announced the adoption of an Indigenous Peoples Policy (IPP). The IPP reflects Denison's recognition of the important role of Canadian business in the process of reconciliation with Indigenous peoples in Canada and outlines Denison's commitment to take action towards advancing reconciliation. The IPP was developed based on Denison's experiences with, as well as feedback and guidance received from, Indigenous communities with whom Denison is actively engaged. This approach was designed to make sure the IPP appropriately captures a mutual vision for reconciliation. The IPP identifies five key areas of action that will support the ongoing development of a continuously evolving Reconciliation Action Plan (RAP): Engagement; Empowerment; Environment; Employment; and Education. Through the RAP, Denison is striving to interweave the principles of reconciliation throughout all areas of the company's operations (Denison 2021a)."</p>	Denison needs to clarify how it intends to consider free, prior, and informed consent (FPIC).



Issue #	Concerns	Recommendations
	→ Denison does not explain how it will accomplish free, prior, and informed consent (FPIC) as per the IPP and RAP. <sup>2</sup>	
4-003	<p><b>4.2 Engagement Approach (p. 4-5)</b></p> <p><i>Figure 4.2.1: Interested Parties for the Project</i></p> <p>→ MN-S is listed under Indigenous Organizations instead of Indigenous Communities of Interest. Not all potentially impacted Métis communities are listed in this figure. Métis communities listed under Indigenous Communities of Interest include Kineepik Metis Local #9, Sipishik Metis Local #37, Patuanak Metis Local #82. Métis communities listed under Other Indigenous Communities include Dore/Sled Lake Métis Local #67 and A La Baie Métis Local #21. These Métis communities are all within NR3.</p>	<p>Denison needs to revise its understanding of Métis, Métis governance and the differences between MN-S and Métis Locals.</p> <p>Denison needs to include MN-S, NR1 Locals, and NR3 Locals as Communities of Interest, or explain why they limited their selection of Métis communities in their listing.</p>
4-004	<p><b>4.2 Engagement Approach (p. 4-6)</b></p> <p>“Denison has further identified key objectives respecting Indigenous engagement associated with the Project:</p> <ul style="list-style-type: none"> <li>• Build and maintain authentic relationships based on a foundation of trust, good faith, and transparency.</li> <li>• Create a respectful dialogue process that promotes communication and collaboration among Denison and Indigenous communities, in a timely and accurate fashion.</li> <li>• Understand how the proposed development of the Project may affect the interests of Indigenous peoples (including Indigenous and/or Treaty Rights), and work with Indigenous peoples to avoid, mitigate, or otherwise address effects, while also collaborating to maximize potential positive effects.</li> </ul>	<p>Denison to continue engaging and involving MN-S, NR1 Locals, and NR3 Locals during the revisions of the Draft EIS and completion of outstanding plans.</p>

<sup>2</sup> Engagement – We are committed to building long-term and mutually respectful relationships through proactive engagement and consultation with Indigenous people. Our aim is to work to achieve the free, prior, and informed consent, where the potential for impacts to rights may occur, before proceeding with economic development projects and during ongoing activities and operations



Issue #	Concerns	Recommendations
	<p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project."</p> <p>→ MN-S appreciates Denison's willingness to evolve engagement activities in response to feedback from MN-S over time.</p>	
4-005	<p><b>4.3.1 Engagement with Identified Indigenous Communities and Organizations, and Supporting Criteria (p. 4-11)</b></p> <p><i>Figure 4.3-2: Identified Indigenous Communities and Organizations in Relation to the Project</i></p> <p>→ Only NR3 communities are listed in Figure 4.3-2: Unidentified Indigenous Communities and Organizations in Relation to the Project.</p>	<p>Denison needs to revise its understanding of Métis, Métis governance and the differences between MN-S and Métis Locals.</p> <p>Denison needs to include MN-S, NR1 Locals, and NR3 Locals as Communities of Interest, or explain why they limited their selection of Métis communities in their listing.</p>
4-006	<p><b>4.3.1 Engagement with Identified Indigenous Communities and Organizations, and Supporting Criteria (p. 4-12)</b></p> <p>"The following criteria have been used to appropriately evaluate Indigenous communities located in the NAD [Northern Administration District] that would be engaged by Denison:</p> <ul style="list-style-type: none"> <li>• Treaty 10 signatory (Treaty in which the Project is located);</li> <li>• potential or established Indigenous and/or Treaty Rights within the Project Area;</li> <li>• geographic proximity of community and/or reserve land to the Project site;</li> <li>• known traditional territory in and around the Project site;</li> </ul>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to equally engage all NR1 and NR3 Locals in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p>



Issue #	Concerns	Recommendations
	<ul style="list-style-type: none"> <li>• history of relationship with operating companies, the CNSC, and the Province in relation to other projects located near the Project (McArthur River, Key Lake, Millennium); and</li> <li>• the potential for collective exercising of Indigenous and/or Treaty Rights in proximity to the Project.”</li> </ul> <p>→ Denison has not engaged all potentially impacted Métis communities. Métis communities in NR1 and NR3 meet multiple evaluation criteria identified by Denison.</p> <p>→ Denison's explanation related to the selection of Indigenous groups to be engaged on the Project is unsatisfactory.</p>	
4-007	<p><b>4.3.1 Engagement with Identified Indigenous Communities and Organizations, and Supporting Criteria (p. 4-14)</b></p> <p>“As the elected government of the Métis people of Saskatchewan, the MN-S plays an important role related to engagement activities. The MN-S is currently structured with a President, an Executive, a Provincial Métis Council, Regional Presidents, and Local Presidents.</p> <p>→ The Project is located within Métis NR1 in Saskatchewan. However, several key Métis communities with whom Denison is engaging are located in Métis NR3.</p> <p>→ The MN-S website states that “consultations must be with the Métis government structures that are elected and supported by the Métis people.” (MN-S n.d.c.)”</p> <p>→ Denison has not engaged with Métis communities outside of NR3.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to equally engage all NR1 Locals and NR3 in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p>
4-008	<p><b>4.3.2.1.3 Key Engagement Activities (p. 4-16)</b></p> <p>“The main forms of engagement included meetings with Chief and Council, community meetings, a workshop on early infrastructure options (2018), a site visit (2019), virtual</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to equally engage all NR1 and NR3 communities in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include</p>



Issue #	Concerns	Recommendations
	<p>presentations and meetings on VCs (2021), two online surveys (2021 and 2022), and a meeting and information session on preliminary effects and mitigation (2022)."</p> <p>→ Denison's engagement to date has largely been with Métis communities in NR3. Particularly, the Kineepik Metis Local #9 community.</p> <p>→ Denison has not had meetings to introduce the Project, share information on Project alternatives and options, VCs, the ISR ming method and proposed freezing method, or any other topics of interest to the MN-S and Métis communities in NR1. These communities also did not receive a VC survey to identify VCs of importance to Citizens and/or other interests and concerns related to the Project.</p>	<p>MN-S and all Métis communities under Indigenous Communities of Interest.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals on Project information, Project-related employment/procurement/cultural opportunities, engagement expectations (e.g., involvement of youth and Elders), and approach for gathering and incorporating Métis Knowledge into Project reports, plans, and processes.</p>
4-009	<p><b>4.3.2.3 Engagement with Sipishik Métis Local #37</b></p> <p><b>4.3.2.3.1 History of Interactions (p. 4-42)</b></p> <p>"In 2019, the SML delegated their Duty to Consult for the Project to the MN-S. From 2019, the MN-S has been representing SML in respect of engagement with Denison for the Project. Clear distinction between the Métis leadership and Citizens, and the Village leadership and residents was, therefore, necessary to make sure the MN-S was able to appropriately provide the representation of the Métis of SML, per the delegated Duty to Consult. As a result, Denison focused engagement efforts exclusively toward the general public of the Village of Beauval onwards from this point, with no intended overlap in relation to Métis interests."</p> <p>→ Denison is taking engagement direction from MN-S to not lump public engagement efforts with Métis engagement is appreciated.</p>	<p>Denison needs to engage Beauval/Sipishik Métis Local #37 throughout the life of the Project.</p>
4-010	<p><b>4.3.2.3.4 Key Issues and Concerns (p. 4-44)</b></p>	<p>Denison needs to share all policies related to creating a safe workplace with MN-S, NR1 Locals, and NR3 Locals for</p>



Issue #	Concerns	Recommendations
	<p><i>Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37</i></p> <p>"Concern with racism and other factors in workplace affecting employee retention. . . . Denison has several policies in place that will be adhered to for the Project, including a Workplace Violence &amp; Harassment Policy."</p> <p>→ The safety of all Métis peoples that will be engaged or employed by the Project is of utmost importance. Racism towards Métis peoples will not be tolerated. Denison's policies need to support a safe work culture for all.</p>	<p>review and comment (e.g., health and safety policies and the Workplace Violence &amp; Harassment Policy).</p> <p>Denison needs to create a culturally safe workplace for Métis peoples.</p> <p>Denison needs to clarify its policies to prevent incidents of workplace violence and harassment and identify clear actions to address potential incidents of workplace violence and harassment.</p> <p>Denison needs to mandate cultural awareness training for all employees to help with one the Project's established principles: "approaching sustainability and engagement activities with the utmost respect for Indigenous communities, Indigenous Rights, and Indigenous Knowledge".</p>
4-011	<p><b>4.3.2.4.3 Key Issues and Concerns (p. 4-46)</b></p> <p><i>Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82</i></p> <p>"Complete = response provided to issue, interest, or concern in EIS, where appropriate."</p> <p>→ Denison created "Key Issues and Concerns" tables in their EIS to document responses to issues and concerns identified by Indigenous Groups.</p> <p>→ Denison marked issues and concerns that they believe have been addressed as "Complete" in "Key Issues and Concerns" tables throughout the Draft EIS. Directing MN-S and Métis Locals to chapters within the EIS is not a sufficient response to an issue or concern identified by MN-S and Métis peoples. One-way information sharing is not an effective means for addressing or mitigating issues and concerns identified by MN-S and Métis people. Responses to issues regarding effects should</p>	<p>Denison needs to respond to issues and concerns identified through engagement during meetings with and communications to MN-S, MN-S, NR1 Locals, and NR3 Locals.</p> <p>Denison needs to implement a collaborative engagement approach that allows MN-S, NR1 Locals, and NR3 Locals to provide feedback and inform Project decision-making, plans, and outcomes versus one-way information sharing engagement approach.</p>



Issue #	Concerns	Recommendations
	<p>discuss the presence or absence of effects, rather than responding that effects were studied.</p>	
4-012	<p><b>4.3.3.5 Engagement with A La Baie Métis Local #21</b></p> <p><b>4.3.3.5.1 History of Interactions (p. 4-52)</b></p> <p>"In 2019, the ALBML delegated their Duty to Consult for the Project to the MN-S. Clear distinction between the Métis leadership and Citizens, and the Village leadership and residents was, therefore, necessary to make sure the MN-S was able to appropriately provide the representation of the Métis of ALBML, per the delegated Duty to Consult. As a result, Denison distinguished its engagement efforts between MN-S, on behalf of ALBML, and the general public of the Village of Île-à-la-Crosse, with no intended overlap in relation to Métis interests."</p> <p>→ Denison's responsiveness to engagement direction from MN-S to not lump public engagement efforts with Métis engagement is appreciated.</p>	N/A
4-013	<p><b>4.3.4 Engagement with Indigenous Organizations</b></p> <p><b>4.3.4.1 Métis Nation – Saskatchewan (p. 4-55)</b></p> <p>"As the elected government of the Métis people of Saskatchewan, the MN-S plays an important role related to engagement activities. The MN-S is currently structured with a President, an Executive, a Provincial Métis Council, Regional Presidents, and Local Presidents. The MN-S website states that <i>'consultations must be with the Métis government structures that are elected and supported by the Métis people'</i> (MN-S n.d.b). The Project is located within Métis Region 1; however, there are Métis Locals in the general area of interest from Northern Region 3."</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, to see Denison equally engage NR1 Locals and NR3 Locals in addition to Kineepik Metis Local #9 throughout the life of the Project. Denison needs to include MN-S, NR1 Locals, and NR3 Locals under Indigenous Communities of Interest.</p>



Issue #	Concerns	Recommendations
	→ Denison has not engaged all potentially impacted Métis communities. Denison has focused engagement efforts on Métis communities in NR3.	
4-014	<p><b>4.3.4.1.2 Agreements Relative to the Environmental Assessment Process (p. 4-56)</b></p> <p>“In recognition of the MN-S’ potential interests in the Project, Denison and MN-S have been negotiating a capacity funding agreement. Denison anticipates the capacity funding agreement and associated workplan and budget will be signed in late September or early October 2022. Once signed, this agreement will outline a mutually agreeable framework and applicable funding arrangements to facilitate the MN-S’ participation and engagement in the EA process for the Project.</p> <p>The parties have specifically agreed to a process between each other that will be funded by Denison and undertaken on behalf of the MN-S in connection with the EA of the Project: a Métis Knowledge Study, meetings to focus on VCs and preliminary effects, and regular meetings and associated costs for hosting such meetings.”</p> <p>→ Denison’s Draft EIS notes that Denison and MN-S were in the process of developing a capacity funding agreement.</p> <p>→ Since the Draft EIS was published, Denison and MN-S reached an agreement.</p>	Denison needs to revise the Final EIS to note that a capacity funding agreement was reached with MN-S.



### 3.6 Section 4A Engagement Appendix

Reviewed, no issues identified.

### 3.7 Section 5 Approach and Methodology of the Assessment



Issue #	Concerns	Recommendations
5-001	<p><b>5.3.1 Valued Components Selection (p. 5-5)</b></p> <p>"Initial direction and input into VC selection were obtained through discussions with Indigenous groups, government agencies, and the public."</p> <p>→ Métis input to VC selection was limited to NR3 communities.</p>	Denison needs to confirm the selected valued components with Métis Locals in NR1 and NR3 and revise the Final EIS as required to reflect their input.
5-002	<p><b>5.4 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on (p. 5-19)</b></p> <p>"In this EIS, IK and LK are viewed as complimentary and influential alongside western science to produce a full understanding of the potential effects of the Project, whether measurable or perceived."</p> <p>See also: <i>11.1.2 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment</i> (p. 11-15)</p> <p>→ The use of "complimentary and influential" does not reflect current best practices that acknowledge Indigenous Knowledge as an equal but different way of knowing (than western science). This terminology implies that Indigenous Knowledge can be absorbed into a scientific approach.</p>	<p>Denison needs to confirm use of the wording "complimentary and influential" and how the use of Indigenous Knowledge is treated as equal to western science in the Final EIS.</p> <p>Denison needs to confirm if it intends the use of "complimentary" or "complementary". Best practices will differ depending on intention.</p>
5-003	<p><b>5.6.1 Potential Interactions Between the Project and Valued Components/Key Indicators (p. 5-25)</b></p> <p><i>Table 5.6-2: Summary Interaction Matrix for Valued Components in the Human Environment</i></p> <p>→ Interactions with the Human Environment Valued Components should be consistent with interaction table in related technical VC assessment sections. Comments have been made for revision to some of the interaction table in related VCs.</p>	Denison needs to update Table 5.6-2 to be consistent with revised interaction tables for related VCs.
5-004	<p><b>5.3 Scope of the Assessment (p. 5-5)</b></p> <p>"Scope of the Assessment"</p>	Denison needs to provide details in the Final EIS on data and analysis limitations.



Issue #	Concerns	Recommendations
	<p>→ It's best practice in environmental assessments to acknowledge limitations on data and analysis used for the assessment. This identifies constraints imposed on the assessment due to limitations in data or analysis that can influence or limit the ability to predict potential effects of the Project. This may be provided as a "technical boundary" or in some other transparent way as a part of the assessment reporting.</p>	
5-005	<p><b>5.8 Residual Effects Evaluation (p. 5-30)</b></p> <p>"Residual Effects Evaluation"</p> <p>→ Details should be provided on what level of residual effects are carried forward for residual effects evaluation. This would help provide a consistent method for bringing measurable effects for a full residual effect assessment. This ensures that measurable (even minor) are not overlooked in residual effects characterization and consideration of significance.</p> <p>→ From review of the Draft EIS, there are instances where effects that remain after the implementation of all mitigation measures and management plans are characterized as minor and not carried forward for evaluation.</p>	<p>Denison needs to provide details on the development and choice of thresholds used to describe residual effects including how LK and IK were considered in threshold development.</p> <p>Denison needs to provide further explanation as to why minor effects will have no or negligible effects and should not be considered further.</p>
5-006	<p><b>5.9.1 Cumulative Effects Assessment Process (p. 5-34)</b></p> <p>"The approach for assessing cumulative effects considers both the current conditions (which include changes caused by past development, projects, and activities, and are, therefore, considered in the baseline condition of the VC)"</p> <p>→ Denison acknowledges that cumulative effects are important to Indigenous communities in section 5.9.3 (p. 5-42).</p> <p>→ For many Indigenous communities and governments, cumulative effects analysis requires an assessment this includes pre-development conditions to understand the impacts of past and existing activities that continue to affect the context for</p>	<p>Denison needs to provide further detail on what projects and activities were considered in the cumulative effects i.e., table listing projects.</p> <p>Denison needs to provide further detail on how it considers cumulative effects important to Indigenous communities and whether it includes an evaluation of changes to pre-development conditions as is being done as practice in other environmental assessments. This would allow Indigenous communities to better understand the ongoing impacts of past and existing activities that continue to affect Indigenous cultural use of lands and resources.</p>



Issue #	Concerns	Recommendations
	<p>environmental and social systems. Considering the fuller context of historic change during an EA is an evolving best practice and is recognized through numerous Canadian cumulative effects assessment initiatives and management frameworks (e.g., Indigenous Centre for Cumulative Effects) and recent Indigenous led environmental assessment (e.g., Squamish Nation Assessment Process).</p>	
5-007	<p><b>5.9.2 Identification of Present or Reasonably Foreseeable Projects and Activities (p. 5-34 -5-35)</b></p> <p>“projects that are either proposed (e.g., are in the publicly available review process) or have been approved to be built, but are not yet built, for which the residual effects overlap spatially and temporally with those of the Project (i.e., they are reasonably foreseeable).”</p> <ul style="list-style-type: none"> <li>→ Clarity is required that this includes existing ongoing activities that may not be certain but are highly likely to occur such as forestry and mine exploration activity.</li> <li>→ Denison did not include the new powerline that SaskPower is building in Table 5.9-1: Projects and Activities for Consideration in the Cumulative Effects Assessment for the Valued Components. See Section 2.3.1.9 for more details on the powerline to be constructed by SaskPower.</li> </ul>	<p>Denison needs to provide further detail on the projects and activities that were considered for cumulative effects and why certain projects and activities were not included.</p> <p>For example, Denison needs to explain how reasonably foreseeable projects and activities that may not be certain but are highly likely in the RSA, such as mining exploration or infrastructure use and maintenance, are not included in Table 5.9-1.</p>



### 3.8 Section 6 Atmospheric and Acoustic Environment

Section 6 was excluded from this review.

### 3.9 Section 7 Geology and Groundwater

Issue #	Concerns	Recommendations
7-001	<p><b>7.4.1 Potential Project-Valued Components Interactions (p. 7-44)</b></p> <p><i>Table 7.4-1 Potential Project Interactions for the Geology Valued Component</i></p> <p>"Hazardous waste management (temporary storage, handling, and off-site transportation)"</p> <p>See also: EIS Section 2 – Project Description <i>Table 2.3-1: Key Activities for the Wheeler River Project</i> (p. 2-71)</p> <p>"Wellfield and freeze hole drilling; ground freezing"</p> <p>→ There is lack of geotechnical information in the Draft EIS that would expand explanation of Project interactions with geology and groundwater.</p>	<p>The Final EIS needs to demonstrate Denison's commitment to developing appropriate mitigations to avoid or limit identified adverse effects resulting from the Project, whether direct or indirect.</p>
7-002	<p><b>7.5 Mitigation Measures (p. 7-63)</b></p> <p><i>Table 7.5-1 Summary of the Mitigation Measures Based on Project Phases for the Geology and Groundwater Valued Components</i></p> <p>"In situ recovery operations affecting subsidence at ground surface associated with consolidation of rock mass (ore) at significant depth (approximately 400 m) below ground."</p> <p>→ There is lack of information, details and modelling related to potential subsidence.</p>	<p>Denison needs to provide additional detail in the Final EIS about mitigation measures related to operations affecting subsidence at ground surface including managing for different subsidence areas, different subsidence sizes, and whether subsidence will propagate further ground surface disturbances that will require further and continuous action.</p> <p>Denison needs to prepare a management and monitoring plan for subsidence.</p>



### 3.10 Section 8 Aquatic Environment

Issue #	Concerns	Recommendations
8-001	<p><b>8.0 Aquatic Environment</b></p> <p>Naming waterbodies in maps/figures.</p>	<p>Denison needs to revise maps/figures to include labels for key waterbodies referenced in the EIS, particularly for figures included in section 8.</p>

Issue #	Concerns	Recommendations
	<p>→ Key waterbodies are inconsistently named on the maps/figures throughout section 8.0 Aquatic Environment. Key waterbodies include those considered as reference or exposure waterbodies, and any others of importance to NR2 and NR3 Locals.</p>	<p>Denison needs to ensure waterbodies are named consistently throughout section 8.0 Aquatic Environment.</p>
8-002	<p><b>8.3 Fish and Fish Habitat</b></p> <p><b>8.3.6.1 Residual Effects Characterization (p. 8-143)</b></p> <p>"Given that fishing on LA-5 has not been documented, and the effect is expected to be of low magnitude, changes in fish abundance or distribution are not expected to be detectable to Indigenous land users."</p> <p>→ Not all fishing and hunting activities are documented. Currently, the MKS has not been completed and therefore this assumption may be incorrect.</p>	<p>Denison needs to revise the fish and fish habitat section as part of the inclusion and consideration of the MKS in the Final EIS.</p> <p>Denison needs to include additional information in the Final EIS that describes data limitations. A conservative approach would consider all waterbodies in the area to be potential fishing waterbodies for current and future use purposes.</p>
8-003	<p><b>8.3.8 Monitoring and Follow-up (p. 154)</b></p> <p>"The fish and fish habitat monitoring and follow-up program will have the following objectives: . . .</p> <ul style="list-style-type: none"> <li>• monitoring changes in fish communities/populations within the Project LSA; and</li> <li>• monitoring changes in physical fish habitat within the receiving environment of LA-5." <p>→ Russell Lake is not identified as a location to monitor fish health.</p> </li></ul>	<p>Denison needs to include Russell Lake in the aquatic monitoring program as cumulative effects from the Key Lake operation will be detected in this waterbody and this is an important local fisheries resource waterbody.</p> <p>Denison should commit to involving MN-S, NR1 and NR3 in the development of management and monitoring plans for the aquatic environment in the Final EIS.</p>
8-004	<p><b>8.5 Fish Health</b></p> <p><b>8.5.7.1 Potential Cumulative Effects (p. 8-250)</b></p> <p>"Fish Health VC are primarily related to c the controlled"</p> <p>→ Typo in report</p>	<p>Denison needs to address the typo and replace "c" with the complete word.</p>



Issue #	Concerns	Recommendations
8-005	<p><b>8.5.8 Monitoring and Follow-up (p. 8-253)</b></p> <p>"Fish Health monitoring . . . in the natural environment will occur at an upstream reference location (i.e., LA-6 – Whitefish Lake North)"</p> <p>→ It is unclear whether there is a physical barrier between Whitefish Lake North and Whitefish Lake South that would allow Whitefish Lake North to be considered as an appropriate reference area for monitoring fish health.</p>	<p>Denison needs to clarify in the Final EIS on an appropriate reference area for monitoring fish health.</p> <p>Denison needs to confirm fish movements between Whitefish Lake North and Whitefish Lake South and that Whitefish Lake North will be an appropriate reference lake. If it is not appropriate, then another reference lake such as Kochichowsky Lake may need to be considered for monitoring fish health.</p>

### 3.11 Section 9 Terrestrial Environment

Issue #	Concerns	Recommendations
9-001	<p><b>9.1 Terrain, Soil, and Organic Matter/Peat</b></p> <p><b>9.1.1.3 Spatial Boundaries (p. 9-11)</b></p> <p>"Terrestrial Regional Study Area (RSA): encompasses the Project Area and LSA [Local Study Area] plus a minimum <i>8 km surrounding buffer around the LSA</i>"</p> <p>→ The terrestrial RSA seems small in consideration of woodland caribou and determining the impacts of the Project in association with the SK1 caribou population.</p>	<p>Denison needs to evaluate the terrestrial RSA as it relates to the SK1 caribou population and Environment Canada's woodland caribou management plan. Provide a detailed explanation in the Final EIS as to how the terrestrial RSA was determined.</p>
9-002	<p><b>9.2 Vegetation and Ecosystems, Listed Plant Species and Wetlands</b></p> <p><b>9.2.3.3 Wetlands Valued Components (p. 9-93)</b></p> <p><i>Figure 9.2-8: Wetlands, Waterbodies and Lakes within the Project Study Areas</i></p> <p>→ Figure 9.2-8 identifies lakes and waterbodies separately</p> <p>→ There is a lack of clarity between a lake and a waterbody and its treatment in the EIS.</p>	<p>Denison needs to clarify and distinguish in the Final EIS if and why lakes and waterbodies are treated differently.</p>



Issue #	Concerns	Recommendations
9-003	<p><b>9.2.7.3 Cumulative Effects Characterization and Determination of Significance (p. 9-143)</b></p> <p>"The cumulative effect of change in concentrations of COPC [constituent of potential concern ] in plant tissue is not expected to result in a change in the constituent concentrations in vegetation KI that will alter the integrity of vegetation within the Terrestrial RSA to the point where it is not sustainable or is unavailable to contribute to ecological functions; therefore, the cumulative effect of change in areal extent of habitat types is expected to be <b>not significant</b>." [<i>emphasis in original</i>]</p> <p>→ There is inadequate evaluation of the combined impact of all of these changes in vegetation on the terrestrial ecosystem. It is unclear whether there will be any short-term or long-term impacts on the overall health of the terrestrial ecosystem due to the individual changes to the terrestrial components.</p>	<p>Denison needs to provide in the Final EIS an assessment of the cumulative impacts of all of the individual changes to the vegetation (e.g., change in vegetation types, a change in the COPC levels in vegetation and a change in wetland composition) on the entire terrestrial ecosystem.</p>
9-004	<p><b>9.3 Ungulates, Furbearers, and Woodland Caribou</b></p> <p><b>9.3.3.1.1 Scientific Literature Review (p. 9-175)</b></p> <p><i>Table 9.3-3: 2016 to 2020 Annual Resident Moose Harvest through Regular and Draw Licences (SK MOE 2021)</i></p> <p>→ The EA assumptions for moose harvest numbers and success are based on the SK database information which includes information for hunters in the southern portion of the province and for non-Indigenous peoples. Reliance on draw licences to support Project models does not capture Métis harvesting and traditional use activities in the Northern Administrative District of Saskatchewan. Métis do not participate in the draw system as they are recognized rights holders.</p> <p>→ Indigenous and non-Indigenous hunters have different hunting patterns. Although the data used in the EA is accurate for non-Indigenous hunters, this data should be used cautiously when</p>	<p>Denison needs to provide confirmation that the assumption that moose harvest information used in the Draft EIS is based on the SK database which includes information for hunters in the southern portion of the province and for non-Indigenous peoples. If yes, Denison to acknowledge in the Final EIS that the Terrestrial Ecosystem Effects Assessment relied on draw licences to support assessment conclusions and these conclusions do not capture Métis harvesting and traditional use activities in the Northern Administrative District of Saskatchewan. In addition, Denison to note Métis do not participate in the draw system as they are recognized rights holders in the Final EIS.</p> <p>Denison needs to incorporate Métis Knowledge from the MKS to the Project's Terrestrial Ecosystems Effects Assessment.</p>



Issue #	Concerns	Recommendations
	<p>assessing a project that is in an area where there is mostly (if not all) Indigenous hunters for moose and other ungulates.</p>	<p>Denison to co-develop and implement a moose-specific monitoring and management plan with the Métis.</p> <p>Denison needs to include Métis harvesting patterns in the Final EIS (e.g., rabbit, moose, caribou, fox etc.).</p>
9-005	<p><b>9.3.4.2.1 Alteration and/or Loss of Habitat (p. 9-211)</b></p> <p>“The effect of habitat alteration and/or loss on woodland caribou is expected to be minimal during Post-Decommissioning, as regeneration of vegetation is expected to continue within reclaimed areas.”</p> <p>→ The nature of vegetation regeneration on an altered landscape can have continuing effects on woodland caribou. This conclusion is sufficiently vague and assume regeneration will be suitable for woodland caribou.</p> <p>→ Denison does not provide information on the removal and decommissioning of the roads built for the Project or the extension of the transmission line in the Draft EIS. Linear disturbances like these are incredibly impactful to Métis traditional land use in and around the Project.</p>	<p>Denison needs to identify how it will be determined that post-decommissioning revegetated habitat will be suitable for woodland caribou including any risk assessments completed to confirm the predictions.</p> <p>Denison needs to involve MN-S as well as NR1 and NR3 Locals in decommissioning planning, mitigation, and monitoring.</p> <p>Denison to provide further information on the removal and decommissioning of roads built for the Project and the extension of the transmission line built by SaskPower in the Final EIS.</p>
9-006	<p><b>9.3.4.2.2 Change in Mortality (p. 9-217)</b></p> <p>“However, during the Decommissioning and Post-Decommissioning phases, the Project Area is expected to temporarily create habitat that could support higher densities of alternative prey species, potentially increasing predator density in the region.”</p> <p>→ Changes in the numbers of prey and/or predators during the post-decommissioning period could impact what animals are available for harvesting by the MN-S in the long-term.</p>	<p>Denison needs to clarify and confirm the duration of the habitat changes that may interfere with predator/prey densities including any risk assessments completed to confirm the predictions.</p> <p>Denison needs to involve MN-S, as well as NR1 and NR3 Locals in decommissioning planning, mitigation, and monitoring.</p>





Issue #	Concerns	Recommendations
9-007	<p><b>9.3.5.2 Additional wildlife specific mitigation measures (p. 9-219)</b></p> <p>"A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs."</p> <p>→ This plan is an important tool for managing caribou in the short and long-term.</p>	<p>Denison needs to involve MN-S as well as NR1 and NR3 Locals in the creation of the Woodland Caribou Management Plan, and include the plan in the Final EIS</p>
9-008	<p><b>9.3.6.4.1 Alteration and/or Loss of Habitat (p. 9-274)</b></p> <p><i>Table 9.3-24: Summary of the Characteristics Ratings for Alteration and/or Loss of Available Woodland Caribou Habitat</i></p> <p>"It is expected that revegetated areas will not become available woodland caribou habitat until terrestrial and arboreal lichen have re-established in the regenerated vegetation communities, up to 20 years post-disturbance."</p> <p>→ The woodland caribou may not return to the Project area for up to 20 years following post-decommissioning due to available food resources. This may have an impact on long-term harvesting of woodland caribou by the MN-S.</p>	<p>Denison needs to clarify and confirm the duration of the habitat changes that may interfere with predator/prey densities including any risk assessments completed to confirm the predictions.</p>
9-009	<p><b>9.3.7.3.3 Woodland Caribou (p. 9-302)</b></p> <p>"The woodland caribou population in the region is reported to be stable and their anthropogenic habitat disturbance is currently estimated at 1.5% in the Terrestrial RSA, which is below the 5% threshold of anthropogenic disturbance recommended as a requirement to sustain viable populations (ECCC 2019)."</p> <p>→ The 5% threshold disturbance is for a viable population which is the SK1 population.</p>	<p>Denison needs to provide confirmation that the Final EIS appropriately used the Environment Canada threshold values on the woodland caribou population as they relate to the SK1 population.</p> <p>Denison needs to confirm that the RSA and threshold is suitable in areal extent. See comment 9-001.</p> <p>Denison needs to commit to re-evaluating their woodland caribou information in the Final EIS. Specifically, to ensure the woodland caribou information used by Denison is in</p>



Issue #	Concerns	Recommendations
		alignment with the SK1 Range Plan being developed by the Province.
9-010	<p><b>9.3.8 Monitoring and Follow-up (p. 9-307)</b></p> <p>This section does not specifically identify a Woodland Caribou Management Plan.</p> <p>→ Previous sections of the Draft EIS identified the development of the Woodland Caribou Management Plan.</p>	Denison needs to confirm the preparation and inclusion of a Woodland Caribou Management Plan within this section of the Final EIS.

### 3.12 Section 10 Human Health

Section 10 was excluded from the review.

### 3.13 Section 11 Land and Resource Use

Issue #	Concerns	Recommendations
11-001	<p><b>11.1.1.1 Values Component Selection (p. 11-8)</b></p> <p>"To validate VC selection and as part of engagement activities, Denison sought feedback from the English River First Nation (ERFN) [ERFN's Wapachewunak Reserve 192D is also referred to a Patuanak] and the Northern Village of Beauval, the Northern Village of Kineepik Metis Local #9 Lake, and the Northern Hamlet of Patuanak (hereafter Beauval, Kineepik Metis Local #9, and Hamlet of Patuanak, respectively)."</p> <p>→ Arrangements and applicable funding to facilitate MN-S' participation and engagement in the EA process are underway. It is expected that MN-S will be given the opportunity to validate VC selection and have this information reflected in the Final EIS.</p>	Denison, in the Final EIS, needs to demonstrate that it confirmed the selected valued components with Métis Locals in NR1 and NR3.
11-002	<p><b>11.1.2.3 The Métis Nation of Saskatchewan [s/c] (p. 11-18)</b></p>	Denison needs to correctly reference Métis Nation-Saskatchewan throughout the Final EIS.



Issue #	Concerns	Recommendations
	<p>"The parties have specifically agreed to a process between each other that will be funded by Denison and undertaken on behalf of the MN-S in connection with the EA of the Project: a Métis Knowledge Study, meetings to focus on VCs and preliminary effects, and regular meetings and associated costs for hosting such meetings."</p> <p>→ The correct name is "Métis Nation-Saskatchewan" (no "of").</p>	<p>Denison needs to include in the Final EIS input from the Métis Knowledge Study and any changes in the selection of VCs and their characterization.</p>
11-003	<p><b>11.1.4.1 Potential Interactions Between the Project and Valued Component/Key Indicators (p. 11-41)</b></p> <p><i>Table 11.1-7: Potential Project Interactions for Indigenous Land and Resource Use</i></p> <p>→ Many of the Project Phase/Activities listed would contribute to a change in the environmental setting for Indigenous land and resource users within the LSA. Interactions should be considered for temporary or longer-lasting aesthetics impact related to Project-related dust, lighting, noise, and visual disturbance.</p>	<p>Denison needs to revise Table 11.1-7 in the Final EIS to include the addition of interactions and effects analysis for "Perceived suitability of lands and resources therein" that considers Project-related construction and decommission impacts to Indigenous Land and Resource Use.</p> <p>For example, the development of access roads and site preparation during construction, and demolition and disposal of surface infrastructure during decommission, would likely result in some interaction with ILRU related to noise, dust, or traffic.</p>
11-004	<p><b>11.1.4.3.1 Terrestrial Resource Availability (p. 11-46)</b></p> <p>"Though other large terrestrial mammals are harvested, such as elk and white-tailed deer, these species are not found in sufficient abundance in the LSA to be assessed as part the Project."</p> <p>→ Missing information to support the claim that other large terrestrial mammals, such as elk and white-tailed deer species, are not found in sufficient abundance in the LSA to be assessed as part the Project.</p>	<p>Denison needs to include additional information in the Final EIS on why large terrestrial mammals that are harvested in the LSA (such as elk and white-tailed deer) are not found in sufficient abundance in the LSA to support this conclusion.</p>
11-005	<p><b>11.1.5 Mitigation Measures (p. 11-61)</b></p> <p>"Mitigation Measures"</p>	<p>Denison needs to include in the Final EIS, effects mitigation, and management and monitoring plans that were prepared with MN-S and NR1 and NR3 Locals involvement and agreement.</p>



Issue #	Concerns	Recommendations
	<ul style="list-style-type: none"> <li>→ In the Draft EIS, Denison has proposed to develop mitigation measures and management planning, but has not begun engaging with Métis Community of Interest and MN-S on contents of mitigation measures or management plans.</li> <li>→ It is good practice for Communities of Interest, including Métis, to have the opportunity to contribute to the scoping, development, and implementation of mitigation measures and management plans (and monitoring programs), including effectiveness reviews and the application of an adaptive management approach.</li> </ul>	
11-006	<p><b>11.1.8 Monitoring and Follow-up (p. 11-73)</b></p> <p>“Monitoring and Follow-up”</p> <ul style="list-style-type: none"> <li>→ In the Draft EIS, Denison has proposed to develop monitoring programs, but as not begun engaging with MN-S or NR1 and NR3 Locals on contents of these programs.</li> <li>→</li> </ul>	Denison needs to include in the Final EIS, management and monitoring plans that were prepared with MN-S and NR1 and NR3 Locals involvement and agreement.
11-007	<p><b>11.1.7 Cumulative Effects (p. 11-69)</b></p> <p>“Existing projects were not considered as part of the CEA because they were captured and assessed within baseline conditions.”</p> <ul style="list-style-type: none"> <li>→ For many Indigenous communities and governments, cumulative effects analysis requires an assessment that includes pre-development conditions to understand the impacts of past and existing activities that continue to affect the context for environmental and social systems.</li> <li>→ An evolving best practice during an EA is to consider the fuller context of historic change. This practice is recognized through numerous Canadian cumulative effects assessment initiatives and management frameworks (e.g., Indigenous Centre for</li> </ul>	Denison needs to include in the Final EIS, a cumulative effects assessment that considers pre-development conditions related to Indigenous use to understand the ongoing impacts of past and existing activities that continue to affect Indigenous cultural use of lands and resources.



Issue #	Concerns	Recommendations
	Cumulative Effects) and recent Indigenous led environmental assessment (e.g., Squamish Nation Assessment Process).	
11-008	<p><b>11.2 Other Land and Resource Use</b></p> <p><b>11.2.3.1.2 Big Game Hunting (p. 11-97)</b></p> <p>"Based on the last two years of data, the average annual estimated moose harvest by licensed hunters in WMZ 75 was 7.5 by 34 hunters, and the average annual estimated black bear harvest was 5.5 by five hunters."</p> <p>→ The EA assumptions for big game numbers and success are based on the SK database information which includes information for hunters in the southern portion of the province and for non-Indigenous peoples. Reliance on draw licences to support Project models does not capture Métis harvesting and traditional use activities in the Northern Administrative District of Saskatchewan. Métis do not participate in the draw system as they are recognized rights holders.</p>	<p>Denison to acknowledge in the Final EIS that the Terrestrial Ecosystem Effects Assessment relied on draw licences to support assessment conclusions and these conclusions do not capture Métis harvesting and traditional use activities in the Northern Administrative District of Saskatchewan. In addition, Denison to note Métis do not participate in the draw system as they are recognized rights holders in the Final EIS.</p> <p>Denison needs to incorporate Métis Knowledge from the MKS to the Project's Terrestrial Ecosystems Effects Assessment.</p>
11-009	<p><b>11.2.3.1.4 Upland Game Bird Hunting (p. 11-98)</b></p> <p><i>Table 11.2-4: 2019 Upland Game Bird Harvest and Harvest Effort in Game Bird Management Unit 6</i></p> <p>→ To characterize trends in wildlife harvesting it would be more appropriate to show a period longer than 1 year; at least 5 years where available.</p>	<p>Following best practices, Denison should include at least 5 years of data in the Final EIS for upland game bird harvest and harvest effort in Game Bird Management.</p>
11-010	<p><b>11.2.3.9 Indigenous Perspectives on Other Land and Resource Use (p. 11-109)</b></p> <p>"The existing environment for OLRU [Other Land and Resource Use] collectively describes the activities and land uses that have intersected with ILRU over time."</p> <p>→ The characterization of Indigenous perspectives on other land and resource use does not yet reflect MN-S and NR1 and NR3</p>	<p>Denison needs to include in the Final EIS, information provided by Métis Locals in NR1 and NR3 on their perspectives on other land and resource use.</p>



Issue #	Concerns	Recommendations
	<p>Locals values or interests as this has not yet been provided. It is expected that when made available, this information will be reflected in the Final EIS.</p>	
11-011	<p><b>11.2.4.5.1 Aesthetic Experience (p. 11-125)</b></p> <p>"Therefore, this pathway is not carried forward for residual effects assessment."</p> <p>→ This conclusion is not consistent with the methods detailed on page 5-30 in section 5.8 as the Draft EIS identifies noticeable residual effects related to traffic (increased traffic volume) and noise (low to moderate impact). These effects should be taken to residual effects assessment.</p>	<p>To be consistent with the methods detailed in section 5.8, Denison should include all noticeable Project-related effects for residual effects assessment.</p> <p>For example, effects were identified related to traffic (increased traffic volume) and noise (low to moderate impact) but were not taken to residual effects assessment for Other Land and Resource Use in the Final EIS.</p>
11-012	<p><b>11.2.7 Cumulative Effects (p. 11-134)</b></p> <p>"Existing projects were not considered as part of CEA because they were captured and assessed within baseline conditions."</p> <p>→ For many Indigenous communities and governments, cumulative effects analysis requires an assessment that includes pre-development conditions to understand the impacts of past and existing activities that continue to affect the context for environmental and social systems.</p> <p>→ An evolving best practice during an EA is to consider the fuller context of historic change. This practice is recognized through numerous Canadian cumulative effects assessment initiatives and management frameworks (e.g., Indigenous Centre for Cumulative Effects) and recent Indigenous led environmental assessment (e.g., Squamish Nation Assessment Process).</p>	<p>Denison needs to include in the Final EIS, a cumulative effects assessment that considers a pre-development condition related to Indigenous use to understand the ongoing impacts of past and existing activities that continue to affect Indigenous cultural use of lands and resources.</p>



### 3.14 Section 12 Quality of Life

Issue #	Concerns	Recommendations
12-001	<p><b>12.1 Cultural Expression</b></p> <p><b>12.1.2.3 Other Sources of Information and Local Knowledge (p. 12-12)</b></p> <p>"Other Sources of Information and Local Knowledge"</p> <p>→ Arrangements and applicable funding to facilitate the MN-S' participation and engagement in the EA process are underway. It's expected that MN-S will be given the opportunity to provide information related to cultural expression and this information will be reflected in the Final EIS.</p>	<p>Denison needs to include in the Final EIS, information provided by Métis Locals in NR1 and NR3 on their input related to cultural expression.</p>
12-002	<p><b>12.1.4.2.1 Potential Effect 1: Change in Knowledge Transmission (p. 12-23)</b></p> <p>"Even if community members are away on working rotation, knowledge transmission is likely to continue because the entire family and community are involved. According to the <i>First Nations Regional Health Survey Phase 3</i> (FNIGC 2018), family members were reported as primarily helping First Nations understand their culture, but it was not limited to parents."</p> <p>→ Need some clarification on this statement as it's reasonable to assume that both parents (mother and father), aunts' and uncles, and other relatives who are members of the community/family would potentially be employed and be away from home. Transmission of knowledge has the potential to be disturbed if multiple family and community members are away on working rotation.</p>	<p>Denison needs to provide clarity in the Final EIS on the statement that "knowledge transmission is likely to continue because the entire family and community are involved" considering the potential that with local hiring practices in place, multiple family and community members may be away on working rotation and not able to adequately facilitate knowledge transfer.</p>
12-003	<p><b>12.1.4.2.1 Potential Effect 1: Change in Knowledge Transmission (p. 12-24)</b></p> <p>"It is difficult to predict with accuracy whether perceptions will result in a change in behaviour."</p>	<p>Denison needs to provide more detail in the Final EIS on monitoring (and adaptive management) for areas of uncertainty such as displacement of cultural activities. This includes management and monitoring plans that were prepared with MN-S involvement and agreement.</p>



Issue #	Concerns	Recommendations
	<p>→ The Draft EIS points to follow-up programs as a way to address any uncertainties identified during the EA process. Insufficient detail is provided to reflect how avoidance of areas near the Project may occur; monitoring (and adaptive management) is needed. More clarity on how monitoring will be developed (in section 12.1.8, p. 12-34) to address this uncertainty.</p>	
12-004	<p><b>Potential Effect 2: Change in Traditional Diet (p. 12-26)</b></p> <p>"Experience from other uranium operations in northern Saskatchewan suggests that resource use will continue despite the potential selenium exceedance. . . . members had developed their own culturally appropriate practice of risk assessment and management based on their relationship with the land.</p> <p>. . . The ERFN Trapper had a positive relationship with other uranium operations in the ILRU LSA."</p> <p>→ The claims made in these statements sound like the potential Project effects being identified are to be mitigated by ILRU users' behavior, based on past behavior patterns, rather than Project mitigation.</p> <p>→</p>	<p>Denison needs to include in the Final EIS, health risk assessment management and monitoring plans that are prepared with MN-S involvement and agreement to address suitability of land and resources for Indigenous land users.</p> <p>Denison should confirm this assertion through a monitoring program that will focus on providing data to verify the predictions and include communication planning to convey health risk assessment results. This may also address assumptions about perceived suitability of lands and resources.</p>
12-005	<p><b>12.1.7 Cumulative Effects (p. 12-32)</b></p> <p>"Cumulative Effects"</p> <p>→ For many Indigenous communities and governments, cumulative effects analysis requires an assessment this includes pre-development conditions to understand the impacts of past and existing activities that continue to affect the context for environmental and social systems. Considering the fuller context of historic change during an EA is an evolving best practice and is recognized through numerous Canadian cumulative effects assessment initiatives and management frameworks (e.g., Indigenous Centre for Cumulative Effects)</p>	<p>See recommendation for Issue #5-006.</p>





Issue #	Concerns	Recommendations
	and recent Indigenous led environmental assessment (e.g., Squamish Nation Assessment Process).	
12-006	<p><b>12.1.8 Monitoring and Follow-up (p. 12-34)</b></p> <p>"No monitoring or follow-up activities are proposed for the Cultural Expression VC. Monitoring activities described for the aquatic environment and human health will be sufficient."</p> <p>→ Areas of uncertainty were identified in the analysis of Cultural Expression (e.g., displacement of cultural activities). Adaptive management is an appropriate strategy for helping to reduce uncertainty about environmental effects and the effectiveness of mitigation. It provides flexibility to identify new mitigation measures or to modify existing ones during the life of the Project.</p> <p>→ In the Draft EIS, Denison has proposed to develop monitoring programs, but has not begun engaging with MN-S on contents of these programs. As a rights holder, MN-S should have the opportunity to contribute to the scoping, development, and implementation of monitoring programs, including effectiveness reviews and the application of an adaptive management approach.</p>	<p>Considering areas of uncertainty were identified in the analysis of Cultural Expression (e.g., displacement of cultural activities) in the Draft EIS, MN-S request more details in the Final EIS on monitoring (and adaptive management) for areas of uncertainty related to Indigenous cultural expression. This includes a monitoring program that will focus on providing data to verify the predictions and include communication planning to convey health risk assessment results. This may also address assumptions about perceived suitability of lands and resources.</p>
12-007	<p><b>12.2.2 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment (p. 12-47)</b></p> <p>"Indigenous Knowledge, LK, and engagement were collected and incorporated into the assessment through workshops, surveys, and KPIs [key person interviews] identified in Section 3 and Section 4 of the EIS."</p> <p>→ Arrangements and applicable funding for a Métis Knowledge study is underway but not yet incorporated in the assessment.</p>	<p>Denison, in the Final EIS, needs to incorporate the outcome of the Métis Knowledge Study.</p>



Issue #	Concerns	Recommendations
12-008	<p><b>12.2.4.1 Potential Interactions Between the Project and Valued Component / Key Indicators (p. 12-74)</b></p> <p><i>Table 12.2-5: Potential Project Interactions for Community Well-being</i></p> <p>→ The interaction table identifies “Employment and Expenditures” as the only project component that would influence community well-being. This is inconsistent with previous interactions tables and information in the Draft EIS that identified potential interactions with the physical components and activities of the project that could affect aspects of community identity and cohesion (e.g., section 12.1 Cultural Expression). Comments were raised in the Draft EIS that community health and well-being is related to the relationship with the environment including issues such as changes in water quality or quantity, and mental health being affected by industrial development. Furthermore, section 12.2.3.3 (p. 12-66 to 12-73) identifies the natural environment as a component of community cohesion. This should be better reflected in the analysis of Community Well-being.</p>	<p>In the Final EIS, <i>Table 12.2-5: Potential Project Interactions for Community Well-being</i> (p. 12-74 to 12-77) should include the addition of interactions and effects analysis for “Change in Community Cohesion” that considers Project-related construction, operations, and decommission impacts to mental, physical, and cultural health that stem from a relationship with the environment.</p>
12-009	<p><b>12.2.4.2.1 Potential Effect 1 – Change in Population and Demographics (p. 12-79)</b></p> <p>"Multiple pick-up points for workers will be determined as part of Project design, including a minimum of two pick-up points in the LSA and one in Saskatoon, with additional locations to be determined relative to eligible labour force supply. In addition, working with LSA communities to develop hiring policies and commuter transportation options that provide flexibility for workers to maintain employment, specifically if they choose to relocate south to larger communities (e.g., Saskatoon) to access education or other amenities for themselves and/or family</p>	<p>The Final EIS should include detail on how the input provided by Métis Locals in NR1 and NR3 and MN-S will influence the development of the location of pick-up points and commuter transportation options and address concerns related to in-migration and out-migration pressures.</p>



Issue #	Concerns	Recommendations
	<p>members, can help with the planning and management of any in-migration and out-migration pressures."</p> <p>See also: Issue # 12-010</p> <p>→ In the Draft EIS, Denison has proposed to develop mitigation measures and management planning, but as not begun engaging with MN-S on contents of mitigation measures or management plans. As a rights holder, MN-S should have the opportunity to contribute to the scoping, development, and implementation of mitigations, such as input into the location of pick-up points and commuter transportation options.</p>	
12-010	<p><b>12.2.4.2.2 Potential Effect 2 – Change in Income (p. 12-80)</b></p> <p>"Best efforts will be made to make sure employment is maximized, including within the LSA communities and to encourage business participation within the LSA."</p> <p>→ "Best efforts will be made . . ." is a vague statement about project-related plans to maximize local training, employment, and procurement opportunities that would beneficially impact income levels for residents. More detail is needed to understand Denison's approach and commitment to increased personal income for residents of the LSA.</p>	<p>Denison needs to provide more certainty and detail within the Final EIS related to local employment and procurement mitigation as well as supports for employee retention. More information is needed to understand Denison's approach and commitment to increased personal income for residents of the LSA.</p> <p>Denison to expand the LSA communities to include all potentially impacted NR1 and NR3 Locals.</p>
12-011	<p><b>12.2.4.2.2 Potential Effect 2 – Change in Income (p. 12-81)</b></p> <p>"Communities have also expressed concerns about the loss of employment following Decommissioning as the loss of income can be difficult for individuals and their families . . . members rely on accessing employment opportunities outside of their communities"</p> <p>→ "Community concerns" are identified related to broader spatial (having to move away to work) and temporal ("crash" after</p>	<p>Denison needs to provide more certainty and detail within the Final EIS related to local employment and procurement mitigation as well as supports for employee retention. More information is needed to understand Denison's approach and commitment to addressing community concerns related to increased personal income for residents of the LSA.</p> <p>Decommissioning planning needs to consider employment transition in addition to site clean-up to avoid boom and bust scenarios.</p>



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	<p>project) uncertainty for increased income. More detail is needed to understand Denison's approach and commitment to addressing community concerns related to income for residents of the LSA.</p>	
12-012	<p><b>12.2.4.2.3 Potential Effect 3 – Change in Community Cohesion (p. 12-83)</b></p> <p>"Community members identified the benefits of the Project (e.g., employment and increased income), but had concerns for family members and community members working for the Project being taken out of the community for long periods at a time. Participation in the worker rotation system may affect family dynamics by having an adverse effect on the worker and their immediate families."</p> <p>→ "Community concerns" are identified related to impact to family and community cohesion due to working away from home for long periods. More detail is needed to understand Denison's approach and commitment to addressing community concerns related to community and family cohesion effects for residents of the LSA.</p>	<p>Denison needs to provide more detail within the Final EIS related to worker rotation system mitigation. Particularly considering the identification of reported difficulty in balancing the demands of a worker rotation system with domestic commitments, and many local community members concern of being unable to achieve a work-life balance.</p>
12-013	<p><b>12.2.4.2.3 Potential Effect 3 – Change in Community Cohesion (p. 12-84)</b></p> <p>"Preparing and educating fly-in/fly-out workers and their families prior to employment can help them make informed choices on a worker rotation lifestyle. Preparation could include strategies to plan and manage a fly-in/fly-out lifestyle, and education on common issues, coping strategies, management of transition between worker rotation and home life, skills for effective communication, tips and ideas from other successful worker rotation families, and financial literacy"</p> <p>→ Terminology like "could" is a vague indicator of commitment to developing strategies to address training and support systems</p>	<p>Denison needs to provide more detail within the Final EIS related to their role in developing and providing culturally appropriate resources for training, education and supports systems as access has already been identified as a barrier to local communities.</p> <p>Denison needs to support Métis training opportunities through Northlands College.</p>



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	<p>for workers. More detail is needed to understand Denison's approach and commitment to addressing community concerns related to providing appropriate local resources for training and support as access to education and supports systems effects for residents of the LSA.</p>	
12-014	<p><b>12.2.5 Mitigation Measures (p. 12-85)</b></p> <p>"This will include the establishment of health and wellness programming on-site, which will be accessible to all workers."</p> <p>→ More detail is needed to understand the types and scope of health and wellness programs. Many of the services listed below this statement are standard health and safety measures for industrial sites and only accessible to on-site staff. They do not address community issues of health and well-being.</p>	<p>Denison needs to provide more detail within the Final EIS related to the health and wellness programs and their role in developing and providing resources of this type. This should include the provision of services more broadly within communities, not just to individuals on-site.</p> <p>Denison to confirm how Métis input is considered in mitigation development.</p>
12-015	<p><b>12.2.5 Mitigation Measures (p. 12-85)</b></p> <p>"Programming may include the development of life skills programming to address topics such as managing personal finances and coping with stressful situations."</p> <p>→ Terminology like "may" is a vague indicator of commitment to development of life skills programming. More detail is needed to understand Denison's approach and commitment to addressing community concerns related to providing appropriate local resources for supporting the well-being of residents of the LSA.</p>	<p>Denison needs to provide more detail within the Final EIS related to a commitment to developing and key components of life skills programs. It is appropriate to address the issues as they are identified as an effect of the project in the proceeding section regardless of the certainty of these effects.</p> <p>Denison to confirm how Métis input is considered in mitigation development.</p>
12-016	<p><b>12.2.5 Mitigation Measures (p. 12-85)</b></p> <p>"Pick-up points will be located at two locally central points in communities within the LSA, one additional site in northern Saskatchewan, and potentially other locations to minimize time spent away from families."</p> <p>See also: Issue # 12-010</p>	<p>Denison needs to provide additional detail within the Final EIS, on how the input provided by MN-S, NR1 Locals, and NR3 Locals will influence the development of the location of pick-up points and commuter transportation options</p>



Issue #	Concerns	Recommendations
	<p>→ In the Draft EIS, Denison has proposed to develop mitigation measures and management planning, but has not begun engaging with MN-S on contents of mitigation measures or management plans. As a rights holder, MN-S should have the opportunity to contribute to the scoping, development, and implementation of mitigations, such as input into the location of pick-up points and commuter transportation options.</p>	
12-017	<p><b>12.2.5 Mitigation Measures (p. 12-86)</b></p> <p>“Mitigation Measures”</p> <p>→ More clarity and commitment are required from Denison on social management mitigations and programming.</p> <p>→ For example, Denison could implement established mitigations to address effects that are identified in the Draft EIS related to community well-being, such as:</p> <ul style="list-style-type: none"> <li>a) maintain a Community Liaison Coordinator position to work with communities throughout the Project and provide a grievance mechanism through which individuals can confidentially and independently raise issues should they arise.</li> <li>b) develop a Community Readiness program to support communities and businesses in assessing local capacity, identify critical gaps that would prevent community members from successfully gaining employment, and capture business and economic opportunities related to the Project.</li> <li>c) involving local communities in the development and implementation of monitoring programs could provide opportunities for employment during Construction to beyond the Decommissioning stage.</li> </ul>	<p>Denison needs to provide additional detail within the Final EIS related to Denison’s commitment to developing mitigations that address potential effects to community well-being such as support for community accessible health and wellness programs, community liaisons, community readiness programs, and long-term monitoring opportunities. This includes mitigations that are prepared with MN-S, and NR1 and NR3 Locals involvement and agreement.</p>
12-018	<p><b>12.2.6.2.2 Community Cohesion (p. 12-89)</b></p> <p>“A summary of residual effects on changes in community cohesion is found in Table 12.2-8. The Project will likely result in</p>	<p>Denison needs to provide additional effects analysis of “Change in Community Cohesion” that considers Project-related construction, operations, and decommission impacts to mental, physical, and cultural health that stem from a</p>



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	<p>some effects on community cohesion, mainly through participation in the worker rotation system (other pathways through changes in demographics and income are assessed separately in Section 12.2.4.2.1 and Section 12.2.4.2.2)."</p> <p>→ This analysis does not address the concerns expressed in the existing conditions reporting (section 12.2.3, p. 12-47 to 12-50) related to mental and physical health being affected by quality of water and land is being affected by industrial developments. This should be better reflected in the analysis of Community Cohesion.</p>	<p>relationship with the environment. For example, concerns were expressed in the Draft EIS reporting (section 12.2.3) related to mental and physical health being affected by quality of water and land is being affected by industrial developments.</p>
12-019	<p><b>12.2.6.2.2 Community Cohesion (p. 12-89)</b></p> <p>"Stress associated with participation in the worker rotation system, along with family tensions, may result in use of alcohol/substances as a coping mechanism. In some instances, evidence exists that these factors may result in an increase in violence and crimes, although this would be difficult to attribute directly to the Project."</p> <p>→ This statement, and the existing conditions reporting, presents evidence that stress and related responses are a potential indirect effect of changes to employment and income that could be related to the Project.</p>	<p>Considering the uncertainty identified in the Draft EIS about social effects of the Project on community cohesion, Denison needs to provide additional detail within the Final EIS related to Denison's commitment to developing monitoring and management programs to understand and respond adaptively to potential effects of the Project on community cohesion. This includes monitoring and management programs prepared with MN-S, and NR1 and NR3 Locals involvement and agreement that could support community members dealing with use of alcohol/substances and/or related violence and crime.</p>
12-020	<p><b>12.2.8 Monitoring and Follow-up (p. 12-92)</b></p> <p>"No monitoring or follow-up is anticipated for Community Well-being. Government departments and private-sector companies that provide community services will continue to monitor the ongoing demand."</p> <p>→ This statement is vague about who will monitor community cohesion and whether Government departments and private-sector companies are committed to provide those services for the life of the Project. It also ignores previous statements in</p>	<p>Denison, in the Final EIS, needs to demonstrate that whether Government departments and private-sector companies are committed to provide community cohesion-related services for the life of the Project.</p> <p>Denison needs to distinguish and clarify earlier statements of monitoring and follow-up with the assertion here.</p>



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	<p>the Draft EIS that identify direct and indirect effects of uncertainty related to changes to community well-being that would be related to the Project.</p> <p>→ Denison's earlier statements indicate that monitoring and follow-up will be an aspect of mitigation. The statements seem contradictory.</p>	
12-021	<p><b>12.3 Infrastructure and Services</b></p> <p><b>12.3.1.3.1 Spatial Boundaries (p. 12-105, 12-107)</b></p> <p>"Figure 12.3-3 shows the location of the Project in relation to the communities in the LSA, including the locations of Highway 914 and Highway 165."</p> <p><i>Figure 12.3-3: Location of the Project in Relation to the Communities in the Local Study Area</i></p> <p>→ Contrary to the text describing the Traffic Study Area, Highway 914 and Highway 165 are not labelled on Figure 12.3-3.</p>	<p>MN-S request the revision of Figure 12.3-3 to include labelling of Highway 914 and Highway 165 in the Final EIS.</p>
12-022	<p><b>12.3.4.2.1 Potential Effect 1 – Change in Traffic (p. 12-148)</b></p> <p>"A slight increase in traffic volume during Construction and Operation may result in an increase in collisions."</p> <p>→ The 31% or 51% increase in truck traffic on Highway 914 seems to represent a more than slight increase in traffic volume. It is acknowledged that this is related to 18 additional trucks per day. Clarification is required to determine if there would be a similar % increase in potential collisions.</p>	<p>Denison needs to clarify and provide analysis of the impact of traffic volume and what is a suitable threshold.</p>
12-023	<p><b>12.3.4.2.1 Potential Effect 1 – Change in Traffic (p. 12-148)</b></p>	<p>Denison should provide further clarification in the Final EIS of why collisions can not be predicted with accuracy given the availability of existing predictive modelling for traffic management planning.</p>





Issue #	Concerns	Recommendations
	<p>"Understanding whether collisions may increase as a result of the Project is difficult to determine and cannot be predicted with accuracy."</p> <p>→ Clarity is required to explain why collisions can not be predicted with accuracy given the availability of existing predictive modelling for traffic management planning.</p>	
12-024	<p><b>12.3.4.2.2 Potential Effect 2 – Change in Community Infrastructure and Services (p. 12-150)</b></p> <p>"If a family member is away for an extended period of time through worker rotation, remaining family members will likely have more responsibilities, and may require additional support (e.g., childcare, counselling, family support services)"</p> <p>→ Clarification is required to explain how Denison intends to provide employee maintenance support services that address the indirect effect to the community members (e.g., childcare, etc.) identified in this statement.</p>	Denison to provide in the Final EIS additional detail on commitments to support employee families while on rotation.
12-025	<p><b>12.3.4.2.2 Potential Effect 2 – Change in Community Infrastructure and Services (p. 12-151)</b></p> <p><i>Table 12.3-14: Summary of Social Services and Organizations for English River First Nation, Kineepik Metis Local #9 Lake, and Beauval</i></p> <p>→ The services listed in Table 12.3-14 are predominately crisis management services and general health care services which are provided by existing organizations in the community/region.</p> <p>→ Clarification is required to identify the community services that Denison will make available to the families of local employees to address shift rotation issues (e.g., childcare services) and how Denison will help families with access these services.</p>	Denison's should clarify their commitment to providing provide community social services to the families of local employees to address issue identified in relation to the shift rotation (e.g., childcare services)



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12-026	<p><b>12.3.2 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment (p. 12-108)</b></p> <p>"Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment"</p> <p>→ Arrangements and applicable funding for a Métis Knowledge study is underway but not yet incorporated in the assessment.</p>	<p>Denison needs to include in the Final EIS, Métis Knowledge study findings on their perspectives on infrastructure and services.</p>
12-027	<p><b>12.3.4.2.2 Potential Effect 2 – Change in Community Infrastructure and Services (p. 12-152)</b></p> <p>"The Project may alleviate some pressures on health facilities in the LSA communities by providing programs for workers on site (e.g., health awareness and education)."</p> <p>→ Clarification is required to indicate how the on-site programs would support community-based health services.</p>	<p>Denison to provide additional information of on-site health services that will alleviate community-based health services in NR1 and NR3.</p>
12-028	<p><b>12.3.4.2.2 Potential Effect 2 – Change in Community Infrastructure and Services (p. 12-152)</b></p> <p>"In addition to offering an appropriate suite of health-related programming and services on site, mining companies have, in the past, developed social responsibility guidelines, which have included donating to community infrastructure and services (e.g., health, education and community development)."</p> <p>→ Denison has not identified</p>	<p>Denison needs to confirm how social responsibility guidelines will support community infrastructure and services in NR1 and NR3 to help offset some of the interactions and effects to local communities and timelines for the action.</p>
12-029	<p><b>12.3.5 Mitigation Measures (p. 12-153)</b></p> <p>"Mitigation Measures"</p> <p>→ Most of the mitigations provided are standard worker health and safety and materials handling measures required for worker and environmental safety and don't address potential effects to traffic within the LSA.</p>	<p>Denison needs to provide additional information in the Final EIS on how the mitigation will alleviate traffic related impacts.</p>



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	→ Detail is required to demonstrate how measures will address potential hazards from increased traffic volumes, and potential risk for conflict between road users and mining traffic.	

### 3.15 Section 13 Economics

Issue #	Concerns	Recommendations
13-001	<p><b>13.1 Scope of Assessment</b></p> <p><b>13.1.1 Valued Component Selection (p. 13-5 to 13-6)</b></p> <p>"Residents in the LSA and Regional Study Area (RSA) have expressed interest and concern about the Project's effect on the local economy, through income, training and employment opportunities, and business opportunities.</p> <p>Initial direction and input into VC selection was obtained from:</p> <ul style="list-style-type: none"> <li>• discussions with Indigenous and non-Indigenous Communities of Interest (COI);</li> <li>• discussions with LK holders; • discussions with government agencies and the public;</li> <li>• results of Denison's baseline studies;</li> <li>• regional data from other EAs;</li> <li>• results from engagement and consultation activity; and</li> <li>• similar or recent projects in the region."</li> </ul> <p>→ N/A</p>	In the Final EIS, Denison needs to include the input from MN-S, NR1 Locals, NR3 Locals and indicate if VCs were altered.
13-002	<p><b>13.1.3.1 Spatial Boundaries (p. 13-12)</b></p> <p>"The economic impacts concentrated within the LSA are expected to be detectable and measurable. Economic impacts extending beyond the LSA are likely to be diffused and undetectable within the broader</p>	Denison needs justify its selection of LSA communities and why no Indigenous Communities of Interest nearest to the site are not in the LSA. The omission calls into question



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	<p>economy. The spatial boundaries were selected based on the consideration of communities where Project recruitment is likely to be prioritized, consideration of previous EAs conducted in the region, and consideration of information shared through key persons in the interview program. The spatial boundaries may be further refined during study implementation based on feedback from regulators, local and Indigenous communities, and the public. . . .</p> <p>The LSA for the assessment of the economy includes the following communities:</p> <ul style="list-style-type: none"> <li>• ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak);</li> <li>• Kineepik Metis Local #9 Lake, Northern Village; and</li> <li>• Beauval, Northern Village.”</li> </ul> <p>→ Denison has not included MN-S or NR1 and NR3 Métis communities in the LSA for the assessment of the economy.</p>	<p>any economic interests of Métis in close proximity to the Project could have.</p> <p>In the Final EIS, Denison to expand its evaluation to Métis</p>
13-003	<p><b>13.1.3.2 Temporal Boundaries (p. 13-15 to 13-16)</b></p> <p>"The fourth phase of the Project, Post-Decommissioning, is not included within the economic temporal boundaries as the monitoring and inspection activity is expected to be very limited compared to the Construction, Operation, and Decommissioning phases. The economic effect of Post-Decommissioning activities is not expected to be detectable at a scale consistent with the Construction, Operation, and Decommissioning phases. Lasting effects of employment, training and business opportunities may exist in the Post-Decommissioning period (and perhaps beyond), through accumulation of skills and experience at an individual and business level; however, such impacts are uncertain and unlikely to be quantifiable.</p>	<p>MN-S requests that in the Final EIS, Denison include the addition of interactions and effects analysis for Post-Decommissioning impacts to economics that may stem from Employment Income within the LSA communities related to monitoring and the implementation of management programs to respond adaptively to potential effects of the Project. This includes monitoring and management programs prepared with MN-S, NR1 Locals, and NR3 Locals involvement and agreement.</p>



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	→ MN-S is interested in understanding all potential Project-related effects during Post-Decommissioning including economic impacts.	
13-004	<p><b>13.1.4 Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment (p. 13-16)</b></p> <p>"The assessment of the Economy VC has been influenced by community engagement, which has identified issues of importance to community members across the COI. These identified issues include opportunities for income, employment and training, business and supply contracts, impact benefit agreements and memoranda of understanding, and the traditional economy (described in Section 13.2.3)."</p> <p>→ Denison has not sufficiently engaged MN-S, NR1 communities, and NR3 communities on the assessment of the Economics VC.</p>	<p>Denison needs to meet with MN-S, NR1 Locals, and NR3 Locals to discuss Project-related economic issues and interests.</p> <p>MN-S request additional detail is included within the Final EIS, on how the input provided by MN-S, NR1 Locals, and NR3 Locals will influence the assessment of the Economics VC.</p>
13-005	<p><b>13.2 Existing Environment</b></p> <p><b>13.2.1.2 Participation Rate (p. 13-20)</b></p> <p>N/A</p> <p>→ Denison has not assessed the participation rate, employment rate, or unemployment rate of MN-S or NR1 and NR3 communities.</p>	<p>In the Final EIS, Denison needs to expand the description of the existing environment to include NR1 communities and NR3 communities.</p>
13-006	<p><b>13.2.1.3 Employment Rate (p. 13-24)</b></p> <p>"Several barriers to employment in northern Saskatchewan have been identified, including lower levels of educational attainment, limited job and work experience opportunities in smaller communities, and the short-term or seasonal nature of many jobs (NLMC et al. 2011)."</p> <p>→ Denison acknowledges that several barriers to employment in northern Saskatchewan exist without providing solutions to address and/or mitigate such barriers.</p>	<p>Denison needs to provide more detail within the Final EIS related to their role in developing and providing resources for training and employment as access has already been identified as a barrier to local communities.</p>



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13-007	<p><b>13.2.3 Key Indicator: Traditional Economy (p. 13-48)</b></p> <p>"The traditional economy also provides a social safety net and supports a culture of reciprocity. For the Métis in northern Saskatchewan:</p> <p><i>'Extra wild meat was always shared in the community and borrowing of staple food products was a common practice. It is often said that the communal lifestyle of the Métis was disrupted by the introduction of electricity and freezers into the Métis communities. Hoarding of food was unnatural, not practical, and virtually unheard of' (Hourie et al. 2006)';"</i></p> <p>→ The Métis Knowledge study by MN-S has not been completed and included in the Draft EIS.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, Denison should equally engage all NR1 and NR3 Locals in addition to Kineepik Metis Local #9 on potential Project-related effects to Métis traditional economy throughout the life of the Project.</p> <p>The Final EIS needs to include the Métis Knowledge Study once completed.</p>
13-008	<p><b>13.2.4.1 Local Businesses (p. 13-51)</b></p> <p>"Economic leakage (i.e., money leaving the local economy) is a relevant concern, particularly for small, concentrated economies. Economic leakage can occur at various points through the cascade of spending in an economy, but the closer that leakage occurs to the point source of investment, the more potential economic benefit that is lost."</p> <p>→</p>	<p>Denison needs to provide more certainty and detail within the Final EIS related to local employment and procurement mitigation to manage for and reduce 'economic leakage'.</p>
13-009	<p><b>13.3 Assessment of Project-related Effects</b></p> <p><b>13.3.1 Potential Interactions Between the Project and Valued Component / Key Indicators (p. 13-57)</b></p> <p>"Communities and residents in the LSA will be given first priority for employment and training and business opportunities followed by RSA communities and residents. The Project will also positively affect the governments of Saskatchewan and Canada mainly through the government payments (e.g., uranium royalties paid to the Government of Saskatchewan, corporation income tax, payroll</p>	<p>Denison to include MN-S and all NR1 communities in the LSA for the economy VC in the Final EIS.</p>



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	<p>taxes). Changes associated with Project employment may also affect the traditional economy of communities in the LSA.”</p> <p>→ Denison does not include MN-S or NR1 communities within the LSA in the assessment on the economy and therefore employment, training, and business opportunities will not be prioritized for all potentially impacted Métis.</p>	
13-010	<p><b>13.3.1 Potential Interactions Between the Project and Valued Component / Key Indicators (p. 13-58)</b></p> <p><i>Table 13.3-1: Potential Project Interactions for Economy</i></p> <p>→ Potential Project interactions for the Economy VC do not reflect feedback shared by MN-S/NR1 and NR3 Locals.</p>	<p>Denison needs to discuss potential Project interactions for economy to Métis peoples and update Table 13.3-1 to reflect feedback shared by MN-S/NR1 and NR3 Locals.</p>
13-011	<p><b>13.3.2.1 Potential Effect 1 - Employment and Training (p. 13-61)</b></p> <p>“Employment opportunities will be of benefit to the LSA where unemployment is typically high. Training opportunities are expected to begin prior to Construction and continue until Operation. Training programming will be determined in consultation with COI and are anticipated to involve existing training facilities and programs (Process Operation Technical [SIIT] Meadow Lake, Chemical Technology [Saskatchewan Polytechnic]) as well as specific ISR training, where required. Denison will initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities.”</p> <p>→ Denison has not included MN-S or NR1 and NR3 Métis communities in the LSA for the assessment of the economy. Denison also has not engaged MN-S or all potentially impacted NR1 and NR3 communities to understand Métis concerns and/or interests related to employment and training opportunities.</p>	<p>Denison needs to engage all potentially impacted Métis communities. Specifically, Denison should equally engage all NR1 and NR3 Locals in addition to Kineepik Metis Local #9 on interests and concerns related to employment and training opportunities throughout the life of the Project.</p> <p>Denison needs to provide more detail within the Final EIS related to their role in developing and providing resources for training and employment as access has already been identified as a barrier to local communities. This includes training programs prepared with MN-S/NR1 and NR3 Locals involvement and agreement.</p>
13-012	<p><b>13.3.2.1 Potential Effect 1 - Employment and Training (p. 13-62 to 13-63)</b></p>	<p>Denison needs to provide more certainty and detail within the Final EIS related to local training and employment.</p>



Issue #	Concerns	Recommendations
	<p>“Denison, like other uranium operations, will give preferential consideration across all job openings to residents of Saskatchewan’s North (i.e., the RSA), and particularly those from the COI in the LSA. This will include working with the Indigenous COI to advertise jobs broadly (e.g., websites, social media, local radio, northern publications), and assisting northern employees in applying for career advancement opportunities.”</p> <p>→ Denison has not identified Métis-specific considerations to their employment and training program.</p>	<p>More information is needed to understand Denison's approach and commitment to addressing effects to local employment especially as it relates to Foundational positions and why a Grade 12 education is required.</p> <p>Denison needs to update the Economics Section to reflect the latest census and the effects that Covid has had on employment in the LSA and RSA.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to discuss employment and training opportunities for Métis (e.g., discussing Métis-specific recruitment strategies).</p>
13-013	<p><b>13.3.2.1 Potential Effect 1 - Employment and Training (p. 13-63 to 13-64)</b></p> <p>“Training opportunities are anticipated to be delivered by institutions in northern Saskatchewan or Saskatchewan more broadly, and will be determined in consultation with LSA communities. Training delivery may involve development partnerships with Northern Career Quest or other relevant entities such as they may exist during the life of the Project, and may include things such as scholarships, summer student opportunities, career counselling or other on-the-job training. These opportunities will be extended to other Indigenous communities and the general public in the RSA after discussions with LSA communities.”</p> <p>→ Denison has indicated that there will in-house training, as well. It is not clear how this will be delivered.</p>	<p>Denison needs to provide more detail within the Final EIS related to their role in developing and providing resources for training and employment as access has already been identified as a barrier to local communities. This includes training programs prepared with MN-S/NR1 and NR3 Locals involvement and agreement.</p> <p>Denison needs to engage MN-S, NR1 Locals, and NR3 Locals to discuss employment and training opportunities and delivery for Métis. Opportunities to discuss include (but are not limited to): hiring and training practices during all phases of the Project, on-the-job training and career counselling to help with advancement from foundational positions, advance sharing of job qualification requirements, clearly identifying training requirements and working with various training institutions to make sure such appropriate training is available, and creation of scholarship and support programs.</p>





Issue #	Concerns	Recommendations
13-014	<p><b>13.3.2.2 Potential Effect 2 - Income (p.13-65)</b></p> <p>"Employment and, hence, opportunities to increase income will be provided first to communities in the LSA. Denison will initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and will work with the leadership of these communities to assist in determining hiring practices during all phases of the Project."</p> <p>→ Initiating efforts with LSA communities excludes most of the Métis communities and keeps them from benefiting.</p>	<p>The Final EIS needs to include additional evaluation of non-LSA communities potential for income benefits.</p>
13-015	<p><b>13.3.2.3 Potential Effect 3 - Traditional Economy (p. 13-66)</b></p> <p>"This means that the access limitations created by the Project (i.e., 169.9 ha restricted for use) are not anticipated to overlap with areas frequented by most resource harvesters."</p> <p>→ Denison has not incorporated Métis Knowledge from MN-S, NR1, or NR3 (except Métis Knowledge from Kineepik).</p>	<p>Denison will need to revise the potential effects evaluation after completion of the MKS.</p>
13-016	<p><b>13.3.2.3 Potential Effect 3 - Traditional Economy (p. 13-67)</b></p> <p>"Communities have expressed some uncertainty regarding the ISR mining method, as it is a new approach relative to other uranium operations in the region. Despite the low use of the area by resource harvesters, this uncertainty may result in some hesitance to use areas in proximity to the Project site. Denison is committed to continued engagement within the LSA to increase the familiarity and comfort with the ISR method."</p> <p>→ Denison has not included details on closure planning including traditional economic activities that can be expected upon decommissioning.</p>	<p>In the Final EIS, Denison needs to provide additional information on closure planning and what traditional economic activities can be expected upon decommissioning.</p>
13-017	<p><b>13.3.2.3 Potential Effect 3 - Traditional Economy (p. 13-67)</b></p>	<p>In the Final EIS, Denison needs to provide more detail related to worker rotation system mitigation. Particularly</p>



Issue #	Concerns	Recommendations
	<p>“The Project’s commuter-rotation schedule (2 weeks on/2 weeks off) is also anticipated to provide participants with the flexibility and sufficient time to participate in traditional activities. Overall, the extent of effects is dependent on personal preferences of individuals and is likely to be balanced out through the income received by employment.”</p> <p>→ Denison has not engaged MN-S, NR1, and NR3 to understand Métis-specific effects of the Project’s proposed commuter-rotation schedule.</p>	<p>considering the identification of reported difficulty in balancing the demands of a worker rotation system with traditional economy activities.</p>
13-018	<p><b>13.3.2.3 Potential Effect 3 - Traditional Economy (p. 13-67)</b></p> <p>“Measures to mitigate potential changes to land and resource use (Sections 11.1.5 and 11.2.5 in Section 11) would similarly be protective of the activities that support the traditional economy. Given that there are limited changes associated with land and resource use activities, it is unlikely that the Project would have any discernable effect on the traditional economy through this pathway.”</p> <p>→ As identified in section 11.1.6 (p. 11-66 to 11-68), Indigenous land use may be affected by the Project despite mitigations. It is reported that Project-related effects such as noise and dust can cause avoidance of the area by some resource harvesters while others may be undeterred.</p>	<p>Denison needs to include in the Final EIS, information provided by Métis in NR1 and NR3 once the MKS is completed.</p> <p>Denison needs to support Métis training opportunities through Northlands College.</p>
13-019	<p><b>13.4 Mitigation and Enhancement Measures (p. 13-69)</b></p> <p>→ Limited listing of potential measures for consideration.</p>	<p>It is unclear from the description of Mitigation and Enhancement Measures whether Impact and Benefit Agreements (IBAs) will be included. Impact and Benefit Agreements are a normal vehicle for extending economic benefits to Indigenous communities.</p> <p>In the Final EIS, confirm whether IBAs are also a mitigation and enhancement measure.</p>
13-020	<p><b>13.4 Mitigation and Enhancement Measures (p. 13-69)</b></p>	<p>Denison indicated multiple pick-up points but a minimum of 3 points (2 in the LSA and 1 in Saskatoon). In the Final EIS,</p>



Issue #	Concerns	Recommendations
	<p>“Denison, through a Human Resource Development Plan, will initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities (anticipated to be in institutions in northern Saskatchewan) and will work with the leadership of these communities to assist in determining hiring and training practices during all phases of the Project, which could include such items as on-the-job training and career counselling to help with advancement from foundational positions, advance sharing of job qualification requirements, clearly identifying training requirements and working with various training institutions to make sure such appropriate training is available, and creation of scholarship and support programs. Priority for employment and training will then focus on Indigenous and non-Indigenous residents of the RSA and then beyond the RSA.”</p> <p>→ Denison has not engaged MN-S or all NR1 Locals and NR3 Locals to understand employment and training needs to support Métis involvement in the Project.</p>	<p>Denison needs to clarify if pick-up points will be extended to the RSA communities so that they can take advantage of employment opportunities.</p>
13-021	<p><b>13.5 Residual Effects Evaluation</b></p> <p><b>13.5.1.1 Employment and Training (p. 13-72)</b></p> <p>“Although the number of jobs will be fewer during Operation than Construction, it will be over a much longer period (i.e., two years for Construction and 15 years for Operation). Decommissioning is also expected to occur over a five-year timeframe with a similar number of jobs available as during Operation. With the implementation of mitigation and enhancement measures in place, residual effects are expected to be low to moderate in magnitude.”</p> <p>→ Denison has not identified mitigation and enhancement measures to support their conclusion that employment and training residual effects are expected to be low to moderate in magnitude.</p>	<p>Denison needs to expand its description of mitigation and enhancement measures to better support their conclusion that employment and training residual effects that are low to moderate in magnitude in Section 13.5.</p>



Issue #	Concerns	Recommendations
13-022	<p><b>13.6 Cumulative Effects</b></p> <p><b>13.6.1 Climate Change Considerations (p. 13-80 to 13-81)</b></p> <p>Detailed plans and procedures would be developed for the Project that are site specific including:</p> <ul style="list-style-type: none"> <li>• process monitoring and operational procedures;</li> <li>• mine development and control procedures;</li> <li>• radiation protection plan;</li> <li>• spill and emergency response plan;</li> <li>• traffic and transportation plan; security procedures;</li> <li>• travel management plan;</li> <li>• environmental monitoring procedures;</li> <li>• personnel training procedures;</li> <li>• regular and preventive inspection and testing procedures; and</li> <li>• surface water and flood management procedures.</li> </ul> <p>→ Denison did not identify how the Métis would be involved in the development, review, and/or implementation of the Project's detailed plans and procedures.</p>	<p>The Final EIS needs to include the detailed plans and procedures for review.</p> <p>The plans and procedures need to include input from MN-S, and NR1 and NR3 Locals.</p>



### 3.16 Section 14 Accidents and Malfunctions

Section 14 was excluded from the review due to funding limitations.

### 3.17 Section 15 Effects of the Environment on the Project

Issue #	Concerns	Recommendations
15-001	<p><b>15.5 Climate Change</b></p>	<p>Denison needs to provide additional detail in the Final EIS describing how the Project will be designed beyond current</p>

Issue #	Concerns	Recommendations
	<p><b>15.5.3 Effects on the Project (p. 15-19)</b></p> <p>"The Project has also been designed using engineering best practices and will meet current regulations and building codes."</p> <p>→ Meeting current regulations and building codes may not be sufficient for short-term or long-term environmental effects as they are characterized in the Draft EIS (e.g., forest fires, flooding). Please provide detail on how the Project will be designed to exceed current regulations in anticipation of changing to environmental conditions.</p>	<p>regulations and building codes in anticipation of changes to environmental conditions.</p>
15-002	<p><b>15.5.3 Effects on the Project (p. 15-19)</b></p> <p>"Denison will develop an Emergency Preparedness and Response Program for the Project to address forest fires and extreme weather that may occur."</p> <p>→ Further details are required on how emergency preparedness and response plans will adaptively respond to changing climatic conditions and potential unforeseen effects to the Project.</p>	<p>Denison needs to provide additional detail in the Final EIS about their commitment to developed adaptive emergency preparedness and response plans to address unforeseen effects to the Project resulting from climate change.</p>



### 3.18 Section 16 Assessment Summary and Conclusions

Section 16 was excluded from the review.

### 3.19 Appendix 2-A Section 2: Engagement Database Summary Table – Project Description

Issue #	Concerns	Recommendations
2A-001	<p><b>Unique ID: 19-EN-CN-1.23, Workshop, 2018-01-16 (p. 13)</b></p> <p>"Denison hosts the MN-S President, MN-S Minister of Environment/MN-S Region 3 President, and the Presidents of the Métis Locals at the Project site for a site tour and to discuss the</p>	<p>Engagement on the proposed Project needs to extend to NR1 communities. The Final EIS should include proof of this engagement and responses to concerns raised.</p>

Issue #	Concerns	Recommendations
	<p>Project, along with representatives from the Canadian Nuclear Safety Commission and the Province of Saskatchewan, Ministry of Environment.”</p> <p>→ The site tour on January 16, 2018 only included the following Métis representation: A La Baie Métis Local #21, Kineepik Métis Local #9, MN-S, and Patuanak Métis Local #82. In addition, other Indigenous Nations were present. It is unclear from Denison's table format who asked how long to freeze and would the freeze wall be kept intact for the life of the operation. Denison shared responses to these questions in their Draft EIS.</p>	
2A-002	<p><b>Unique ID: 22-EN-EQC-648.1, Presentation, 2022-03-03 (p. 19)</b></p> <p>“Event Summary: Denison Mines presented to the Northern Saskatchewan EQC, via Microsoft Teams, on March 2-3, 2022. A schedule, with time allotments for several guests and presenters, was provided for the two day event. Denison's presentation focused on providing the EQC with an update on the Wheeler River Project. . . .</p> <p>Comment (From Interested Party): . . . What are the concerns with groundwater monitoring once mining is done and the freezing comes out?”</p> <p>→ These meetings had representation from Métis Local #39 (La Loche) and no other Métis. It is unclear who asked, "What are the concerns with groundwater monitoring . . .". MN-S does not consider Denison's engagement with the EQC as engagement with MN-S or Métis communities. MN-S prefers Denison specify feedback shared at join workshops by Indigenous Nation.</p>	<p>Denison engagement with Métis communities has been limited. In the Final EIS, MN-S expects to see more informed engagement and responses to concerns raised.</p>



### 3.20 Appendix 7-C Numerical Modelling: Post-decommissioning Evaluation

Issue #	Concerns	Recommendations
7C-001	<p><b>Executive Summary (p. ii)</b></p> <p>"By accounting for these reactions, the simulated dissolved constituent plumes emanating from the ore zone reach their maximum extents within the deeper units (i.e., Lower Sandstone Aquifer and deeper parts of the Desilicified Zone) after approximately 10,000 years. Consequently, concentrations at Whitefish Lake throughout the future centuries are simulated to be similar to background concentrations. Under the base case scenario, which represents a conservative estimate of the conditions present, there are no exceedances of the groundwater quality screening criteria protective of freshwater aquatic life in the receiving environment."</p> <p>→ Whether conditions are "conservative" or not, is dependent on perspective.</p>	<p>"Denison needs to provide further rationale detailing how the "base case scenario" represents a conservative estimate of the conditions present.</p>
	<p><b>Executive Summary (p. ii)</b></p> <p>"A suite of parameter and process uncertainty scenarios were performed to evaluate the potential for concentrations to reach Whitefish Lake above the GQSC [groundwater quality screening criteria] threshold values. A suite of 16 additional scenarios is presented; all scenarios indicated that concentrations of most constituents would not exceed GQSC thresholds. The exceptions include constituents with naturally elevated concentrations or naturally outside of the GQSC range (e.g., iron, manganese, and pH), and a scenario with conservative dispersivity values wherein selenium and cobalt concentrations were simulated to exceed the GQSC."</p> <p>→ Denison provides no rationale for "conservative dispersivity values" in the Draft EIS.</p>	<p>Denison needs to provide site-specific research to confirm literature dispersivity values are conservative in the Final EIS.</p>
	<p><b>Executive Summary (p. ii)</b></p>	<p>Denison to complete simulations that increase focus on maintaining containment of the contaminant source for a greater period of time (i.e., a higher level of focus on</p>



Issue #	Concerns	Recommendations
	<p>“The simulated conditions indicate that the natural setting has a large assimilative capacity, such that the mass left in solution within the Phoenix ore zone will be naturally sorbed to available mineral sites within the sub-surface, limiting the potential to be transported to Whitefish Lake throughout the future centuries. Sorption and geochemical reaction, coupled with dispersion is predicted to reduce the concentrations of constituents reaching Whitefish Lake to relatively minor variations from background conditions.”</p> <p>→ Additional modelling will be needed to confirm at the time of decommissioning the assumption that there is “large assimilative capacity” of the groundwater system, in order to manage risk in Whitefish Lake.</p>	<p>source term control and flushing), and less reliance on management of contaminant along the pathway, prior to the contaminant reaching the receptor.</p> <p>In other words, simulations that focus, to a greater extent, on evaluating the benefit of additional effort and time on source term control (the first step in the risk hierarchy of source, pathway, receptor).</p>
	<p><b>2.4 Scope of Work (p. 1.6)</b></p> <p>“As a result, this study is focused on evaluating groundwater quality that would reach surface water bodies during future centuries for areas where groundwater is interpreted and predicted to be at least partly sourced from the mining area.”</p> <p>→ Denison assumes non-surface reaching groundwater will not be extracted or accessed by future generations.</p>	<p>Denison to study and provide further understanding of deep groundwater characteristics with MN-S, NR1 Locals, and NR3 Locals prior to commencement of mining operations. This information may affect final closure options.</p> <p>Denison to consider modelling for surface receptors of deep groundwater beyond the boundaries identified in Section 1.1.</p>
	<p><b>2.4.1 Groundwater Recharge (p. 2.19)</b></p> <p>“Groundwater recharge refers to the amount of water that infiltrates through the unsaturated zone and reaches the underlying water table. The rate of groundwater recharge is dependent on precipitation, vegetation, surficial soil type (geology), physiography, and ground surface topography. Recharge is enhanced in areas where the ground surface is hummocky as the potential for overland flow to nearby creeks and rivers is reduced.</p> <p>As noted in the Baseline Report, the estimated average annual recharge rate for the Phoenix site is approximately 156</p>	<p>Denison should develop a Project-specific climate change model database, which clearly articulates the shared socioeconomic pathway (SSP) the Project is choosing from IPCC AR6, and show how that scenario has been down-scaled for use within Project modelling predictions, and present the results in the Final EIS.</p>





Issue #	Concerns	Recommendations
	<p>mm/year. The groundwater recharge rates applied in the model are illustrated on Figure 2-7 and range from a low of 100 mm/year on the drumlins and areas where tills are interpreted to lie at surface, to a high of 165 mm/year where sands are interpreted to lie at surface.”</p> <p>→ Denison’s Draft EIS does not confirm if the groundwater recharge rates were adjusted for potential changes to recharge as a result of climate change.</p>	
	<p><b>2.4.2 Surface Water Features (p. 2.21)</b></p> <p>“Interaction between groundwater and surface water features are simulated in the model using specified head boundary conditions. Based on the model simulated groundwater level, and the water level assigned to represent the surface water stage, groundwater may be simulated to discharge into the surface water body or recharge the underlying aquifer.</p> <p>Several lakes located within the model domain were modelled using specified head boundary conditions. The water level elevations of these lakes were assigned based on observed water level elevations (within the Baseline Report), as outlined in Table 2-5 and Figure 2-8.”</p> <p>→ Water levels in surface water features are not static; they change in response to regional climate and flow conditions. This would influence the interaction between groundwater and surface water, as the assumption by the model developer is that water levels are input as static head boundary conditions.</p>	<p>Denison needs to explain in the Final EIS why static head boundary conditions are used for the modelling beyond a need to simplify the modelling.</p>
	<p><b>2.5.2.1 Water Level Elevations – Quantitative Calibration (p. 2.27)</b></p> <p>“The model simulated fit to observed water levels is illustrated in a scatterplot (Figure 2-13), which illustrates the level of fit between observed (horizontal axis) and model-simulated (vertical axis) water levels. The line of ideal fit, which corresponds to an</p>	<p>Denison needs to provide an explanation, basis, and/or literature to state that a calibrated model to observe water levels is sufficient with a deviation of +/- 2m in the Final EIS.</p>



Issue #	Concerns	Recommendations
	<p>exact match between observed and simulated values, is illustrated as a 45-degree line extending through the origin. A deviation of <math>\pm 2</math> m is shown on the plots as parallel lines offset from the line of ideal fit, which illustrates that most of the simulated water levels are within 2 m of the observed values. Points that lie outside may be due to generalization of modelled hydrogeologic parameters or errors associated with the field-observed data such as incorrect location coordinates, ground surface elevation, or water level readings.</p> <p>The scatterplot also illustrates that there is no bias towards over-estimating or under-estimating groundwater levels. These trends appear to be consistent throughout the targets with the range in scatter being constant across the range of observed water levels.”</p> <p>→ Denison does not provide the basis, explanation, or literature to state that a calibrated model to observe water levels is sufficient with a deviation of <math>\pm 2</math> m.</p>	
	<p><b>2.5.2.3 Statistical Measures of Calibration to Water Levels (p. 2.32)</b></p> <p>“Mean Error = 0.23 m for all targets. The mean error is a measure of whether, on average, simulated water levels are higher or lower than those observed. Ideally, the Mean Error should be as close as possible to zero. This statistic indicates that on average the simulated water levels are higher than the observed values by 0.23 m. This represents an excellent match to the observed water levels.”</p> <p>→ Denison provides no rationale/basis for considering a mean error of 0.23 considered to be an “excellent match” to the observed water levels.</p>	<p>Denison should provide an explanation, basis, and/or literature for why a mean error of 0.23 is considered to be an “excellent match” to the observed water levels in the Final EIS.</p>



Issue #	Concerns	Recommendations
	<p><b>2.6.3 Groundwater Flow Quantity (p. 2.39)</b></p> <p>"As noted above, there is a minor component of deep groundwater flow out of the model south toward Russell Lake."</p> <p>→ Ecological receptors could potentially be exposed to groundwater flows.</p>	<p>Denison should provide an understanding of deep groundwater as a contaminant pathway to ecological receptors within immediate vicinity in the Final EIS.</p>
	<p><b>2.7.1 Groundwater Demand (p. 2.41)</b></p> <p>"Groundwater pumping was simulated in the model to be derived from three pumping wells located outside the ore zone and proximal to the mine operations. The wells were simulated to pump water from the Upper Sandstone Aquifer."</p> <p>→ The Project has assumed that it is "conservative" to supply all water for the Project from outside the ore zone, and assume minimal influent from re-cycled / treated water. This statement supports that position.</p>	<p>Denison should provide simulations that maximize recycling treated water, rather than minimize using recycled water for the Project.</p> <p>Denison to confirm how groundwater quality predictions differ when recycled and treated water is used to supply water to the Project, as compared to assuming conditions as noted in this statement.</p>
	<p><b>2.7.3 Hydrogeological Change Due to Mine Operations (p. 2.41)</b></p> <p>"The simulated decommissioning phase ends at year 23 on the graph (Figure 2-18), and full recovery of groundwater discharge is asymptotically approached and achieved by year 34 (i.e., 9-years later); 90% recovery is achieved within 4 years (by the end of year 26)."</p> <p>→ The interaction of increase drought or increased precipitation (i.e., climate change) could potentially affect the length of time for full recovery of groundwater recharge due to potential changes in climate conditions.</p>	<p>MN-S requests that interaction between climate change scenarios and groundwater modelling should be included in the Final EIS.</p>
	<p><b>2.7.3 Hydrogeological Change Due to Mine Operations (p. 2.41 to 2.42)</b></p> <p>"The simulated decommissioning phase ends at year 23 on the graph (Figure 2-18), and full recovery of groundwater discharge</p>	<p>Denison should provide simulations that consider the full range of calibrated hydraulic conductivity values in the Final EIS.</p>



Issue #	Concerns	Recommendations
	<p>is asymptotically approached and achieved by year 34 (i.e., 9-years later); 90% recovery is achieved within 4 years (by the end of year 26). However, because groundwater discharge to Whitefish Lake is a small component of the flow through the Lake (i.e., average flow estimated as 1.41 m<sup>3</sup>/s or 1,410 L/s), the change in water quantity conditions within Whitefish Lake are predicted to be negligible and too small to measure (Figure 2-18; blue line).</p> <p>Consequently, the water quantity impact on Whitefish Lake is expected to be of low magnitude, and for a moderate length of time. This outcome is considered likely as the onsite water use is small relatively to the surface flow through the Lake which has been measured over several years of streamflow monitoring (2011 to 2019)”</p> <p>→ It is unclear if the statements made about full recovery and 90% recovery are defensible given that calibrated hydraulic conductivity values, as shown in Table 2-2 (p. 2.7), for the lower sandstone aquifer ranges over 2 orders of magnitude, and the ore zone calibrated hydraulic conductivity over nearly 5 orders of magnitude, and that no range in hydraulic conductivity is reported for the desilicified sandstone aquifer (i.e., a single calibration value is reported).? ?</p>	
	<p><b>3.1.1 Groundwater Remediation (p. 3.1)</b></p> <p>“a) Groundwater Sweep: after injection of mining fluids is stopped, water continues to be pumped from the ore zone through both production and injection wells. This results in native groundwater being drawn into the ISR mining area to replace the solution being pumped out, and thus, flushing the remnant mining solution from the ore zone.</p> <p>b)Groundwater Recirculation with or without amendment(s): after mining stops, groundwater is recirculated through the ore zone, with above-ground treatment of COPCs, as required.</p>	<p>Denison needs to provide more clarity on what the expected time period to reach acceptable levels of remaining contaminants or effective remediation in order to leave the area in a pre-mining condition. This unknown time frame may play into the viability of remediation and final closure costing.</p>



Issue #	Concerns	Recommendations
	<p>Amendments can be added to the recirculation stream to re-establish specific, designed geochemical conditions within the leaching zone. Examples of amending chemicals may be pH-neutralizing or buffering agents (alkaline solutions) or oxygen scavenger solutions, to establish reducing conditions.”</p> <p>→ No time period is provided to reach acceptable levels of remaining contaminants or effective remediation accomplished in order to leave the area in a pre-mining condition.</p>	
	<p><b>5.2.2 Assumptions (p. 5.4)</b></p> <p>“The regional groundwater system is assumed to have groundwater levels and gradients that are stationary and reflect a groundwater flow system that is in equilibrium. Observed water levels from monitoring wells are assumed to represent long-term average conditions. Thus, a steady-state groundwater flow simulation approach is appropriate.”</p> <p>→ Climate change as a variable does not appear to have been incorporated into the modelling.</p>	<p>Denison needs to provide more clarity in the Final EIS on how climate change as a variable has been incorporated into the ground water modelling as climate changes scenarios and effects on the groundwater could affect the closure pathway.</p>



## 4. REFERENCES

MN-S. 2023. Métis Origin. Retrieved on February 23, 2023: [Métis Origin | Metis Gathering](#).

MN-S. n.d. About the Métis. Retrieved on February 23, 2023: [About the Métis Nation | Métis Nation Saskatchewan \(metisnationsk.com\)](#)



## 5. **APPENDIX**

- 5.1 Meeting Minutes Northern Region 1 (NR1) Community Engagement Session, February 11, 2023



## Wheeler River Project – Draft Environmental Impact Statement Northern Region 1 (NR 1) Community Engagement Session, February 11, 2023

<b>Subject</b>	Wheeler River Project EIS
<b>Prepared By</b>	Two Worlds Consulting (TWC)
<b>Location</b>	In person: Round Prairie, SK & Virtual: Microsoft Teams
<b>Groups Involved</b>	<p>Métis Nation Saskatchewan (MN-S)</p> <p>Northern Region 1 (NR1)</p> <p>Northern Region 3 (NR3)</p> <p>TWC</p> <p>Canadian Nuclear Safety Commission (CNSC)</p> <p>Denison Mines Corp (Denison)</p> <p>Government of Saskatchewan (GoS)</p>
<b>Participants</b>	<p>NR1:</p> <p>Laura Burnouf – Regional Director</p> <p>George Natomagan, Local 16 - Weyakwin</p> <p>Larry Lavallee, Local 20 - Timber Bay</p> <p>Allen Augier, Local 50 - Uranium City</p> <p>Lazar Lafleur, Local 19 - La Ronge</p> <p>Curtis Fiss, Local 80 - Stony Rapids</p> <p>NR3:</p> <p>Elder Max Morin</p> <p>MN-S:</p> <p>Brent Laroque, Director of Environment</p> <p>Shannon Landrie-Crossland, Senior Engagement Advisor</p> <p>Roslyn Smith, Métis Guardian Program Coordinator</p> <p>Andrew Spriggs, Lands and Consultation Officer</p> <p>TWC:</p> <p>Eliza Bethune, Technical Review Support</p> <p>Heidi Klein, Technical Review Support</p> <p>Canadian Nuclear Safety Commission (CNSC):</p> <p>Jessica Way, Environmental Assessment Officer</p> <p>Denison Mines Corp (Denison):</p> <p>Carolanne Inglis-McQuay, Director Corporate Social Responsibility</p> <p>Chad Sorba, Director Technical Services</p> <p>Janna Switzer, Director HSE &amp; Regulatory Compliance</p> <p>Government of Saskatchewan (GoS):</p> <p>Brianne England, Manager of Applications, Ministry of Environment</p> <p>Aimann Sadik, Senior Environmental Assessment Administrator</p>
<b>Date/Time</b>	February 11, 2023 (10:00 am – 2:00 pm MST)
<b>Copies to</b>	MN-S, TWC





## Purpose of Meeting

- Provide an overview of the Wheeler River Project's ("Project") and related Draft Environmental Impact Statement (EIS).

## Discussion

### Introduction:

- Shannon thanked everyone for attending the meeting and requested everyone's permission to record the meeting via Microsoft Teams.
- Elder Morin led an opening prayer.
- Shannon led roundtable introductions and provided a culture share.
- Shannon reviewed the meeting agenda.

### Denison's Presentation: Wheeler River Project and Environmental Assessment Overview

- Carolanne Inglis-McQuay welcomed everyone, noting this was an opportunity to share information on the Project and answer questions. Thanked Shannon and Andrew for helping Denison prepare their presentation.
- Denison provided a 3D model of the proposed Wheeler River operation on the table for in-person participants, and virtually via PowerPoint, for everyone's review. Noted the photograph pictured on the title page of the PowerPoint illustrates half of the estimated Project footprint during operation. Included in the model is a picture of Whitefish Lake – the proposed release point for 40 cubic meters of treated water, which is the maximum release amount.
- Shared that Denison has been working on the Project since 2006.
- Chad Sorba reviewed the Project location (approx. 7-8 km from Saskatoon), including the controlled Key Lake access road. This road is 7-8 kilometres (km) from Saskatoon.
- Reviewed the Project's schedule of activities during construction, operation, decommissioning, and post-decommissioning: construction is estimated to take 2 years; operation for 15 years; decommissioning for 5 years; and post-decommissioning for 15 years.
- Noted that post-decommissioning phase of the Project will focus on environmental monitoring.



**Question:** Allen Augier asked what assets and metals are found at that Project site and if there are variations in the deposit? **Answer:** The deposits are very consistent. The phoenix deposit is made of ore and high-grade uranium. Very little other elements.

**Question:** Lazar Lafleur asked how far off the road the Project is located? **Answer:** The Project site is located 4 km west of Highway 914.

**Question:** Lazar Lafleur asked how close the Project is to the Wheeler River? **Answer:** The Project is located 30 km north of Wheeler River. Noted Key Lake is located 35 km south of the Project. Shared that the certain portions of the highway will require updating to extend access directly to the Project site.

- Chad noted the Project site is small compared to other uranium mines in Saskatchewan, such as McArthur River/Key Lake.
- Highlighted the well-field area, freeze plant, and process plant locations.
- Noted the mine footprint is 900m x 55m wide.

**Question:** Lazar Lafleur asked where the treated pond water be released? **Answer:** Treated pond water will be released to Whitefish Lake.

**Question:** Will mixing water with salt contaminants create an adverse effect to Whitefish Lake? **Answer:** The landfill area is double lined and meets criteria established by the CNSC to prevent leaching from radioactive waste. Radioactive waste will be sent to a certified treatment plant.

**Question:** Is the double-lined landfill being used for the first time? **Answer:** The in-situ recovery (ISR) mining method for uranium requires no traditional tailings facility. Radioactive material in the Project's landfill would

come from piping in the wellfield. The ISR mining method removes uranium from the iron uranium liquid solution and then gypsum is removed.

**Question:** Will Denison keep recycling water until it goes to water treatment? **Answer:** Water can be recycled repeatedly in the wellfield. Once water is no longer used in the wellfield, it goes to the water treatment plan and will not be released into Whitefish Lake until the water quality meets standards established by the CNSC.

- Reviewed the ISR and wellfield remediation mining method.
- Noted the phoenix uranium deposit is 400m below surface and ranges approximately 10m in thickness and stretches across 900m.
- Highlighted that the ISR process moves fluid through the uranium deposit.
- Explained two types of injection wells are used in the ISR process: 1) injection wells and 2) recovery wells. A sulphuric acid and peroxide-based solution (same chemicals used at the Key Lake mine) called a uranium bearing solution (UBS) is injected into the injection wells. The UBS travels into the cracks and fissures of the uranium deposit and then up the recovery wells.

**Question:** Lazar Lafleur noted Denison will not have 100% uranium recovery from the ISR process. Noted he had experience working on a slurry (ISR) project. **Answer:** Denison conducted extensive field testing for 3-4 years to better understand hydraulics of the system to support uranium leaching. The pre-feasibility study shows 85% is recovered depending on the extent of deposits in contact with the solution. Solution is injected into core volumes until an adequate amount of uranium is leached, followed by flushing with fresh water.



**Question:** Lazar Lafleur noted that the ISR process uses saturates deposits with the solution. **Answer:** Denison confirmed that solution is injected into core volumes until an adequate amount of uranium is leached. This is followed by flushing with natural groundwater to reduce acid levels. If the flushed water does not meet water quality standards, Denison will engage in a remediation stage to treat the water and remove any remaining solution, returning quality to pre-mining conditions.

- Denison noted the process plant is located at the back end of the mill site. The samples containing uranium-bearing solution (UBS) are stored in the freeze wall. Chad showed a picture of the proposed freeze wall and described the technology and construction model informed by past projects in Saskatchewan.
- Denison described the solution treatment process and how UBS is processed into yellowcake. Closed loop circle.

**Question:** Brent Laroque asked where the original water for the solution comes from? **Answer:** The water is sourced from groundwater or lake water.

**Question:** Lazar Lafleur asked how much water is required? **Answer:** Denison will require 40 cubic metres of water per hour at a rate 1% higher than what is being injected to ensure continuous waterflow.

**Question:** Minister Laura Burnouf asked what would happen if the freeze walls would melt? **Answer:** Waterflow is directed towards the recovery well and not towards the freeze wall. The freeze wall is a tertiary level of containment, 10 metres thick, designed according to previous mining operations (Cigar, McArthur) in Saskatchewan. It will take 12-30 months to build and continuously grow up to 40 metres wide over the project lifespan. The only time the wall will melt is when it is turned off during closure. This will only occur when the fluids inside the mining area achieve standards to be released.

**Question:** Elder Morin emphasized that Métis should be involved in the monitoring process. Noted that the precedent of Cluff Lake is a concern. Who will be monitoring the water to ensure environmental contaminant/radiation safety to water and animals? **Answer:** CNSC will be monitoring, and Denison will provide regular reports to the GoS. Denison notes there will be opportunities to discuss transparency and monitoring with Métis and that there are multiple ways to approach monitoring.

- Ministry of Environment noted that the GoS will oversee compliance, conduct inspections, and annual monitoring. Environmental protection officers will be present on the site. Noted that community participation is important in monitoring to ensure trust in reported results.

- Jessica Way from CNSC noted that CNSC will similarly conduct inspections regularly and report to CNSC independently of Denison and conduct spot testing. Noted that CNSC would encourage a monitoring partnership with MN-S.

**Question:** Lazar Lafleur asked if there are any initiatives for Indigenous people to monitor their lands? To date, no initiatives have been followed through and there is a separation between GoS processes and Indigenous peoples. Northern communities are conducting monitoring of the land to ensure it is done correctly. Another environmental monitoring program course at the university in La Ronge would help this. **Answer:** CNSC has independent monitoring and discussions with local Indigenous communities to do monitoring in areas where there are places and species of interest. Manitoba and Ontario have undergone independent monitoring in response to requests from Indigenous groups and CNSC is open to more opportunities like this. For example, the Eastern Athabasca Regional Monitoring Program between CNSC, GoS, and First Nations.

**Question:** Is the Eastern Athabasca model something that can move westward? **Answer:** This is a collaborative and transparent model with publicly available data sharing that is not a one-size-fits-all approach. CNSC has also had independent environmental monitoring programs involving communities, which are built upon feedback from communities, such as land guardian programs. In-person reports are sent every 4-6 months and approaches are modified based on feedback.

**Question:** Elder Morin asked how to ensure locals are comfortable? **Answer:** Examples put forward by Denison and CNSC and the province will be open to feedback and modified to ensure people are comfortable with the approaches.



**Question:** Allen asked if treated water is filtered before being released into the environment, considering there are no solids going into the environment? **Answer:** The details of water treatment are still being determined. There is a filtration system and holding pond where water will be tested before release.

**Question:** Lazar asked about the discharged water. **Answer:** Denison has completed an assessment of what discharged water will look like and how it will settle into sediments over time. Further details will be available.

**Question:** Brent asked what the release standards are for Denison? **Answer:** End of pipe criteria, as per Canadian surface water quality guidelines, CCME and GoS.

- Chad narrated the project video "Project Technology: Video Overview". The water that flows through the project site flows southeast. Provided an overview of the groundwater freezing process and building of the freeze wall, and the use of directional drills. Denison will use 312 injection wells over 300 freeze holes, drilled 2 metres apart from the well. The monitoring wells will be located below the deposit area.

**Question:** Lazar asked if there would be more wells downstream? **Answer:** Chad noted the mining phase determines positioning of the wells.

- Brent noted that the monitoring of wells could take hundreds of years to detect leakage.
- Chad affirms that groundwater monitoring wells can exist at 350 metres in depth but that groundwater moves faster closer to the surface. Results are generated at this depth. Initial tests will confirm the monitoring network across the mining system.
- Lazar noted that the system appears sufficient, in terms of following ISR precedents from other countries and applying methods approved in Saskatchewan.
- Minister Laura Burnouf requested clarification on what ISR is. Chad confirmed ISR is in-situ recovery.

**Question:** Elder Morin asked if this is the same technology used for oil fracking? **Answer:** Denison explained the difference between oil fracking and ISR. Fracking for oil is done under extremely high pressures; Denison's project is 60 – 100 PSI compared to 500 PSI for oil fracking. ISR is predictable drilling and has an extensive pre-monitoring and monitoring network during extraction.

- Carolanne reviewed the regulatory process. Exploration work for Denison started in 2008 and continues at present. Baseline studies started in 2016 to gather plants, animals, and water quality information to develop the EA application, drafted in October 2022. The public review period ends February 20<sup>th</sup>, preceded by

provincial comments submitted in January and federal comments due in March. The permitting and licensing process will begin in 2023 and may take up to two years. Upon approval by the federal and provincial governments, this two-year estimate is being used as the point until construction begins.

**Question:** Lazar asked what was included in the baseline studies, if only Key Lake was considered? **Answer:** Baseline studies focused on the project area.

- Carolanne reviewed the environmental assessment approach and methodology. Baseline environmental conditions were informed through third party consultant studies. Provided an overview of predicting project effects, mitigations to reduce effects, and how monitoring will inform predictions in the EA to confirm potential impacts to water quality, plants, wildlife, and other VCs.

### Government of Saskatchewan (GoS) Presentation: Environmental Assessment Regulatory Process

- Breanne England and Aimann Sadik from GoS provided an overview of Denison's participation in the GoS EA regulatory process.
- The *Environmental Assessment Act* (2018) is regulatory basis for major projects. Primary role is to assess the effects of major developments and potential impacts to the environment, ensuring the public is aware of the Project before the Minister makes a decision on approval.
- Notification to the public was completed in 2019 after the determination that Denison was entering into the EA process.
- Provided overview of the Duty to Consult (DTC). GoS follows the *Consultation Policy* framework. The DTC determines if the proposed project has the potential to impact Treaty and Aboriginal rights, traditional uses of lands and resources, and right of access to unoccupied Crown land. In 2019, GoS notified Denison of the DTC and to engage with Indigenous communities on how the project may impact Indigenous rights. Denison then developed a Terms of Reference (TOR) to describe the proposed project and how they will work with communities to understand how the land is being used and what is valuable to communities.
- Provided overview of regulatory agencies the GoS collaborates with on an EA, the technical review process, and public and Indigenous review periods.
- At present, Denison is funding consultation activities independent of GoS. MN-S, NR1 and NR3 will be able to provide comments to the GoS consultation report 30 days after posting. Shannon noted that the budget provided only allows for community meetings, not a technical review of the consultation report. Lazar agrees this is a limited timeframe.



**Question:** Shannon asked if there will be funding available to complete a technical review of the consultation report? MN-S has applied for GoS funding available, but it has not been received. **Answer:** Brianna noted that the Consultation Policy framework is under review and has also heard funding is insufficient from other communities. Denison will have to fund the work.

- Lazar echoes Shannon's sentiments that this funding does not provide enough to complete a fulsome technical review and conduct engagement.
- Brianna reviewed the Participation Funding program (PFP), the adequacy of consultation requirement (did the proponent provide an opportunity for communities to share comments and feedback on potential adverse impacts?) and the process of the Minister's EA decision.

**Question:** Lazar asked who will be doing Indigenous engagement reviews? **Answer:** Brianna noted that Denison is working with the community to develop this process.

**Question:** Shannon noted that many proponents have collective public engagement sessions and consider this First Nations and Métis consultation. Asking to confirm if Denison is seeking a public session or a Métis-specific engagement? A public session should not be considered consultation. **Answer:** Brianna noted that it is up to Denison to conduct engagement to the public and Indigenous groups.

- George Natomagan noted the approach should not be contacting individual organizations within communities. He is a mayor, and a Métis Local and these represent different interests. Many people in northern communities hold multiple roles. Métis and First Nations should be separately consulted from the public, and Métis and First Nations separate as well. Section 35 rights are more in depth than a public engagement session can capture. The importance is knowing that the GoS and proponents are involved in

hearing issues, comments, and feedback from the community members themselves and grouping people together causes confusion. Noted that presidents not receiving letters is also an issue.

- Lazar echoes these sentiments and notes that many people have multiple roles in communities and each role represents a different relationship being built. Speaking with multiple people at GoS in the same role prevents relationship building. Métis should have a role. Shannon notes that they can only explain the same issues so many times. Looking forward to new policy changes from 2022 to see how these changes will be implemented and if Metis recommendations have been considered.
- Breanna thanks and acknowledges the comments. Noted that the Minister of Environment implements the policy rather than creates it. Shannon emphasized the importance is in the relationship.
- Finished the presentation with an overview of the permitting and licensing process.

### Government of Saskatchewan (GoS) Presentation: Environmental Assessment Regulatory Process

- Jessica Way (CNSC) went over the presentation agenda and explained CNSC's role as a science-based regulator. The primary purpose is to use regulations to understand risks to the environment, Canadians, national security, of major projects. The main regulation that mandates CNSC is the *Nuclear Safety and Control Act*.

**Question:** Lazar referred to Rabbit Lake and asks what was done to protect people from the environment and ensure safe fishing? **Answer:** Jessica noted the approach would be to immediately return to the site for monitoring. She is unfamiliar with this project but will provide further information to Shannon.



- Provided overview of the types of activities CNSC regulates, including uranium mining and processing, transportation, nuclear research, nuclear power generation, nuclear medicine.
- Denison will be granted a license to operate by an Independent Commission. The Commission has 7 members at a time and CNSC does not elect them, and they are not part of government. The hearings held by the Commission include CNSC staff, proponents, the public, and representatives from Indigenous groups. Denison will eventually have to present at a hearing in order for an EA decision to be made and at this hearing individuals are welcome to present. Commission decisions are based off information provided by all presenters.
- Reviewed the roles of CNSC staff. Recommendations made from CNSC are based on technical assessments provided by applicants, which are reviewed by staff with scientific expertise. CNSC staff also ensure if a license is granted, that regulations are in place to ensure project safety – the primary concern of CNSC. The CNSC does not promote the nuclear industry, select project sites, exploration, or have a role in revenue sharing or economic development. What we do slide – primary concern is safety.

**Question:** Lazar asked what the CNSC does to value Indigenous Knowledge? **Answer:** Jessica noted that during the EA process, information shared by Indigenous groups are incorporated into CNSC's work. For example, the independent environmental monitoring program has included consulting with Indigenous groups potentially impacted by nuclear facilities and ask them to identify where sampling should take place. CNSC also reflects on information shared and ensure Valued Components identified by Indigenous groups are reflected in applications.

**Question:** Lazar asked if this is done before or after the assessment? **Answer:** Jessica noted this occurs during all phases of the assessment or at any point during the process where information from Indigenous groups is received.

**Question:** Lazar asks if this process is integrated across all CNSC departments or is siloed into a specific department. **Answer:** There are divisions within CNSC that review specific documents. For example, the environmental assessment division participates in the EA and conducts environmental risk assessment reviews periodically to ensure the facilities are adhering to environmental protection programs. The Industry Stakeholders Relations division more directly handles Indigenous Knowledge because this department maintains relationships with Indigenous groups. There are main contacts, but everyone is involved in the work, and there are department-wide processes that protect Indigenous Knowledge and this is integrated into the work they do.

- Environmental Reviews are central to CNSC's work. Reviews follow legislation separate from CNSC (e.g., *Impact Assessment Act* (2019)). Coordination and joint reviews with the province occur as much as possible.



- Jessica overviewed the EA process. The Environmental Protection Framework is embedded within the EA process. The CNSC has an obligation to ensure Indigenous peoples have an opportunity to participate in the process.
- Reviewed the importance of Indigenous Participation. CNSC has been meeting with MN-S since 2019 and speak on a monthly basis at a minimum. These communications help incorporate Indigenous Knowledge into CNSC's project work.

**Question:** Lazar asked if Indigenous participation procedures are available online, including how to participate in hearings and apply for funding? These should be available for review. **Answer:** The website contains high-level descriptions. CNSC follows regulations around what document should be posted on the website, and emails are sent about public funding and participant funding. All steps of available documents and funding are communicated.

**Question:** Lazar asked which steps Indigenous people are involved in? **Answer:** CNSC has regular communications with MN-S on a monthly basis for Denison. Multiple processes during an EA and CNSC engages Indigenous peoples at various stages, for example, for the release of annual regulatory reports, Indigenous peoples are involved before and after.

- Overviewed the participation process for the Wheeler River Project. MN-S was sent communication during the first step to inform that the Project Description has been received and comments are open to understand the issues and concerns around the project. This early engagement informs the assessment and is ongoing throughout the EA. Currently, CNSC is trying to coordinate with GoS as much as possible. Comments on the EIS are due by February 18<sup>th</sup>.
- CNSC is looking at how Denison captured these concerns in the EIS and any proposed solutions or mitigation. If there are concerns unaddressed, CNSC is looking for explanations why.
- Shannon noted there was not enough time for MN-S to engage community members during the 90-day comment period, especially because of the holidays. The extension for comments to February 18<sup>th</sup> was not enough time to coordinate engagement with multiple project EIS reviews (e.g., NexGen Rook I) occurring at once. Shannon asked if there is more time to engage after the draft EIS is finalized.
- Jessica noted 90 days is the longest timeframe for a comment period. CNSC will continue to be available and have discussions up to the hearing date, particularly the regular monthly conversations with MN-S. The February 18<sup>th</sup> deadline is not the last time to raise concerns. Noted that an extension for the EIS technical review may be possible and invited MN-S to speak offline about this.
- Shannon notes that there are other opportunities to engage with communities after EIS submission, as is being done with NexGen. Jessica notes the CNSC welcomes as many opportunities as is wanted by communities; CNSC assumes more feedback will be shared with Denison and that all information identified during the EA process will be included in the CNSC's report to Commission to influence decision making.
- The decision for the application will be posted on the website, but CNSC will also share this with MN-S directly and MN-S will likely know before public notification. Jessica notes her availability to discuss these items further at any time.
- Shannon notes this is the beginning of a long journey. MN-S is working with the support of Regional Councils, the legal team, Locals, and TWC to get information to CNSC. Noted that CNSC works well with MN-S on community engagements and also provides funding and this is better than the GoS process.



**Question:** Lazar reminded that Métis want to be involved in ongoing oversight and compliance. What initiatives are there for this? **Answer:** Jessica notes the environmental monitoring progress has unique initiatives through the CNSC to support Indigenous-led processes. Programs are developed on a yearly basis. CNSC prioritizes discussions with communities to identify concerns and land use happening in a target area.

**Question:** Shannon asked if CNSC is developing programs and conducting monitoring this year, will local presidents be able to attend and/or share information? **Answer:** Jessica noted that sampling programs are built upon information from proponents, and CNSC reaches out to Indigenous groups in the area to ask for feedback on sampling plans. Indigenous groups can review plans and participate in sampling, i.e., during hunting. CNSC invites members to participate in funding as much as possible. CNSC can send more information to MN-S and Locals through email.

- Shannon will reach out to Jessica after discussing this with NR1.

- George asked if Adam is still employed with CNSC and Allen noted they have worked together in the past. The value of building a relationship with someone from CNSC is valuable and this is what MN-S and Locals would like to see in the Wheeler River project.
- Lazar noted that the meeting with NR3 on February 12<sup>th</sup> should have representation from all regions and the Independent Environmental Monitoring Program.
- CNSC has a project distribution list and can include anyone from NR1 and NR3. Shannon will share all NR1 and NR3 emails with Jessica to add to list.

### **Métis Nation Saskatchewan: Next Steps**

- Shannon led the conversation on next steps. Community engagement for February 18<sup>th</sup> will include NR1 and NR3 Regional Council, board members, and community. Leadership Locals must be informed in order to engage the community. Noted there will be more opportunities for engagement after this date.
- Heidi Klein (TWC) provided an updated on the EIS Technical Review. It will be reviewed by MN-S on Wednesday and TWC will revise the report for completion by February 18<sup>th</sup>.
- Minister Laura Burnouf inquired about the status of the MKS Project Coordinator. Heidi noted the job description has been reviewed and sent to HR. The plan continues to ensure the position is filled in March.
- Lazar inquired about the Elders Engagement Forum. Heidi noted that this can be discussed after the meeting. It will focus on planning and the purpose of the Metis Knowledge Study and an update should be provided to Regional Councils and MN-S in the next few weeks. The Coordinator will help identify what Elders will be interviewed.
- Shannon noted that the next step is meeting internally and working together on the TLU and finalizing the EIS submission. Shannon suggested a virtual meeting to discuss the EIS and answer any questions.
- Minister Laura Burnouf gave thanks for the meeting.
- Allen gave a closing prayer.



### **Actions**

#### **MN-S:**

- Shannon to request further information on sampling program participation to Jessica Way and the monitoring program at Rabbit Lake (CNSC).
- Shannon to send NR1 Locals and NR3 Locals emails to Jessica Way (CNSC) for email list.

5.2 Meeting Minutes Northern Region 3 (NR3) Community Engagement Session, February 12, 2023





## Wheeler River Project – Draft Environmental Impact Statement Northern Region 3 (NR 3) Community Engagement Session, February 12, 2023

<b>Subject</b>	Wheeler River Project EIS
<b>Prepared By</b>	Two Worlds Consulting (TWC)
<b>Location</b>	In person: Round Prairie, SK & Virtual: Microsoft Teams
<b>Groups Involved</b>	Métis Nation Saskatchewan (MN-S) Northern Region 3 (NR3) TWC Canadian Nuclear Safety Commission (CNSC) Denison Mines Corp (Denison) Government of Saskatchewan (GoS)
<b>Participants</b>	<p>NR3:</p> <p>Elder Max Morin</p> <p>Mervin 'Tex' Bouvier - Regional Director</p> <p>Percy Kenny, Local 82 – Patuanak</p> <p>Joe Daigneault, Local 37 - Beauval Sipisihk</p> <p>Mike Natomagan, Local 9 - Pinehouse Lake</p> <p>Louis Gardiner, Local 21 - Ile-a-la-Crosse</p> <p>Patsy Laliberte, Local 38 - Jans Bay</p> <p>Eugenie Lafleur, Local 67 - Dore/Sled Lake</p> <p>Lisa Maurice, Local 176</p> <p>Sandra Bouvier, Local 41 - Cole Bay</p> <p>Fred Kenny, Local 174 - Canoe River</p> <p>Kim Burnouf, Services Director</p> <p>MN-S:</p> <p>Brent Laroque, Director of Environment</p> <p>Shannon Landrie-Crossland, Senior Engagement Advisor</p> <p>Matt Vermette, Chief Operating Officer</p> <p>Madison Smith, Métis Guardian program coordinator</p> <p>Andrew Spriggs, Lands and Consultation Coordinator</p> <p>TWC:</p> <p>Eliza Bethune, Technical Review Support</p> <p>Heidi Klein, Technical Review Support</p> <p>CNSC:</p> <p>Jessica Way, Environmental Assessment Officer</p> <p>Denison:</p> <p>Carolanne Inglis-McQuay, Director Corporate Social Responsibility</p> <p>Chad Sorba, Director Technical Services</p> <p>Janna Switzer, Director HSE &amp; Regulatory Compliance</p> <p>GoS:</p> <p>Brianne England, Manager of Applications, Ministry of Environment</p> <p>Aimann Sadik, Senior Environmental Assessment Administrator</p>



	Regrets: Kelvin Roy, Local 5 - Green Lake
<b>Date/Time</b>	February 12, 2023 (10:00 AM – 3:00 pm MST)
<b>Copies to</b>	MN-S, TWC

### Purpose of Meeting

- Provide an overview on MN-S' technical review of the Wheeler River Project's ("Project") Draft Environmental Impact Statement (EIS).

### Discussion

- Elder Morin led an opening prayer.
- Shannon led introductions and provided a culture share.
- President McCallum said a few words about partnership and key items to discuss (e.g., economic benefits to Métis communities from project work; industry represents investors, which represents money, and communities are not considered).
- Denison representatives introduced themselves.



### Denison's Presentation: Wheeler River Project and Environmental Assessment Overview

- Carolanne Inglis-McQuay (Denison) welcomed everyone. Thanked Shannon and Andrew for helping Denison coordinate the meeting.
- Denison provided a 3D model of the proposed Wheeler River operation. The proposed Project Footprint is smaller than other uranium mining projects in Saskatchewan. It is located between McArthur River and Key Lake. Included in the model is a picture of Whitefish Lake behind the proposed footprint.

**Question:** How far is the project from the river? **Answer:** Chad Sorba (Denison) noted that the Wheeler River itself is 28 kilometres (km) south from the Project. Denison named the project "Wheeler River" because in 1978, the project area once extended close to the Wheeler River, but today it is much smaller.

- Denison provided a review of the project stages and schedules. Planning for construction, operation, decommissioning, and post-decommissioning is underway.

**Question:** Has there been testing done to date? **Answer:** Denison conducted extensive field testing for 3-4 years to better understand hydraulics of the system to support uranium leaching. The pre-feasibility study shows 85% is recovered depending on the extent of deposits in contact with the solution. Solution is injected into core volumes until an adequate amount of uranium is leached, followed by flushing with fresh water. There has not been full scale mining exploration. The purpose is to determine how and where groundwater is flowing.

**Question:** What recovery was identified from the pre-feasibility test? **Answer:** The goal of the test was to identify how uranium could be recovered, not the percentage of recovery. The purpose was to demonstrate how mining solution could be moved from one well to another. The tests showed this technical mining method was successful in that fluids could be controlled.

**Question:** What is the total recovery of the agents used? **Answer:** The percentage Denison was able to recover from the tests was 85%, though this number may be slightly diffused and is based on modelling. The test area was returned to a stable pH level after testing. The remaining agents were able to be recovered.

**Question:** Was Denison able to prove that the agents were contained? **Answer:** Yes. Monitoring is ongoing.

**Question:** Is there a disaster relief program in place if agents were released to the environment? **Answer:** Carolanne noted that there are 15 regulated provincial criteria for groundwater quality to ensure there is no leaching into the groundwater system, and no effect to downstream water bodies, to be considered environmentally protective. The tests met these criteria. Monitoring is ongoing.

- Carolanne noted that part of the permitting process is to ensure monitoring programs are sufficiently funded even if Denison were to walk away from the project – then the Government of Saskatchewan (GoS) would take up the monitoring responsibility.
- NR3 expressed interest in how communities can be involved in monitoring and have a training program in place for Locals to conduct their own assessments. Understand that Denison/GoS have their own monitoring system. Métis need one too. NR3 echoes sentiments heard by NR1 leadership the day prior. With Pinehouse, there was a monitor that visited the project site 3 times and had full access, and NR3 wants to move in this direction. Understands the interest around transparency and broader involvement from the communities to be involved in monitoring. CNSC has a program.
- Jessica Way (CNSC) is the EA lead for the Project. Noted there is a CNSC Independent Environmental Monitoring Program (IEMP) where the CNSC goes to site and does sampling in publicly accessible areas. CNSC is trying to reach out Indigenous groups as they are developing sampling plans to make sure the areas and species of concern are being monitored. Jessica is not deeply involved with IEMP, but conversations are being had to involve MN-S more in this work. Mentioned the Eastern Athabasca Regional Monitoring Program (EARMP) and more work is being done to progress this elsewhere.
- Métis have a cultural science and live in a modern world and follow modern science for decades. Cultural science is the people that live off the land. They know more about the assessment than modern science itself. Métis need to watch over the species, water, and land using cultural science. Want Denison and GoS to understand that cultural science is very important.
- Carolanne said they understand there is another lens and worldview to bring to monitoring. Working with communities brings information that doesn't come from CNSC or Denison or GoS, and is outside their lived experience.
- Billy Gardiner noted that there was a moose release a couple days ago from the Cluff Lake remediation program. In terms of Orano's application to release Cluff Lake back to GoS, the issue is that Métis should also have traditional hunters and users monitoring and this should not be funded by taxpayers. For Cluff Lake, Northern people are not included in monitoring to ensure it is returned to a natural state. Métis aren't aware of what is going on – how to know the water is safe and drinkable? Recalls when a traditional trapper went to the Cluff Lake site and got pushed out. These are qualified people to monitor.
- Denison reviewed the in-situ recovery (ISR) slide and explained the technology is being used globally. This is similar to the potash industry in Saskatchewan, where holes are drilled to move fluids from one area to another. This is the first ISR uranium mine in Saskatchewan.



**Question:** What builds the gap of the uranium window? **Answer:** Chad explained that this is not the same as a traditional mine. ISR process leaches high-grade uranium using the solution. If leaching is successful, you 40% the "block mass" is reduced while some areas are more compressed. Rock mass will be kept in tact by a network of "sponges". There will be small pockets into the groundwater to maintain integrity.

**Question:** Can Denison guarantee that? **Answer:** The work over the last 5 years will help de-risk but nothing is guaranteed. Testing started with smaller holes and increased pressures over time. In 2021, the tracer test using saltwater did not determine any displacement on a small scale.

**Question:** There is a technical side of monitoring and natural state monitoring. Is there a percentage Denison considers? For Cluff Lake, there was a disconnect between what was technically sound versus what land users experienced on site. **Answer:** All work to date has been done focusing on the technical side and calibrated back to a baseline understanding of groundwater conditions going back many years. Detailed monitoring was done in advance of tests to understand how much neutralizing and flushing needs to be done to return water to acceptable pre-mine conditions. The surface may see a maximum movement of 7.5 centimetres (cm). Monitoring is done to ensure models are acting according to predictions based on annual sampling.

**Question:** How would Denison prove air quality is returned to a pre-mining state? Cluff Lake hurt the environment. **Answer:** Air quality experts review the emissions released from the project and follow air quality criteria set by provincial and federal requirements. ISR does not result in a ton of rock, which is a big contributor to air quality impacts.

- There is trust missing between Métis and CNSC/GoS in terms of what is considered environmental protection. Northerners have not been involved in the monitoring process and this is a big piece missing. MN-S needs to set up a monitoring committee or department so there are people on the ground to assess

operations. Métis have better knowledge and understanding of the process. As ISR is a new process, the trust issue stands out. Denison having a vested interest in the North is the bottom line.

- Brianna (CNSC) noted that the EARMP is an example of community-involved monitoring initiatives being discussed.
- Shannon noted that big piece missing from EARMP is communities. The communities collect the samples. More examples are out there that need to be looked into.

**Question:** Does sampling mean on-site, and what do laboratory tests do? **Answer:** Water and animal samples are tested in labs in Saskatoon.

- Is there potential for samples to be contaminated during transfer and what about a lab in Northern Saskatchewan? There are people in the North can do this work. Highlights the issue of trust. With Northern involvement there is assurance that whoever is looking at the samples has vested interest in the North.
- Brent noted his experience in Western science monitoring at a hazardous waste facility. He understands what Denison's groundwater modelling consists of. Reviewed lab sampling and testing process that prevents contamination, and the labs are credited. They are third parties. The data would be given back to Denison.
- Shannon noted that there were biodiversity surveys and monitoring done for Orano's Long Term Monitoring and Management Plan (LTMMMP) and MN-S only participated in the technical review. Cluff Lake was not an example of building trust and inclusion. Need to be involved with leadership, with collaboration and inclusion in the beginning of the process.
- NR3 noted there is more that needs to be done, with more Métis involvement and community investment. Métis will be present on the land forever and need to be comfortable with their neighbors. Concerns about waiting until monitoring results are shared that could be disastrous. There is a history of being taken advantage of, and violation, by the Church and the Canadian Government, and this is still felt today. Want to build trust within communities and with the government. Métis want their own plan in place and not have their people die if the government/proponent plan isn't working. This is Métis land, species, territory. Cluff Lake was a disaster and now the ore is running into rivers and killing people. Métis need to be monitoring right away in the right way.
- Jessica acknowledges the message. Emphasizes the importance of opportunities to change things. CNSC wants to improve the work and values what is shared at hearings to the CNSC Commission. This has an impact. Provided thanks for sharing.
- Elder Morin noted that Denison is a mining company. The provincial government issues a lease. Is NR3 being asked for a blessing or does the CNSC/Denison/GoS want Métis to be involved? Recalls attending the Saskatchewan Research Council and not being told of how Key Lake was shut down because the mill flooded. No notification of possible contaminants and impacts to wildlife. These are the stories that are heard in the North. Métis may have opportunities for contracts and employment, but monitoring is a big question. Funding is provided from the province to monitor, but Métis are not partners. Recalls how a community member went to visit the trapline and hunt ducks but could not eat the ducks because they were sick. The fish can tell if something is wrong – they are the stewards of the land, they will know if beavers have no food. There is a history of not being involved to make sure things are being done safely from Métis perspective. Things need to be done safely so 50 years from now children are not dying from radiation in the river. If Denison wants to support the North, partner with Métis. Should have been working together right from the beginning and there is no interest in working against the companies but it is supposed to be collaborative. It is hard to trust the government because they have not contributed to communities. Forests are being clearcut, mining companies are abandoning mines. It is hard to trust CNSC after what has happened with Cluff Lake. Wants to see safety for Métis people and the environment to continue living. Monitoring with Métis people is key.
- Carolanne acknowledges this important point and moving forward will look at the Cluff Lake monitoring regimes. Noted that the question is how things will be done, and how they will be done differently. Looking at monitors going to the site now as the foundation. Transparency in testing is needed. Understands that tension exists. There is a benefit at this point of the Wheeler River Project to move through the regulatory phase and create processes for clarity around what is being monitored. Noted it is still very early in the process.
- NR3 noted Cluff Lake revenue sharing agreements were not fulfilled and that is where the trust issue came in. When uranium mines came to the North, what was told is not what happened.
- The engagement deadline is not enough and NR3 wants an extension to allow more time to look at all of the information, collaborate with NR1 as one voice. Noted that NR1 should be at this meeting to hear their questions.



- Shannon noted CNSC provided a 2-week extension on MN-S' EIS Technical Review to allow more time to review TWC's report. Noted that there are different words and understandings between Indigenous science/knowledge and Western science and need to bring both together to make things better. More data always improves things. Involvement with surveys and birds and this will build trust.

### Government of Saskatchewan (GoS) Presentation: Environmental Assessment Regulatory Process

- Brianne introduces Aimann Sadik (GoS), the Senior EA administrator working on the Project.
- Denison provides an overview of different project components and the proposed locations for each components. Mentioned the project will be conducting up to 15 years of mining over 5 phases. When compared to traditional mine/mill site, it's a fraction of the project footprint. The entire area will be approx. 1km x 2.5 km. Carolanne pointed out there is an effluent release and the holding pond is the entrance point to Whitefish Lake.
- Provided an overview of the ISR process and wellfield remediation. Injection wells will go into recovery wells and leaching will occur in place. The recovery well pumps liquid uranium to the surface, to the process plant at the back-end of the mill. There is no crushing or grinding required; the process occurs in-ground. This is a closed-loop cycle. The process continues in a closed loop cycle. Freeze walls have a third layer of containment to keep mining solutions in the mining area. Monitoring in all areas, including in the freeze wall. Exact positions to be confirmed. The freeze wall surrounds the entire deposit. Cross wells divide the deposit into 5 areas.
- Mining methodology is built on phases. Phase 1 starts in the middle and moves outward over the 15 year mining life. Small scale and small steps.
- Denison notes that freezing technology is not new. This was used at Cigar Lake. The process creates a key-sized hole to install piping, where brine is circulated and brought down to -35 degrees to freeze groundwater in place, which creates the freeze wall. This is a combination of two known technologies – not novel technologies.
- Reviewed Project Technology Processing for UBS (uranium bearing solution). During the process, iron is removed and the solution is thickened to remove impurities. Recycled water is treated and released back into the pond. The rest undergoes the leaching process. This is a simple process compared to other conventional mills and there are not a lot of impurities.



**Question:** Is this different in different areas? **Answer:** There are not as many circuits in an ISR process.

- Video overview of Project Technology: Deposits are 1.5 km off Highway 19. Access road will be built and is 5.5 km long. Right now, Denison is looking at the Phoenix deposits. There are two zones (A and B) for this deposit.

**Question:** What is the difference between Zone A and B? **Answer:** This is a naming convention to identify the areas that will be drilled. Phases 1-5 as described prior will occur at each zone.

- In the ISR process, Denison will drill vertical holes 400 m depth for groundwater monitoring and enhancement with horizontal drills as an extension of the drilling process. Slinky drills occur around 2-4 metres away. This is done to pinpoint exact drilling locations and make the process controllable, while giving additional access to fractures in the deposit. USB flows towards the recovery well and it becomes uranium containing solution once pulled up. Entire process is being controlled by the injection system. Always controlling the fluid through hydraulic containing. Wells will be positioned to detect the movement of fluid inside and outside the mining area. Testing shows data wells should be 10-15 metres in depth.
- Provided overview of the ISR process. There are no tailings like in traditional mines. Precipitates will be removed off-site; calcium sulphate is a by-product. Chad noted that there are two pads on the site side-by-side near the wellfield.

**Question:** What is the spillproof program in place? **Answer:** The waste material is staying off-surface during the mining operation and will be on double-lined pads, pumping water that comes off the treatment plant. Gypsum pile will get covered in place. The iron sulphate will be transported off site.

**Question:** What is the Gryphon deposit? **Answer:** Carolanne noted that it is located 3km north of the Phoenix deposit. Although there are two known deposits, we are only advancing the regulatory and EA process for the Phoenix deposit.

- Janna Switzer (Denison) reviewed the regulatory process. The GoS Ministry of Environment assesses potential impacts to people and environment. The EIS (6000 pages) was submitted in draft form and submitted to provincial and federal governments. Denison is waiting on comments from Indigenous groups and the public. The EIS will not be finalized until questions are answered by those parties. Likely 2.5-3 year process before the hearing in front of the CNSC Commission will occur for licence approval - one from CNSC and another permit from GoS. Therefore, in 2.5 years Denison is planning to begin construction.
- The anticipated production rate is 600 million pounds per year.
- Reviewed the EA Approach and Methodology. Mitigation measures are being developed to avoid individual environmental effects. EA will determine the overall change in the environment. Denison will continue to do both daily and monthly samples to compare results from what is predicted. If there is a difference, changes will be made to the project.
- Review of different Valued Components (VCs) being considered for the project. Understand post-mining impacts to groundwater or potential for it move up to surface water. Doing a lot of the process underground. Aquatic environment looks at fish and fish habitat quality. Terrestrial looks at impacts to wildlife.

**Question:** Is there a breakdown of all the VC's? Wondering about community investment outside of training and jobs. **Answer:** The EA will look at potential for business opportunities and how much money comes into those communities. This is included in the EIS.

**Question:** Are there more accessories to address justice, and different types of education? **Answer:** Carolanne notes this may or may not be reflected in the baseline information of the EIS, as it is dependent on areas of concern. There is information for a baseline on education in a particular area and in terms of how the Project could change or improve those areas.

**Question:** What about improvement of the community, so money flows from the mine to help with social and mental issues? **Answer:** Half of the EIS does consider community well-being. Part of that is housing considerations and impact of rotational schedules on people, and all the parts that put our communities in a good place – or a place where they are struggling. The EIS describes the conditions of what information is known and how the Project fits within community drivers, like quality of life.

- Denison has handouts of VC summaries. Carolanne wondered if those and the 14 page summary of the EIS can be provided to MN-S. Shannon agreed.
- Joe noted that conversations yesterday discussed the HR Development Agreement as part of the surface lease agreements. Where is HR development in the EA process/methodology? The EA references social and economic impact, and HR development should be included and highlighted in the assessment process. Training is very critical. There is no system in place where Northerners can be trained properly and play a role. They will have individuals that will be on the "lower end" and the ones on the "high end" are going to be from elsewhere because they are qualified. For example, people from Ontario and Alberta. This is a major obstacle for communities. Unions also create barriers for Northerners – for example, apprenticeship after pre-employment training is completed. There is also racism and bad experiences on mine sites towards Indigenous people.
- Carolanne noted there is an HR Development Agreement that the government also uses. Saskatchewan required surface lease agreements in the 90s, the first one likely 1993. Other jurisdictions in the country are catching to meet social commitments. Carolanne acknowledges there is a gap between surface lease agreements and the evidence, as 30 years later improvements still need to be made. Denison will begin discussions on surface lease agreements and the associated HR Development Agreements. Part of this conversation will be asking, what does those commitments look like for the new generation of uranium miners? This includes entry versus management jobs. Denison has this in mind and there are 3-4 generations of uranium miners, and this is an opportunity for Denison to draw on talent that is not always at entry level. Denison has an ability to connect with those that have come before and take a strong interest in moving beyond entry level positions to positions with more decision-making capabilities. In terms of racism on site, all sites have cultural respect policies. Racism and respect for all diversity categories is quite important to all companies. A feasibility study was completed this past year and 11/14 field program were Indigenous. Foundationally, Denison had conditions to build on to continue to emphasize the importance of diversity and respect for everyone including or Indigenous colleagues at site. It does matter.
- Shannon added that creating a safe work environment for everyone looks at truth and reconciliation. Right now, you can't speak your own language over the radio. Even with environmental monitoring technician





positions, there is no support. There is limitations in receiving training and going to site and being treated as a joke. History of being tokenized by companies. Denison should be creating something to educate contractors and consultants on truth and reconciliation, Métis people, and the value of Métis involvement. NexGen and Fission they all have great statements, but at the field level it's not working.

- Joe notes it seems like GoS is trying to achieve business first and people second. They are cutting corners. Recalls the *Saskatchewan First Act* and for Denison to understand this. Hopes that Denison can stand up for Métis. Shannon notes this should be addressed by GoS.
- Brianna notes she is not involved with this *Act* and it does not affect the *EA Act*.
- The *Act* does not encourage doing anything new but to clearly define Indigenous rights.
- This *Act* aims to establish provincial jurisdiction. So, when it comes to regulatory licensing, this is concerning. Hope that public servants can recognize this and say no to certain things as we have gone a long ways since changes were made, and studies were done for uranium mining. These can be thrown out over provincial concerns.
- Eddy Gardiner echoes Joe's sentiments and that this *Act* is concerning as it does not recognize Indigenous rights. The Duty to Consult (DTC) policy reflects it. DTC is interest based, not Rights based. In terms of Denison, NR3 is looking to do the one voice approach with NR1. NR3 is considered an impact region. Considering the agreement drafted, some locals here are not included and all should be included in these discussions, as NR3 operates as a council. These are Rights-bearing communities. Municipalities do not speak with Métis; communication is always through Métis Local, Region, or MN-S that speak with Métis people. Métis need to have more of a say and role in governance. NR3 needs to have some capacity to meet with Denison's technical team to strategize and be part of decision making and be part of the TLU.
- There is history. Il-a-la-Crosse was here before Canada was a country. The fur trade they everywhere. So if you tell us we are not part of the impact, the history tells us different. NR3 needs to look at this TLU and capacity. Denison has to leave something for the community. Métis support the project. Métis people have to be major players. When Denison mentions they need 4 approvals, they actually need 5 and it's that social licence from the people/communities. Moving in that direction, key players are always at the major decision-making tables. This includes training and careers for young people. There is a big labour pool in Northern Saskatchewan and Denison should tap into that. There are strategies around hiring immigrants with expertise – but the focus should be on the North.
- Janna thanked Eddy's comment on the social licence.
- The Métis Knowledge Study will be conducted and take 12 months. Carolanne said the agreement includes the MKS and a proposal brought to Denison by MN-S/TWC. This is a significant CFA that Denison has entered into to. Denison is really proud this was signed this because it's what MN-S had been seeking and supporting.
- There is still fear about engagement and DTC. Exploration and engineering has been done. The descriptions are confusing and Denison has proceeded far ahead of Métis, without considering these other factors that have been going on for years.
- Carolanne said in 2019, there was a fairly major change when MN-S came to Denison. Part of today and yesterday's meeting was to start the lift off and capture Métis interests in a process we've agreed to with MN-S. Noted this discussion can be continued offline with Brent/Shannon to provide more details. Sometimes it takes a while. We started in 2019/early 2022 and then a pandemic occurred.
- Louis noted NR1 and NR3 should be at the same table.



## Two Worlds Consulting (TWC) Métis Knowledge Study

- Heidi Klein (TWC) reviewed the Métis Knowledge Study (MKS) to distinguish it from the other studies. It will be specific to NR1 and NR3. Hiring a coordinator to work with TWC in both regions at the same time. TWC will be doing secondary research and there are key documented records of Métis Knowledge to bring into this process, while also starting the on the ground planning with the two regions. The new primary research and interviews is currently considered for March and June, dependent on when the Community Coordinator is hired. Provided a summary on EIS report writing and the presentation in December. The purpose is to pick up on the comments for the EIS that are Métis knowledge needs to be part of it.
- The intention of this MKS is to inform the EA decision-making process. Denison is to determine the timeline for this.
- Along with TWC, MN-S has started a system of collecting and storing MK and creating story maps similar to what Shannon showed in the cultural share. There will be story map where the regions can go to this map to see hunting areas, etc. Funding has been provided and TWC is beginning this work now. This can be built upon in the years as there are other funding sources made available. This is just the starting point. MN-S will be able to add to this over time.

- 
- MN-S is in charge in the hiring process for the Community Coordinator.

**Question:** Where can NR1 and NR3 be involved in the hiring process? **Answer:** Shannon said initially, MN-S had asked for two coordinators for each region. Denison provided funding for one region. A job description is being developed. MN-S are not trying to implement anything but had to put this together to get funding.

### **Métis Nation Saskatchewan (MN-S) Next Steps**

- Next step is for NR3 and NR1 to work together. MN-S is meeting with NR1 every two weeks. Currently, MN-S is at the very beginning stages of informing regions and leadership.
- Story mapping is a methodology that was used in ER3. It's not just for mapping, it includes photos and videos and allows interaction.
- The NextGen TLU is not a living document. This will allow interaction with communities. It's about bringing communities together and displaying the information, being transparent, accountable, and looking at the VCs for Denison and building on them to meet the needs of our communities. Want to make it work for our communities. The EIS review was big and now MN-S is setting up the joint meetings to be consistent in the whole process to make it successful. Direction will always come from leadership.
- Louis notes that for the one voice approach, NR3 has to be more involved and his membership wants updates.
- Shannon said CNSC and GoS didn't get a chance to present. Today is a long process for CNSC and GoS. This is our first date and for building relationships. This will not happen during this meeting. There needs to be consistent collaboration and inclusion.
- Louis notes there is a window closing on this and MN-S needs to move quickly.
- Shannon said she is talking about the long-term relationship. Noted that Carolanne is right, while Métis weren't involved in the baseline studies, and the more we meet the more direction MN-S can get to move this forward.



### **Actions**

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#### **MN-S:**

- Shannon to set up meeting with NR1 and NR3.



5.3 Meeting Minutes Joint NR1 and NR3 Community Engagement Session, February 27, 2023



**Wheeler River Project – Draft Environmental Impact Statement  
Northern Region 1 (NR 1) and Northern Region 3 (NR3)  
Community Engagement Session, February 27, 2023**

<b>Subject</b>	Wheeler River Project
<b>Prepared By</b>	Two Worlds Consulting (TWC)
<b>Location</b>	Virtual: Microsoft Teams
<b>Groups Involved</b>	Métis Nation Saskatchewan (MN-S) TWC
<b>Participants</b>	<p>Northern Region 1 (NR1):  Laura Burnouf – Regional Director  Lazar Lafleur, Local 19 - La Ronge  Curtis Fiss, Local 80 - Stony Rapids</p> <p>Northern Region 3 (NR3):  Elder Max Morin  Mervin 'Tex' Bouvier - Regional Director  Percy Kenny, Local 82 – Patuanak  Joe Daigneault, Local 37 - Beauval Sipisihk  Kim Burnouf, Services Director  Kelvin Roy, Local 5 - Green Lake</p> <p>MN-S:  Brent Laroque, Director of Environment  Shannon Landrie-Crossland, Senior Engagement Advisor  Andrew Spriggs, Lands and Consultation Officer</p> <p>TWC:  Daryl Harrison, Technical Review Support  Eliza Bethune, Technical Review Support</p> <p>NR1 Regrets:  George Natomagan, Local 16 - Weyakwin  Larry Lavallee, Local 20 - Timber Bay  Allen Augier, Local 50 - Uranium City</p> <p>NR3 Regrets:  Mike Natomagan, Local 9 - Pinehouse Lake  Louis Gardiner, Local 21 - Ile-a-la-Crosse  Patsy Laliberte, Local 38 - Jans Bay  Eugenie Lafleur, Local 67 - Dore/Sled Lake  Lisa Maurice, Local 176  Sandra Bouvier, Local 41 - Cole Bay  Fred Kenny, Local 174 - Canoe River</p>
<b>Date/Time</b>	February 27, 2023 (9:00 am – 3:30 pm MST)
<b>Copies to</b>	MN-S, TWC



## Purpose of Meeting

- Provide an overview of the third-party review of Denison Mines Corp's (Denison) Wheeler River Project's (Project) Draft Environmental Impact Statement (EIS).

## Discussion

### Introduction:

- Shannon thanked everyone for attending the meeting and requested everyone's permission to record the meeting via Microsoft Teams to support note taking. Minister Mervin 'Tex' Bouvier did not want the recording to be accessible beyond the attendees or staff that need to reference it.
- Elder Morin led an opening prayer.
- Shannon led roundtable introductions and Elder Morin provided a culture share.
- Shannon shared that Denison declined MN-S' budget request to support a joint in-person meeting between NR1, NR3, and Denison in Saskatoon. Noted Denison suggested MN-S use money from the Métis Knowledge Study (MKS) budget to cover the meeting costs and that they would provide additional funding to MN-S at a later date. As a result, MN-S decided to proceed with a virtual meeting.

### *Locals' Administrative Challenges*

- Minister Mervin 'Tex' Bouvier noted Locals require administrative support from MN-S. Acknowledged that some Locals do not have an office, legal support, access to a computer or cell phone, access to strong wifi, or training on virtual meeting platforms such as Zoom. Noted many NR3 Locals were not able to attend today's meeting because of these challenges.
- Brent noted that any 10 Métis can form a Local ('paper Local'). MN-S is working to close this gap to help provide capacity to established Locals.
- Minister Mervin 'Tex' Bouvier advised MN-S avoid using the term 'paper Local' and noted that these Locals vote and have influence at the Métis Legislative Assembly (MLA). Encouraged everyone to work together and not against each other.



### TWC Draft EIS Technical Review Presentation

- Daryl clarified purpose of the meeting was to provide a summary of TWC's technical review of the Project EIS and take any comments or questions.
- Eliza reviewed the presentation agenda.
- Joe asked Eliza to provide a summary of the previous meeting. Eliza noted that Denison gave a Project overview presentation to NR1 and NR3 a few weekends ago. Noted Locals from both regions shared a lot of great feedback including expectations for Denison related to monitoring and engagement. She added that TWC has since updated the Technical Review Report they've prepared for MN-S, NR1, and NR3 to reflect the feedback shared during sessions.
- Eliza provided an overview of the Environmental Assessment (EA) and Environmental Impact Statement (EIS) processes for the Project (slides 1-8). Noted where the Project is in each process. Confirmed the EIS process is separate from the Impact Benefit Agreement (IBA) process.
- Joe expressed importance of knowing background of consultants conducting review as trust is a key issue moving forward. Eliza highlighted that bio's for all consultants involved are included in the TWC technical review document.
- Joes highlighted the importance of the baseline/benchmark of conditions at the mine site. Eliza identified that Denison provides baseline studies for values components in the draft EIS and that the Métis Knowledge Study will context of existing conditions for Métis. It is to occur in the future with funding from Denison and be integrated into the final EIS. Mervin would like to get copy of the baseline studies.
- Eliza reviewed issues and resolutions identified from the third-party technical review of the Project's Draft EIS. Noted this information will be used to inform the Final EIS, the Project, and Denison's engagement with MN-S, NR1, and NR3 going forward.
- Minister Mervin 'Tex' Bouvier expressed the importance of a cultural assessment of the Project.
- Joe said Métis should be involved in setting sampling/monitoring benchmarks for the Project. Added that this involvement needs to be prior to Project approval.
- Minister Mervin 'Tex' Bouvier shared concern for Denison-led studies. Noted importance of Métis-led studies.

- Shannon confirmed that Denison will be conducting annual sampling and they will push for Métis traditional resource users to collect traditional land use data to bridge the knowledge gap.
- Minister Laura Burnouf suggested TWC continue their presentation. Stated not all communities in NR3 will be impacted by the Project.
- Minister Mervin 'Tex' Bouvier disagreed with Minister Laura Burnouf's suggestion. Noted the rivers flow throughout NR3 and expressed importance of not excluding any communities.
- Joe added that some communities will be affected by the Project's transportation route, airborne impact, impacts to lakes etc.
- Lazar said NR1 is not trying to exclude anyone. Noted the MKS should focus on NR1, but acknowledged that everyone is affected by the Project.
- Joe suggested the regions form some kind of committee similar to the EQC to protect Métis rights.
- Lazar said this the in-situ recovery (ISR) mining process is manageable. Noted the importance of educating Métis people to interpret Denison's technical data.
- Percy asked if MN-S has a legal team. Shannon confirmed that the CNSC identified all NR1 and NR3 communities to be consulted and engaged on the Project. Noted the MKS will help support IBA discussions between MN-S' legal team and Denison. She confirmed the IBA process is separate from the EIS process.
- Minister Mervin 'Tex' Bouvier emphasized the importance of training, jobs, and economic support at the community level. Added the Denison should also be providing community well-being support (e.g., mental health services).
- Lazar suggested Denison consider Northlands College for mining-specific training opportunities for Métis. Brent said MN-S was looking into this.
- Eliza reviews Draft EIS sections and Engagement issues (slides 9-12)
- Joe commented that Denison's definition of an Indigenous Community of Interest was not reflective of Métis.
- Percy expressed concern for the Project's effects to the underground water system. Concerned that the Project will have similar impacts to the environment as the Key Lake operation. Minister Mervin 'Tex' Bouvier also expressed concern for legacy impacts as a result of the Project similar to Orano's Cluff Lake Project.
- Lazar said Denison will be subject to strict water quality standards set by the CNSC. Noted the ISR mining method and freeze walls proposed for the Project will require extra reclamation work during decommissioning.
- Joe and Lazar discussed potential Indigenous-owned monitoring companies to be involved in Denison's sampling programs including CanNorth Environmental Services.
- Joe noted the importance of being able to understand and explain Project information at the Local and community levels. Noted some materials may need to be translated to Michif.
- Eliza reviews Engagement resolution (slide 13) and Métis Knowledge and Traditional Land Use issues and resolution (slides 14-15). Daryl summarizes issues and resolutions for Land and Resource use highlighting lack of Métis input and need for more Métis participation in monitoring and management planning.
- Minister Mervin 'Tex' Bouvier noted a Northwestern Study from Carrier Forest Products, that was provided to government but not to communities, that may include traditional land use information to support the Project's MKS. Brent said MN-S is working to source this report.
- Eliza reviewed Economics issues and resolutions (slides 16-17).
- Minister Mervin 'Tex' Bouvier expressed interest in Denison providing support to address effects to determinants of health in Métis communities.
- Joe suggested Denison's procurement policy include a clause that requires Denison to source business and procurement opportunities in the north, and with Métis. He asked if we could a list of businesses that may provide services to support the project could be developed.
- Discussion was had related to topics of interest covered by the IBA process. For example, Locals expressed interest in profit-sharing and ownership shares. Shannon confirmed these discussions will take place after the MKS is complete. Kelvin noted that these discussions should have happened before any work on the Project was done. Shannon and Brent acknowledge that would have been ideal, but MN-S, NR1, and NR3 now have to work within the constraints of the regulatory process for the Project. Noted the importance of using information from the MKS to inform the IBA negotiations with Denison.
- Kelvin expressed concern for the Project's waste disposal, job opportunities, and long-term reclamation of the lands. Shared concern for mines that being abandoned.
- Elder Morin shared that First Nations will get Project-related contracts if Métis are fighting. Noted Denison should have negotiated with Métis prior to conducting environmental studies. Elder Morin also shared concern for Locals' administrative constraints and Project impacts to social determinants of health. Elder Morin added that NR1 and NR3 have a lot of environmental knowledge to inform the Project.



- Minister Mervin 'Tex' Bouvier suggested MN-S file an injunction to establish a paper trail to ensure the Métis are taken care of. Brent said the concerns shared at today's meeting would be passed along to MN-S leadership and Legal counsel.
- Daryl reviewed the Quality-of-Life issues and resolutions (slides 22-21).
- Joe noted that some people in his community liked the two-week rotation schedule, but others did not. Noted it did have impacts to family life. Suggested the Project guarantee better wifi connection to support virtual calls between families as well as wellness services.
- Eliza reviewed Monitoring and effects management issues and resolution (slides 22-23) and Project Design issues and resolution (slides 24-25)
- Minister Mervin 'Tex' Bouvier said the cultural part is missing from the Draft EIS.
- Minister Mervin 'Tex' Bouvier noted the Locals lack capacity to complete their own reviews of Project documents/information.
- Joe asked if MN-S has someone to help turn Denison's documents/information into plain language to support Locals and community understanding. Shannon said they can request Denison provide plain language materials that use more visuals and present findings to community. She often reviews proponent presentations first to help ensure they are not too technical.
- Lazar said the MKS will help build the foundation to ensure the cultural part is reflected in the Final EIS. Shannon added that the MKS will use story mapping to document traditional land use information to better assess Project impacts to Métis.
- Eliza reviewed Aquatic Ecosystems issues and resolution (slides 26-27).
- Minister Mervin 'Tex' Bouvier asked about the Department of Fisheries and Oceans (DFO) data on fish in the Project study area. Lazar indicated they can request the information.
- Joe asked if Denison had completed any other monitoring outside of what is included in the Draft EIS. MN-S to ask Denison if other monitoring has occurred outside of what is included in the Draft EIS.
- Shannon said it's important that monitoring programs for the project include Métis-led data collection. Noted Métis should be involved in all of Denison's monitoring/sampling/surveying. Shannon said MN-S is working with the CNSC to ensure Métis are involved in CNSC-led monitoring programs.
- Eliza reviewed Terrestrial Ecosystems issues and resolution (slides 28-29)
- Shannon suggested Denison conduct a moose-specific study in the Final EIS. Caribou are included in the Draft EIS, but they have moved further north and not really in the Project area.
- Joe emphasized the importance of not focusing on key wildlife species but including the broader range of species used by Métis.
- Curtis confirmed Métis hunt Barren caribou. Percy inquired about the direction of groundwater flow. Denison's Draft EIS says groundwater will flow "eastward from the mining zone within the Lower Sandstone Aquifer before moving upward through the Desilicified Zone in the Athabasca Sandstone and overlying overburden deposits toward Whitefish Lake" (pg. 10-28).
- Eliza reviewed EIS Next Steps (slide 30)
- Joe said the provincial Duty to Consult policy was outdated. Shannon said MN-S provided feedback on the policy. New policy to be released in the near-future.
- Shannon confirmed Matt will meet with NR3 Locals this week to discuss IBA negotiations for the Project. Noted NR1 had this discussion with Matt already.



## Actions

### MN-S:

- Source the Northwestern Study from Carrier that was provided to government (not to communities) that may include traditional land use information to support the Project's MKS.
- Pass along the concerns shared at today's meeting to MN-S leadership and Legal counsel.
- Re-send a copy of TWC's presentation from today to all NR1 and NR3 Locals.
- Ask Denison if other monitoring has occurred outside of what is included in the Draft EIS.





# PETER BALLANTYNE CREE NATION

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March 03, 2023

Ms. Jes Way  
Environmental Assessment Officer  
Canadian Nuclear Safety Commission  
Email: wheelerriver@cnsccsn.gc.ca

**Re: Denison Mines – Wheeler River Project**

## **Comments of the Peter Ballantyne Cree Nation on Draft Environmental Impact Statement**

Dear Ms. Way,

### **Preliminary Issue**

Peter Ballantyne Cree Nation (PBCN) has had a limited opportunity to conduct an initial review of the Denison Mines Ltd (Denison) proposed Wheeler River Project (Wheeler or Project) draft Environmental Impact Statement (dEIS) due to the fact that it was initially excluded from consultation. Although PBCN acknowledges and appreciates the opportunity to submit its views on the adequacy of the information presented in the Wheeler dEIS it has concerns regarding the adequacy of the aboriginal consultation undertaken to date by Denison and the Canadian Nuclear Safety Commission (CNSC) in respect of Wheeler.

It is understood that cooperation with Canada's Indigenous peoples with respect to Environmental Assessment (EA) is one of the purposes of the CEAA 2012. The CNSC ensures that its EA and licensing decisions uphold the honour of the Crown and consider Indigenous peoples' potential or established Indigenous and/or treaty rights pursuant to section 35 of the Constitution Act, 1982.

Both Denison and CNSC indicate they have fulsome aboriginal engagement policies and guidelines and appear to be undertaking their delegated Crown duty to consult in good faith, as informed by those policies, principles, legal and regulatory requirements. However, there has been an initial error in the assessment, by both Denison and CNSC, of the indigenous communities that should be considered an indigenous community of interest for purposes of consultation on this Project. PBCN was erroneously excluded from indigenous engagement, ostensibly due to distance from Wheeler and a lack of understanding of PBCN lands and indigenous activities potentially impacted by the Project.

PBCN is an Indigenous community that must be consulted having regard to the decided law, the provisions of CEAA 2012 and Denison's own criteria. PBCN meets nearly all of Denison's stated criteria to evaluate Indigenous communities located in the Saskatchewan Northern Administration District that would be engaged by Denison. Wheeler falls within PBCN traditional territory, where traditional land use activities have historically been and are currently practised. For the record:

- PBCN territory encompasses Treaty 10.



- PBCN has potential or established Indigenous Rights within the Project Area.
- PBCN community of Southend is proximate to the Project having regard to conditions and the geography of Northern Saskatchewan. Southend is 185 km away, in a straight line, from the Project.
- PBCN has known traditional territory and has exercised aboriginal rights in and around the Project site.
- PBCN not only has the potential to exercise its Indigenous/Treaty Rights in proximity to the Project but is currently doing so.

PBCN is of the view that this lack of understanding, among Denison and CNSC, concerning PBCN's territory and the exercise of its Indigenous rights has impeded engagement during the early stages of the Wheeler regulatory process. This may be due in part to the Covid-19 pandemic challenges or misplaced reliance on communication with an umbrella organization like the Prince Albert Grand Council, that does not have authority to outline individual First Nation lands and interests and potential impacts. Regardless of the reason, the engagement process must be honoured to ensure that the PBCN is properly consulted with respect to the proposed Project.

One starting point to redress a failure of engagement is to assist Denison and the CNSC to better understand the nature and scope of PBCN lands and treaty and aboriginal rights and uses. To this end we have attached a map indicating the traditional territory and some uses by PBCN. This document is a working draft and we request that you retain it in confidence consistent with CEAA guidance to protect the Indigenous knowledge and to allow us to jointly discuss management and disclosure of this information.

Although the Wheeler regulatory review is underway, the PBCN intends to engage with CNSC and Denison to share our perspectives on how PBCN interests may be impacted by Wheeler and how the impacts can be addressed.

PBCN's goals are to:

- Work together with Denison in a spirit of mutual respect to cooperate to collectively identify means to avoid, mitigate, or otherwise address potential negative impacts of the Project on PBCN's territory and the exercise of its Indigenous rights and interests.
- Participate in a funding agreement with Denison to facilitate and support PBCN participation and meaningful engagement in the EA process.
- Meet with CNSC and Denison to share PBCN knowledge of its land, and Indigenous uses, and how these may be impacted by the Project and methods to address any adverse impacts.
- Explore employment and job opportunities related to the Project.
- Establish a shared understanding of how PBCN would like to be engaged in the regulatory review including, but not restricted to, timely project updates, information and an opportunity to discuss concerns throughout the EA process, including the review of the dEIS, CNSC staff's EA Report, and other project-related documentation.



We understand that the CNSC, with the support of the federal-Indigenous Review Team, will engage in an EIS technical review. PBCN's intention is to participate fully in the ongoing Wheeler regulatory review.

The following PBCN comments are in response to the 90-day public comment period on the dEIS. They provide background on PBCN and our initial perspectives, as a treaty and aboriginal rightsholder, on issues arising from Denison's dEIS.

### **PBCN Background, Rights, and Interests**

The Peter Ballantyne Cree Nation has a number of concerns about Denison's proposed uranium mine development that it would like to discuss with Denison and CNSC. These include potential adverse environmental and socio-economic impacts to PBCN members, lands and uses, including hunting, fishing, and gathering, in all seasons, throughout its territory.

The PBCN has occupied lands and waters in Northeastern Saskatchewan and Northwestern Manitoba since time immemorial. PBCN is a signatory to Treaty 6 and its traditional territory spans all of Treaty 10 and a portion of Treaty 6. The Project is located on Crown land with the nearest PBCN community located at Southend Saskatchewan (approximately 185 km, in a straight line).

Within Saskatchewan, PBCN traditional hunting, fishing, and gathering territory extends from the Saskatchewan/Manitoba border west to Trade Lake, north to Reindeer Lake and south to Sturgeon Landing. The PBCN territory located within Saskatchewan is critical to sustaining the culture, lifestyle and traditions of PBCN and its members. Not only do PBCN members currently rely on the right to harvest fish, wildlife and plants for subsistence purposes, our members have harvested wildlife as a traditional economic resource activity in all seasons throughout our territory.

Under our treaty, PBCN members also have the right to sustain cultural practices, lifestyle and traditions by preserving and accessing heritage resources such as: access to migration routes, waterways; trap lines and/or subsistence trapping of fur-bearing animals; traditional medicines; raw materials such as bark, wood, stone, bone, fibers and dyes; place names, stories and where they connect with the land; preservation of camps, trails, caches, sacred and burial sites; traditional knowledge; and archaeological and historical sites.

A full and accurate description of PBCN's rights and interests is an essential part of the Wheeler dEIS and is necessary to ensure a fulsome environmental assessment. PBCN is interested in the opportunity to collaborate with Denison Mines to comprehensively identify PBCN's rights and interests that may be impacted by the Project.



### Engagement with PBCN

It is PBCN's expectation that inclusion of Indigenous Knowledge in the EIS should not be limited to a description of land uses but should contribute to all valued components where relevant information is shared or provided. The Wheeler dEIS, as submitted, fails to include PBCN territory or land uses proximate to the project and regional study areas.

Meaningful engagement requires an "exchange of views" (R. v. Sparrow, 1990, SCC 104, at 1114). CNSC and Denison must provide a reasonable amount of time for the identification and analysis of potential adverse impacts of the Project including cumulative effects on PBCN territory and PBCN members exercise of their Indigenous rights. This must include adequate engagement with PBCN on mitigation strategies to address these impacts. Currently neither Denison, the CNSC or PBCN have the necessary information to adequately, and mutually, understand the potential adverse impacts, the severity of those impacts, proposed mitigation, and residual effects.

We ask the CNSC to ensure that its review timelines be adjusted, as required, to ensure fulsome participation by PBCN with the proponent and the regulator, going forward.


### Preliminary Concerns

PBCN has concerns regarding potential impacts to Valued Components including but not limited to water quality, fish, wildlife, aquatic vegetation, Human health, country food consumption, resource use, and socio-economic factors.

Areas of specific concern are:

- Potential impacts to the landscape as a whole, including aquatic and terrestrial environments.
- Effects on the growing/carrying capacity of both aquatic and terrestrial environments for Country Foods because of potential changes to the landscape including the risk of introduction of contaminants.
- Potential accident/spills impacts on the harvesting of plant specific country foods.
- Limitations to access lands for country food harvesting due to mining traffic or operation of the mine.
- Denison's proposed use of freshwater from Whitefish Lake.
- Potential impacts to boreal shield woodland caribou.
- Treatment of mine contact effluent associated spills containment, and the anticipated downstream impacts. PBCN has a specific interest in the potential impacts to the interconnected waterbodies that PBCN relies on in the exercise of its indigenous rights.
- Socio-economic impacts that may result from the Project, including a 300-person construction camp, and a 180 person operations camp and related impacts to vulnerable populations.
- Lack of detail on the proposed means and haul route of yellowcake product to market.
- Employment opportunities for PBCN members and procurement opportunities for PBCN Group of Companies.
- Ensuring PBCN participation in the development and execution of the long-term environmental effects monitoring and follow up programs.

PBCN would like to work collaboratively and efficiently with Denison to develop a shared understanding of PBCN impacts and interests. Our common goal is to ensure that the Wheeler regulatory review will result in an environmentally responsible and sustainable Project. This cannot be accomplished without active engagement with PBCN including appropriate capacity funding. Though Northern Saskatchewan is often characterized as remote, it is de facto an interconnected ecosystem that PBCN relies upon for its continued environmental, social, and economic wellbeing. We look forward to working together with Denison and the CNSC to build mutual understanding and support for the Project.

Sincerely, 

Signature Redacted

Ben Merasty,

Executive Director

c.c. Ted Merasty, Director of Lands and Resources PBCN

Patricia McCunn-Miller, President Blue Bridge Energy Ltd

# YA'THI NÉNÉ LAND AND RESOURCE OFFICE INTERVENTION

*In the matter of the Denison Mines Wheeler River Project:  
Environmental Impact Statement (EIS)*



4 March 2023

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## Introduction and Project Overview

The Wheeler River Project (hereafter, the Project) is a proposed in situ recovery (ISR) uranium mine and processing plant situated 35 km northeast and 35 km southwest of the Key Lake Mill and McArthur River Mine, respectively, and 4 km west of Highway 914. The Project is operated and 95% owned by Denison Mines Incorporation (hereafter, Denison). The Property hosts two uranium deposits, Phoenix and Gryphon. Only the Phoenix deposit is amenable to ISR mining. It is the focus of this Environmental Impact Statement (EIS) under review.

Estimated to contain 70.2 million pounds of triuranium octoxide ('yellowcake,'  $U_3O_8$ ) in mineral resources of high-grade ore (with an average grade of 19%), the Phoenix deposit is geologically situated 400 m below the surface at or above the unconformity between the overlying sandstone and underlying basement rock.

Briefly, extraction by the ISR method involves delivery of an acidic mining solution (containing sulphuric acid, hydrogen peroxide, and ferric sulphate) through injection wells to the ore body. This solution permeates the ore body through natural fissures and dissolves the uranium. Uranium in solution is then recovered through recovery wells. The uranium-bearing solution (mining solution + dissolved uranium) is processed at an on-site facility to produce yellowcake. The active mining area belowground is isolated from the surrounding area by an engineered freeze wall to prevent groundwater from flowing through the uranium deposit. ISR mining has not yet been used as an extraction method for uranium in Saskatchewan. However, the freeze wall technique is used at both McArthur River and Cigar Lake Operations.

The proposed timeline for the Project is 38 years: 2 years construction, 15 years operation, 5 years decommissioning, and 15 years post-decommissioning.

In addition to the proposed mine, processing plant, and associated infrastructure and facilities, the area hosts exploration operations currently conducted from Denison's camp facilities. This includes many kilometres of geophysical survey grid lines that transect the Property, about 750 drill pads, and various access trails.

Ya'thi Néné Lands and Resources (YNLR) holds a Participant Funding Contribution Agreement with the CNSC to provide an intervention related to Denison's Wheeler River Project EIS. The Project falls within Nuhenéné, the traditional territory of the Athabasca Denesų́liné. The purpose of YNLR's intervention is to provide information and context of the Athabasca Denesų́liné and Basin Residents' perspectives and concerns regarding this EIS. Of principal concern to YNLR is that the Project be fully sustainable with respect to cultural rights and traditions of the Athabasca Denesų́liné, socioeconomic equity, and environmental protection. To achieve this end, YNLR expects Denison to work collaboratively with the people of Nuhenéné through the YNLR office.



## Background of Nuhenéné and YNLR

YNLR works to protect the lands and waters of Nuhenéné for the long-term benefits of its member Denesų́liné First Nations and Athabasca communities, guided by their knowledge, traditions, and ambitions, while being a respected partner in relations with industries, governments, and organizations who seek to develop the Athabasca Basin’s resources. YNLR is governed by an independent Board of Directors appointed by the elected community leaders and operates five offices in Saskatchewan (Saskatoon, Fond du Lac, Black Lake, Hatchet Lake, and Uranium City).

The organization is mandated by the Hatchet Lake, Black Lake, and Fond du Lac Denesų́liné First Nations, as well as the municipalities of Wollaston Lake, Stony Rapids, Camsell Portage, and Uranium City, to act as the representative body and initial point of contact for consultation and engagement from government and proponents. YNLR manages all consultation and engagement within Nuhenéné. In addition to the protection of lands and waters within Nuhenéné, YNLR works to promote the interests of the region’s residents through training, employment, and procurement opportunities.

The Project is located within Nuhenéné, the traditional territory of the Athabasca Denesų́liné. The First Nation members of YNLR are all signatories to treaties with the Crown.<sup>1</sup> A significant majority of the residents of the municipalities represented by YNLR are also Indigenous Peoples,<sup>2</sup> with Aboriginal and/or Treaty rights protected by section 35 of the *Constitution Act, 1982*. Despite a long history of Crown and industry seeking to exclude Indigenous People from the area and disrupt their connection to their ancestral lands, the relationship between the Athabasca Denesų́liné and their lands and waters continues.

References in this submission to “the Aboriginal and Treaty rights of YNLR members” refers to the Aboriginal and/or Treaty rights held by the First Nations, and/or exercised by the Indigenous Peoples resident in the municipalities.

YNLR provides support for the implementation of the Collaboration Agreement with Cameco and Orano on behalf of the seven Athabasca Basin communities, as well as involvement in many other land and resource-related initiatives. With Denison specifically, YNLR and Denison are partnered in an Exploration Agreement that was signed in October 2022.

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<sup>1</sup> Fond du Lac and Black Lake Denesų́liné First Nations are both signatories to Treaty 8. Hatchet Lake Denesų́liné First Nation is a signatory to Treaty 10.

<sup>2</sup> According to the 2016 census, 89.5% of Wollaston Lake residents, 78% of Stony Rapids residents, and 60% of Uranium City residents are Indigenous Peoples, or “aboriginal peoples” as defined under section 35 of the *Constitution Act (1982)*. Data for Camsell Portage is not available.

## Document Timeline and YNLR Submission

YNLR applied for funding to intervene in the EIS on 14 March 2022. YNLR received the fully executed funding agreement on 23 June 2022. A draft form of the EIS (reviewed by CNSC) was made available on 21 November 2022. However, Denison had provided YNLR with the Indigenous sections of the EIS for review and comment in June 2022.

Once YNLR received the draft EIS released on 21 November 2022, YNLR undertook the following tasks:

- Participated in joint in-person and virtual meetings with the YNLR Board of Directors and Athabasca Land Protection Committee (ALPC) on 15 December 2022.
- Participated in a joint in-person and virtual meetings with CNSC staff on 20 December 2022.
- Conducted a biophysical review.
- Conducted a review of Indigenous rights and perspectives.
- Conducted a legal review.

YNLR is providing this submission on behalf of its member communities. This submission is intended to provide the Commission with a summary of key issues relevant to the EIS. YNLR and its advisors have engaged in as much analysis as possible within the limited time frame available, especially considering the intervening December holidays. In reviewing these submissions, **YNLR reminds the Commission that an absence of analysis or documented concern or discussion should not be taken to indicate that YNLR has no concerns on that issue.** The information in the following written document is incomplete, and an absence of data does not mean an absence of value or perspective.

The recommendations and comments provided in this submission are not comprehensive nor representative of the entirety of YNLR's membership. Nothing in this submission is intended to or shall abrogate or derogate from any Aboriginal and/or Treaty rights of YNLR or the communities and organizations it represents.

Application review, evidence collection, and intervention preparation were limited to a short window of time and overlapped with the December holidays. As such, YNLR requested and received a two-week extension to the deadline for the written submission of 18 February 2023 to 4 March 2023. As outlined in this submission, YNLR has actively engaged with the proponent and sought to provide a comprehensive review within the strict timelines available. Through this review, YNLR has identified important information gaps and methodological issues that create uncertainty about potential impacts.

## 1. Designation of Athabasca Denesų́liné as an Indigenous Community of Interest

Denison's EIS (draft) for the Wheeler River Project recognizes and categorizes Indigenous communities as either Indigenous Communities of Interest (COI) or Indigenous Communities (IC). For the purposes of this EIS, Athabasca Denesų́liné First Nations and communities were categorized as Indigenous Communities, about which YNLR has had previous correspondence with Denison.

Designation of Athabasca Denesų́liné as an IC and not a COI marginalize the Athabasca Denesų́liné and their knowledge. This categorization ensures that the EIS expends considerably more effort to understand the issues and concerns of a COI than an IC. To determine whether an Indigenous community is an IC or COI, the EIS uses a Local Study Area (LSA) and Regional Study Area (RSA) that focus on the area to the south of the Project location and along the road network, rather than downstream along the Wheeler and Geikie Rivers to the north.

The preoccupation with road access ignores that Athabasca Denesų́liné traditional land users generally access the study area via overland routes. For example, Hatchet Lake and Wollaston Lake Post are about 160 km downstream of the Wheeler River Site.

In contrast, the English River First Nation (ERFN) Community (or Metis Local #82) of Patuanak is further from the Project site at approximately 225 km yet is designated as a COI. Both ERFN and Hatchet Lake Denesų́liné First Nation are signatories to Treaty 10. They have knowledge, land use, and occupancy in the area. Hatchet Lake/Wollaston Lake Post is approximately 65 km closer to the Wheeler River Project than Patuanak. Yet, Patuanak is considered a COI, while Hatchet Lake is an IC. This seems inconsistent with the criteria used in the EIS to determine designation of communities. To be clear, we are not questioning the inclusion of ERFN or the Metis Local #82 as COI within the EIS, but we are pointing out the inconsistent treatment.

The ramifications of the designation of Athabasca Denesų́liné communities as an IC rather than a COI are evidenced by the limited engagement with the Athabasca Communities and the limited inclusion of their knowledge within the EIS.

The EIS states that (Pages 25-26, Executive Summary EIS):

*“Denison recognizes the value Indigenous Knowledge (IK) and Local Knowledge (LK) adds to project planning, the completion of the EIS, and throughout the lifespan of the Project. Denison has recorded and stored information regarding IK, LK, and engagement activities in an Engagement Database referenced throughout the EIS. Indigenous perspectives can be complementary to the Cumulative Effects Assessment (CEA) for the Project. ERFN and KML have shared their Indigenous Knowledge on past, present, and predicted cumulative effects. The Ya'thi Néné Lands and Resources (YNLR) Office also shared a report with Denison that focused*



*primarily on the Athabasca Denesų́líné First Nations including Hatchet Lake, Black Lake, and Fond du Lac, as the following source:*

- *An Exploration of Recorded Athabasca Denesų́líné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project (Ya'thi Néné Lands and Resources Office 2022)*

*Denison has brought this Indigenous Knowledge and Traditional Knowledge together with 'western' science throughout the EA process. Additionally, Denison is supporting several processes to aid community-led collection of IK. These processes are at different stages of completion. Denison will continue to consider and integrate results from any forthcoming materials provided by communities as it advances the EIS process."*

However, Denison misunderstands the nature of the YNLR Report provided in March 2022.

This report is an amalgamation of existing information from YNLR's database, which originates from a variety of projects varying in purpose, each with differing objectives and geographic scope. Consequently, it is not specific to the Wheeler River Project. It is thus not a focused Athabasca Denesų́líné Knowledge, Land Use, and Occupancy (ADKLUO) Study. This, in our opinion, leads to misunderstandings and misrepresentations within the draft EIS. This error was detailed by YNLR to Denison in a July 2022 letter.

In part, because the Athabasca Denesų́líné were not identified as a COI, specific works were not undertaken or commissioned; to better understand the Athabasca Denesų́líné, additional efforts are necessary. This is important because it sets the tone for comparisons with other Indigenous groups who have engaged with Denison more frequently and conducted far more intensive and focused work. This impacts the level of Athabasca Denesų́líné information available and included. As a result, it does not allow for a shared, more in-depth exploration of Athabasca Denesų́líné experiences.

Moreover, given the legacy of dispossession and denial of Indigenous Peoples' rights, the Athabasca Denesų́líné connection to their ancestral lands is less about who does what, where, and when, than it is about *who belongs to those lands*. And, as part of Nuhenéné, Athabasca Denesų́líné hold a sacred obligation to look after these lands for both today and to steward it for future generations.

*Assertion of Traditional Territory: land use.* YNLR's 2022 Report mentions woodland caribou values, tracks, and sightings within the EIS study area; again, these data arise from various caribou studies and clearly demonstrate that Athabasca Denesų́líné members were in the EIS area. That harvesting or other information were not recorded is a function of the purpose of the various woodland caribou studies from which these data originated rather than an indication that

Athabasca Denesųliné do not utilize the area for other traditional purposes. In addition, Athabasca Denesųliné activities include, but are not limited to, large and small game harvesting, gathering activities, and fishing, all of which are of key cultural importance. Additional engagement with the Athabasca Denesųliné communities and YNLR could have ensured further clarification.

Additionally, information from the YNLR 2022 Report (Section 3.3) appears to have been disregarded in the draft EIS. This information includes references to activities mentioned during duty-to-consult works for other projects with the LSA. This includes hunting, fishing (including commercial) and gathering of berries and medicines. The responses also indicate that the land is used for therapeutic purposes, youth gatherings, fish camps, and general camping. Further, the responses note that areas were utilized year-round for hunting, trapping, and fishing, with activities such as berry picking occurring in summer. Impact concerns raised by the interviewees included damage to the lands and water, effects on wildlife, disruption to traditional activities, and accessibility to the areas while projects are ongoing. This information is relevant to the Wheeler River project and should be included with the EIS.

Depictions of contemporary land use describe only land use that has persisted through time, despite impacts. For example, the greater landscape surrounding the Wheeler River Project has been bludgeoned with mineral exploration and extraction for generations. Although YNLR's 2022 Report describes ample Traditional Land Use in the Project area, when considering contemporary land and resource use by Athabasca Basin residents, it is imperative to remember the alienation from the land caused by the cumulation of *all* industrial development prevents residents from fully accessing affected areas.

Cumulative impacts of development have left residents with a steadily shrinking usable area to exercise their rights. In addition, psychological, cultural, and social impacts of uranium exploration and mining, including fear of contamination due to nearby extraction and milling sites north and south of the Wheeler River Project, have further prevented residents from fully accessing the general area.

*Assertion of Traditional Territory: connectivity by water.* The EIS states (Pages 1-7):

*"Water in the Project Area drains towards Russell Lake, the Wheeler River, and ultimately into Wollaston Lake (via the Geikie River)."*

It is important to note that the Hatchet Lake Denesųliné First Nation and the community of Wollaston Post are situated at Wollaston Lake. In addition to documented Traditional Land Use, this fact should categorize Athabasca Denesųliné Communities as a COI given their downstream

location of the Wheeler River Project and, thus, potential to receive negative impacts on aquatic resources and ecosystems.

Given the preceding, Athabasca Denesų́liné communities should be designated as a COI. In any case, YNLR points out that the Project is located within Nuhenéné (the Athabasca Denesų́liné territory), the Athabasca Denesų́liné First Nations are signatories to Treaties 10 and 8, and our communities are in proximity to the Project and have demonstrated traditional activity. The groups YNLR represents are constitutional rights holders, not mere stakeholders. As such, they need to be involved at a significant level when their rights may be impacted.

YNLR acknowledges the intent between Denison and YNLR to enter into negotiations for a Benefit Agreement. We anticipate our concerns noted within this document will be discussed as well as any other concerns our community members and leadership identify. We recognize the implications of having been designated as an IC instead of a COI but we anticipate being able to work through these differences with Denison and to be able to rectify this concern. Some of our more notable concerns that arise as a result of the designation include:

**Project economic and employment benefits:** the draft EIS (page 25, Executive Summary) states, *“Denison will concentrate initial and sustained efforts towards employment and training initiatives for the Project targeted at the Communities of Interest. Best efforts will be made to make sure employment is maximized within the Communities of Interest and beyond that, with Indigenous people and Residents of Saskatchewan’s North. Denison will work with the leadership of the Communities of Interest to assist in determining appropriate hiring practices during all phases of the Project.”*

Unlike the performance of many past northern developments, YNLR expects this project to deliver on the economic and employment benefits promised to local and Indigenous People, including Athabasca Denesų́liné communities, while at the same time protecting the ecological health of the surrounding lands and waters. As expanded upon below, appropriate mechanisms can serve to both properly respond to and address potential ecosystem and socioeconomic impacts and to add confidence and certainty to impact assessment and outcomes for the Project.

**Involvement in future monitoring:** the draft EIS (page 74, Executive Summary) states that *“Denison is proposing project monitoring and follow-up. Monitoring programs are designed to meet regulatory requirements (e.g., permit or license conditions), and/or to demonstrate compliance with environmental commitments made in the EIS. Follow-up programs are those that are proposed to address any uncertainties identified during the EA process (e.g., to verify predictions made during the EA; determine the effectiveness of proposed and implemented mitigation measures) and to determine when to implement adaptive management measures.”*

A cursory examination of the EIS revealed no less than 23 proposed management and monitoring plans.

Given the multitude of environmental concerns with the EIS, including those posed by YNLR (see below), YNLR believes that monitoring throughout the life of the Project is extremely important. However, the list of proposed management and monitoring plans is daunting, requires a refinement of realistic, measurable outcomes, and reinforces the need for YNLR's involvement in all phases of monitoring and mitigation activities.

For example, one of the proposed monitoring plans states, *"Monitoring programs were identified as being required to measure the effects on selected ungulates, furbearers, and woodland caribou to meet regulatory requirements."* This is a vague statement with statistical implausibility to achieve a conclusive end; the result is that it is largely a meaningless statement. "Monitoring" could vary from systematic surveys to simply recording observations. "Measure the effects" could involve measurements of metrics ranging from population size, reproduction, or behaviour. As these groups of organisms are typically wide-ranging and with low population abundance, determination of effects on any of these metrics would require extensive and intensive studies with likely unachievable necessary sample sizes.

YNLR believes these uncertainties represent another opportunity for further collaboration between Denison and Athabasca Basin residents. Athabasca Denesųliné have much to offer to reduce uncertainty and improve overall environmental management of the Project, impact avoidance/reduction, and opportunities for shared benefits. While the physical footprint of the Project may be small, the nature and permanence of a uranium mine development raises the risk level for the surrounding environment and its Indigenous People. YNLR, therefore, expects to be fully involved with the design, implementation, and reporting of all monitoring programs for the Project, and expects such programs to be arms' length, statistically robust, and transparent to the public.

YNLR seeks a transparent and trusted process regarding who is responsible for ensuring that the promised monitoring programs are delivered in the future. To that end, YNLR should play an independent auditing role in this regard. Without these steps, there is a strong probability that the Project will not adequately monitor and manage Athabasca Denesųliné food security, access to and enjoyment of land, and harvesting success. But by taking these steps, Athabasca Denesųliné and their knowledge will be better integrated into the environmental management of the Project. This will build trust with local peoples and communities and improve the Project overall by providing more opportunities for including Indigenous and Local Knowledge into the adaptive management system.

The above areas of concern are further detailed in our technical comments that follow. However, on the whole, the main outstanding concerns and deficiencies are largely the result of the limited engagement with the Athabasca Denesų́liné and Basin residents and the limited inclusion of their knowledge within the EIS. We anticipate that our concerns will be mitigated by an anticipated benefit agreement implementing a co-designed monitoring, reporting, and adaptation approach for the Project. Without this involvement, it will be difficult to know with certainty how the Project will impact Indigenous People and their relationship and rights to the lands.

## 2. Protection of Woodland Caribou Considering Cumulative Effects

The individual EIS discipline sections predict project-specific LSA residual effects for each Valued Component (VC) and their associated Key Indicators (KI) as well as RSA cumulative effects from the Project, plus other previous and existing projects and activities, where applicable. For example, the EIS includes 33 LSA and RSA VCs (Table 5.3-1, pages 5-6) plus their associated KIs. Yet, all the 66 residual and cumulative effects analyses following mitigation are ‘non-significant.’ While YNLR understands the important role of mitigation in reducing predicted impacts, we find this conclusion extremely suspect and statistically unlikely. YNLR believes that this overly optimistic conclusion results from several sources ranging from a poor selection of VCs to the largely subjective and qualitative nature of the impact assessment analyses, including the erroneous conclusions drawn for some VCs, including for woodland caribou, of which populations are in decline.

Residual and cumulative effects assessments of the EIS were deemed to be not significant for all bird and wildlife VCs, including the woodland caribou (page 55, Executive Summary). As a result, a ‘woodland caribou management plan’ is proposed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and best management practices (page 2-104). YNLR disagrees with this conclusion. The situation for this important species in the region is already uncertain. YNLR believes that the Wheeler River Project will exacerbate this. Simply stated, the region’s woodland caribou populations are declining, and any further disturbance to the animals themselves or their habitats – and this project contributes to both aspects – will have negative impacts.

YNLR does not understand how both residual and cumulative effects on woodland caribou are not significant with the presence of enormous historic seismic cutline disturbance in the area (Figure 9.2-6, page 9-83, EIS and Appendix 9B). For example, 100% of the LSA and 82% of the RSA are already disturbed in this manner (Appendix 9B). Such linear features are well known to be detrimental to woodland caribou. YNLR cannot find any reference to seismic disturbance being

included in the analyses of the effects and is perplexed about the reasons justifying its omission. The Indigenous groups consulted undoubtedly mentioned it.

In addition, the normal 'proven and accepted mitigation' has not helped this species historically hence its precarious conservation status today. There remain concerns over the unknown impacts the Project will have on caribou and other wildlife. Therefore, a minimum of an aggressive habitat-offset plan for woodland caribou should be developed, approved, and actioned before construction begins on the Project. YNLR would like to be involved with the development of this plan. We suggest that the plan should address the many kilometres of seismic disturbance within the Project LSA and RSA and beyond.

If the seismic cutline disturbance has not been included in the analyses of the residual and cumulative effects for woodland caribou, then a project development permit should not be issued until such studies have been conducted and assessed. As well, if such disturbances have not been included in the analyses of the residual and cumulative effects, then it brings into question the conclusions drawn of non-significant impacts for all other avian and wildlife species.

### 3. Protection and Health of Aquatic Environments

The EIS states (pages 12-13 and 16, Executive Summary):

*"Mining will be completed using a relatively new ISR (In Situ Recovery) method, which is considered better both environmentally and financially. A water-based acidic mining solution is injected from surface pump houses via a series of injection wells, entering the uranium deposit mining area 400 metres below the surface. As the mining solution travels from injection wells towards recovery wells, uranium contained in the host rock is dissolved and transported to the surface within the mining solution. Water will be sourced from either a shallow groundwater well or Whitefish Lake.*

*Containment of the acidic mining solution and resulting uranium bearing solution within the mining area will be achieved through three levels of containment:*

*1. Design and operation of the injection and recovery wells to reduce the likelihood of leakage into the overlying sandstone.*

*2. The inward hydraulic gradient between the injection and recovery wells.*

*3. Creation and maintenance of an underground freeze wall.*

*Processing of the Uranium bearing solution to Triuranium Octoxide or U<sub>3</sub>O<sub>8</sub> ('yellowcake') will then take place in the processing plant on the surface."*

YNLR has questions concerning the proposed method of mining. First, the relative newness of the ISR technology combined with the use of a freeze wall, and second, the enormous amounts of the natural lake and ground water proposed to be used.

The EIS cites two other Saskatchewan uranium mines where freeze wall technology is in operation (Cameco's McArthur River and Cigar Lake). Yet, YNLR cannot find any reference to the environmental performance of these freeze walls in the Wheeler River EIS. Is this information not available?

YNLR is concerned about freeze wall integrity through the life of the mine, and the fate of contaminants in the system following decommissioning when the wall thaws. While Denison provides the usual assurances in the EIS, ongoing independent monitoring is critical here, and YNLR would like to be included as part of this.

Water usage and maximum quantity of water withdrawal were discussed during a virtual engagement meeting with YNLR and Leadership representing the communities throughout the Athabasca Basin (page 2-36, EIS). Despite this, YNLR has remaining concerns about project water management.

During its operation over several decades, the Denison mine will extract fresh water from both groundwater and Whitefish Lake at the rate of 81 cubic metres (81,000 litres) per hour (page 2-36, EIS). (However, Figure 2.2-15 shows only an extraction rate of 40.5 cubic metres per hour from groundwater OR Whitefish Lake; please clarify.)

Assuming the larger quantity, 81 cubic metres per hour equates to 2 million litres per day, or 710 million litres per year. As a result, stream flows are predicted to decline by 3% (page 46, Executive Summary, EIS). In addition, more than 90% of this extracted water will be released back into Whitefish Lake following treatment for contaminants (page 2-32, EIS), which raises concerns about future water quality in the lake and beyond. Whitefish Lake connects to Russell Lake, the latter of which is part of the Wheeler River. Wheeler River connects downstream to the Geikie River, which flows to Wollaston Lake. As such, Basin residents are rightfully concerned about the quality of these waters and the ramifications to human and ecosystem health.

Denison proposes a monitoring program to test the effectiveness of water mitigation measures and predictions. In consultation with Indigenous communities, relevant federal and provincial agencies, and other interested parties in the development and implementation of this program, specific monitoring and follow-up plans will be prepared to refine and finalize the monitoring approach (page 47, Executive Summary, EIS).

In situations like this where the impacts to the environment are uncertain or there remain significant outstanding questions surrounding the conclusion of impact predictions, collaborative

ongoing monitoring and mitigation becomes paramount. Doing so will lead to more informed decision-making and, ultimately, a better project. YNLR looks forward to being actively involved in these discussions.



## Appendix A: Details of Biophysical Review

A note on this Appendix's format: some sections of the EIS have been directly copied and indicated in *italics* to provide context and clarity to the comments immediately following them.

### A. Executive Summary of EIS

#### *Project Overview (Page 2)*

- *Project components and activities: the central Project components are the ISR (in situ, or 'in place' recovery) mine and the processing plant. Supporting Project components and activities include those needed for waste management, water management, distribution of electricity, and transportation, such as pads, ponds, buildings, roads, and an airstrip.*
- *Inputs: freshwater, chemicals (for mining, uranium processing, treating water), electricity, and fuel.*
- *Outputs: waste (organics, clean waste rock, special waste rock (drilling core), domestic waste, industrial waste, precipitates from the processing plant and water treatment, sewage), air emissions including greenhouse gas emissions (GHGs), noise, and treated effluent.*
- *Product: U3O8 or yellowcake. The product Denison sells is ultimately used as fuel in nuclear power plants, supporting global efforts to reduce GHG emissions.*
- *Employment: Approximately 300 workers during Construction and 180 during Operation. The Project will be operated as a fly-in-fly-out operation.*
- *Project duration: Total of approximately 38 years, about 2 years for Construction, 15 years for Operation, 5 years for Decommissioning, and 15 years for post-Decommissioning periods.*

**Comment 1: YNLR sees a potential benefit of the in situ approach as it is designed to reduce the surface disturbance of the Project, and the potential leakage of contaminants from excavated rock and tailings. However, see the comments below.**

**Comment 2: YNLR is concerned that the extraction of source water for the Project may have a negative effect on stream flows both below- and aboveground.**

**Comment 3: YNLR is concerned with the potential effects of contaminants released during and after the Project.**

**Comment 4: From these statements, YNLR assumes no permanent work camp will be constructed. YNLR expects that a sizeable proportion of the Project workers will be hired from the local and regional area.**

**Comment 5: YNLR is concerned with the potential increase in road and off-road traffic affecting wildlife and fisheries sustainability.**

*The environmental assessment (EA) outlined in this environmental impact statement (EIS) was transparent and conservative, following a standard, stepwise approach for evaluating Project effects including cumulative effects. In an effort to generate a conservative EA and provide operational flexibility, Denison developed an assessment basis for the EA, which bound, or was higher than, the current understanding of the Project's engineering design basis. For example, the direct Project footprint based on engineering site plans is about 75 ha, but the EIS assumed the Project's area of disturbance was closer to 170 ha. (Page 2)*

**Comment 6: YNLR supports this built-in precautionary approach to the Project's risk assessment. However, given the lengthy timeline of the Project, YNLR would like to see that lost (i.e., unmitigated) wildlife and fisheries habitat be offset in some manner. A response to this should be approached through an anticipated impact benefit agreement.**

*Residual effects remaining after mitigation were largely linked to land clearing, increases in traffic, emissions to air, waste generation, and water management. Residual effects were evaluated for 32 Valued Components (VCs) and significance determined for receptor VCs. The evaluations and conclusions of the EIS are that the Project can be constructed, operated, and decommissioned while regional plant communities are stable and continue to function, regional fish and wildlife populations are viable and healthy, human health is protected, there is continued opportunity for land use activities, including exercising Indigenous rights, and there is continued social and economic viability of local economies. The EIS outlines mitigation measures, monitoring requirements, and commitments needed for Denison to have confidence that Project is operating as planned and that the actual effects resulting from Project Construction, Operation, and Decommissioning are at or below predicted effects. (Page 2)*

**Comment 7: Despite these reassuring statements, YNLR is aware that predictions may fall short, hence the need for close collaboration with Indigenous Peoples, communities, and organizations, including their input into the design and implementation of transparent and statistically-robust project monitoring programs.**

*Overall, the Project has the potential to achieve a superior standard of environmental sustainability when compared to conventional uranium mining operations. Owing, in large part, to the use of the ISR mining method, the Project has potentially fewer residual effects remaining after mitigation when compared to conventional open pit or underground mining methods and conventional milling activities. (Page 2)*

**Comment 8: See above comment on the potential benefits of ISR technology. However, YNLR remains concerned about the nature and disposition of project contaminants during and after the mining process.**

*Importantly, Denison has been proactively engaging with Indigenous communities and organizations, the general public, and regulatory agencies since 2016. The use of a collaborative approach to engagement and advancement of the Project is exemplified by the input these groups have provided to influence both project designs and the EA in various ways. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous EA, licensing, and permitting process for a uranium mining facility in Canada. (Page 2)*

**Comment 9: YNLR supports these statements with the caveat that the company's collaboration and partnership with Indigenous Peoples, communities and organizations continues throughout the life of the Project. It is important for the company to understand that these groups do not consider themselves as stakeholders but rather as rights holders.**

*Mining will be completed using an ISR method. A water-based low pH or acidic mining solution is injected from surface pump houses via a series of injection wells, entering the uranium deposit mining area (approximately 400 metres below surface) via slotted well screens installed at the base of the injection wells. As the mining solution travels from an injection well towards a recovery well, uranium contained in the host rock is dissolved and transported to surface within the mining solution. (Page 12)*

**Comment 10: While YNLR supports the Project outcome of lower aboveground disturbance, it retains concerns about the management inputs and outputs of the ISR method, particularly project water sources, quantity, and release along with its associated contaminants.**

*Containment of the mining solution and uranium bearing solution within the mining area will be achieved through a defence-in-depth approach with three levels of containment (Page 12):*

- 1. Design and operation of the injection and recovery wells – The wells are designed with both an outside and inside casing which will minimize the potential accidental release of mining solution or UBS into the sandstone above the mining area.*
- 2. Inward hydraulic gradient from wellfield operation – A hydraulic gradient will be present in the mining area as the mining solution is pumped from an injection well (areas of high pressure) towards a recovery well (areas of low pressure). This consistent gradient in pressure causes the solutions to preferentially flow towards the low-pressure areas in a controlled manner.*
- 3. Creation of a freeze wall – Denison is proposing a freeze wall for tertiary containment of the mining solution. The engineered freeze wall will extend from the surface of land down to the basement rock below the depth of the uranium deposit. The very low permeability basement rock underlying the uranium deposit serve as a natural aquitard; however, the sandstone hosting the uranium deposit is permeable and groundwater can flow horizontally through the deposit. Ground freezing technology is well established throughout the world. Its use in a mining environment was pioneered in Saskatchewan's potash mining industry for shaft sinking activities, and later adapted for use in Saskatchewan's uranium industry. Ground freezing to control and eliminate groundwater from entering the mining areas is a fundamental component of two existing Athabasca Basin underground uranium mines: Cameco Corporation's McArthur Operation and Cigar Lake Operation. The freeze wall for the Project will be established ahead of the commencement of mining activities by drilling vertical holes (using common diamond drilling methods) from surface to the basement rock. These holes will be cased and outfitted to allow for the recirculation of a freeze brine, which will gradually reduce the temperature of the ground near the drill hole and ultimately freeze the water within the rock to create a continuous in-ground freeze wall around the perimeter of the mining area. A total of over 300 freeze holes are planned for the Project. Once completed, the freeze wall will create a physical boundary*

*around the mining area that will completely isolate it from the surrounding regional groundwater. (Page 13)*

**Comment 11:** YNLR assumes that information and data exist with respect to the environmental safety of freeze wall technology in uranium mining operations within Saskatchewan. Has Denison reviewed these data and are they considered/presented as part of this EIS? If not, why not?

**Comment 12:** What happens to the freeze wall and its retained contaminants at the end of the Project's life? – despite safeguards and remediation, it has potential to release contaminants after mining is completed.

*Groundwater monitoring wells will be configured to demonstrate effective containment of solution within the mining area and provide early warning of any vertical migration of the mining solution or UBS within the perimeter of the freeze wall. Additional monitoring wells will be positioned to monitor groundwater pressures and quality outside of the mining area, including outside of the perimeter of the freeze wall. Groundwater samples taken outside of the mining area during Operations are expected to be comparable to regional groundwater quality. (Page 13)*

**Comment 13:** See preceding comment. Monitoring and adaptive management are important components of sustainable uranium mining. YNLR expects to be consulted/included in the design and implementation of the Project's environmental monitoring programs.

*When the UBS comes to surface, radon gas will naturally migrate out of solution and into the atmosphere. To keep radiation exposure of process plant worker as low as reasonably achievable (ALARA,) a radon purge tank will be used to remove an initial volume of radon before the solution enters the processing plant. (Page 16)*

**Comment 14:** Will the released radon gas be of any concern to natural resources, such as fish and wildlife?

*Water management for the Project involves distribution of freshwater, collection of runoff water, recycling and treatment of process water, and collection and treatment of industrial and domestic wastewater. As part of Denison's approach to sustainable mining at the Project, Denison intends to recycle process water to the greatest extent possible, thereby reducing the demand for fresh water supply and reducing the volume of treated effluent released. A freshwater distribution system will be designed to provide fresh water for the fire water system, the potable water treatment plant (WTP), the processing plant including mining solution preparation, the wash bay, drilling, and batch plant operation. Water will be sourced from either a shallow groundwater well or Whitefish Lake. (Page 18)*

**Comment 15:** While Project water reuse is laudable, its overall conservation and management are significant concerns for YNLR, particularly the quantities removed from the ecosystem and the fate of contaminated water released back into the ecosystem from the Project that end up in Wollaston Lake. See the above comments on environmental monitoring.

*Denison will concentrate initial and sustained efforts towards employment and training initiatives for the Project targeted at the Communities of Interest. Best efforts will be made to make sure employment is*

*maximized within the Communities of Interest and beyond that, with Indigenous people and Residents of Saskatchewan's North. Denison will work with the leadership of the Communities of Interest to assist in determining appropriate hiring practices during all phases of the Project. (Page 25)*

*Programs and actions focused on producing socio-economic benefits for Communities of Interest have been initiated for the Project. Denison's corporate Indigenous Peoples Policy (IPP) reflects the company's belief that reconciliation is advanced through collaboration with Indigenous peoples and communities to build long-lasting, respectful, trusting, and mutually beneficial relationships, while aspiring to avoid adverse effects of Denison's activities and operations (Denison 2021). (Page 25)*

**Comment 16: YNLR supports this commitment and looks forward to collaborating with Denison to ensure that the Project's socioeconomic benefits reach local Indigenous People. To this end, YNLR is interested in an impact benefit agreement with Denison ensuring mutual benefits from the Project and co-management of environmental monitoring and mitigation.**

*Denison recognizes the value Indigenous Knowledge (IK) and Local Knowledge (LK) adds to project planning, the completion of the EIS, and throughout the lifespan of the Project. Denison has recorded and stored information regarding IK, LK, and engagement activities in an Engagement Database referenced throughout the EIS. Indigenous perspectives can be complementary to the Cumulative Effects Assessment (CEA) for the Project. ERFN and KML have shared their Indigenous Knowledge on past, present, and predicted cumulative effects, through the following sources...(Page 25)*

*The Ya'thi Néné Lands and Resources Office also shared a report with Denison that, focused primarily on the Athabasca Denesųliné First Nations including Hatchet Lake, Black Lake, and Fond du Lac, as the following source: (Page 26)*

- *An Exploration of Recorded Athabasca Denesųliné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project (Ya'thi Néné Lands and Resources Office 2022).*

*Denison has brought this Indigenous Knowledge and Traditional Knowledge together with western science throughout the EA process. Additionally, Denison is supporting several processes to aid community-led collection of IK. These processes are at different stages of completion. Denison will continue to consider and integrate results from any forthcoming materials provided by communities as it advances the EIS process. (Page 26)*

**Comment 17: YNLR acknowledges that Denison incorporated the YNLR report into the EIS and looks forward to further working with the company collaboratively regarding the rights of Indigenous People.**

*Denison understands the importance of engaging with local and Indigenous communities, residents, businesses, organizations, land users and the various regulatory authorities, which are collectively referred to herein as Interested Parties. Since 2016, Denison has engaged with Interested Parties to develop meaningful relationships and facilitate a collaborative approach to engagement and the advancement of the project. (Page 26)*

**Comment 18:** As noted above, Indigenous People and their communities are rights holders, not stakeholders. This is an important distinction, as the rights they hold are constitutionally protected. This must be respected and recognized in the ongoing dialogue between the company and Indigenous Peoples through their chosen representatives, like YNLR.

*Interested Parties are categorized into three broad groups, each with several sub-categories. These include Indigenous Groups, the General Public, and Regulatory Agencies. As part of our adaptive approach, engagement activities for each of these groups of Interested Parties have been tailored to comply with both federal and provincial regulatory legislation and, importantly, meet the expectations of each Interested Party. (Page 28)*

**Comment 19:** Again, the Indigenous People, communities, and organizations YNLR represents are rights holders, and are not to be arbitrarily grouped and treated as non-rights holders.

*Indigenous peoples have a unique relationship with the environment, and importantly, Indigenous and Treaty Rights, which must be fully respected during the process of Project development, Construction, Operation, and Decommissioning. To this end, Denison's objectives with respect to Indigenous engagement associated with the Project are as follows: (Page 29)*

- *build and maintain relationships built on trust and transparency.*
- *create a respectful dialogue that promotes communication between Denison and Indigenous communities and organizations, in a timely and accurate fashion; and*
- *understand how the proposed development of the Project may affect the ability of Indigenous peoples to exercise collective Indigenous/Treaty Rights.*

**Comment 20:** YNLR broadly supports these statements and looks forward to working with the company in a collaborative fashion. This would best be achieved through the signing of an impact benefit agreement.

*Indigenous Knowledge and engagement activities clearly identified the importance Interested Parties place on groundwater as a pathway to surface water, and the associated potential for changes in groundwater inputs to surface water to influence Fish and Fish Habitat, Sediment Quality, Vegetation, Wildlife, Human Health, and Indigenous Land and Resource Use. (Page 43)*

*The primary potential effects from the Project on groundwater included changes to Groundwater Quantity and Groundwater Quality during Operation as a result of surface facilities (ponds, landfills, laydown and wash areas) and mining, as well as the migration of chemical constituents in groundwater from the remediated mining area as natural groundwater flow conditions are re-established in post-Decommissioning. (Page 44)*

*The freeze wall will be established as tertiary containment before mining operations commence to create hydraulically isolated mining area. Groundwater will be remediated during Decommissioning to acceptable standards, which are referred to as mining area decommissioning objectives. These objectives reflect concentrations of mining-associated groundwater constituents that are protective of the surface*

*water environment after giving consideration to the removal of the hydraulic isolation of the freeze wall following the decommissioning stage. (Page 44)*

*Migration of dissolved constituent concentrations along the groundwater flow path from the mining area to Whitefish Lake (the local surface water receptor) is predicted to take hundreds to thousands of years, with concentrations remaining below values that would result in an environmental risk. (Page 44)*

**Comment 21: The release of contaminants before and after the Project's completion worries YNLR, which sets a high priority on clean and abundant groundwater and surface water. The Indigenous People, communities, and organizations YNLR represents will be here long after mine decommissioning, so minimizing this risk with statements regarding the length of time it takes is not helpful. Monitoring of water will be critical, and YNLR expects to be consulted and heavily involved with respect to this activity.**

*Flows and water levels in lakes and rivers within the LSA for the Surface Water Quantity VC are expected to experience some adverse change (i.e., reduction) as a result of altering the drainage areas reporting specifically to Whitefish Lake and water taking from this same waterbody. (Page 45)*

*Residual adverse effects are expected on Surface Water Quality due to the mobilization of solids and treated effluent discharge to Whitefish Lake; however, with the implementation of appropriate design criteria for site water management and the effluent discharge pipeline and diffuser, in addition to meeting provincial and federal criteria for discharge criteria and mine water treatment (as needed), the residual effects of the Project on Surface Water Quality are anticipated to be not significant. (Page 47)*

**Comment 22: As with groundwater, YNLR places a high value on the quantity and quality of surface waters and expects to be fully included with respect to decisions regarding the monitoring of impacts.**

*The physical and chemical attributes of aquatic sediments directly influence benthic invertebrate community distribution, diversity, abundance, and health. Potential changes to water quantity and quality are key considerations in the assessment process and draw a high level of concern from interested parties. Changes to Surface Water Quality have the potential to influence sediment particle size, chemistry, and distribution within the aquatic environment, and in turn influence biodiversity and biological function. Such effects are of interest with respect to the cultural values of Indigenous communities. (Page 48)*

**Comment 23: See above comments on groundwater and surface water.**

*The Fish and Fish Habitat VC was selected for inclusion in the assessment as Project activities have the potential to cause erosion-driven mobilization of suspended sediment. Project activities are also expected to discharge treated effluent to the natural environment, overprint fish habitat, and locally increase access to fisheries resources with the addition of a new access road and temporary increase of employees to the site. Furthermore, inclusion of the Fish and Fish Habitat VC is vital due to its importance to Indigenous peoples from a cultural and subsistence perspective. (Page 50)*

*The assessment predicted residual effects on Fish and Fish Habitat due to change in water quality (including temperature), change in sediment quality, change in aquatic habitat (aerial extent), and change in fish harvest from increased site access. However, with the implementation of appropriate mitigation*

*measures, the predicted residual effects were characterized as low magnitude, localized, and fully reversible, and are, therefore, anticipated to be not significant. (Page 51)*

*The main Project activity that may affect Fish Health is the release of treated effluent to Whitefish Lake. Changes in surface water quality and sediment quality have the potential to affect Fish Health in the receiving environment. (Page 52)*

**Comment 24: Fish, fish habitat, and fish health are all extremely important to northern people of Saskatchewan, and especially Indigenous People. Wild fish are a culturally important source of protein and provide economic opportunities in the form of commercial fishing and recreational angling. YNLR will be eager to and expects to be involved in collaborating with Denison in the future monitoring of these vital natural resources.**

**Comment 25: Based on existing federal fishers legal and policy requirements, YNLR expects that all fish habitat destroyed or altered by the Project will be more than offset.**

*The assessment predicted residual effects on Vegetation and Ecosystems, Listed Plant Species, and Wetlands due to changes in the extent of habitat types, changes in the constituent concentrations of potential concern in plant tissue, changes in the number of listed plants, and changes in the area of wetland ecosystems. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in cumulative effects on Vegetation and Ecosystems. The residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) on Vegetation and Ecosystems, Listed Plant Species, and Wetlands are predicted to be not significant. (Page 54)*

*The assessment predicted residual effects on wildlife via direct loss of habitat through vegetation clearing, changes in how wildlife may use their preferred habitats due to sensory disturbance, direct mortality through wildlife-vehicle collisions, and indirect mortality due to the potential for increased harvest and/or predation. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in cumulative effects on wildlife. The residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) on terrestrial wildlife are predicted to be not significant. (Page 55)*

**Comment 26: Again, YNLR places a high priority on wildlife and wildlife habitat, from both ecological and sociocultural perspectives. Given the long time frame of the Project, we are concerned about the lack of significance associated with the residual and cumulative effects assessments of all ecological VCs. YNLR believes that the addition of this mine with its associated disturbances will have a cumulative effect on wildlife, especially for woodland caribou, as the area is already crisscrossed with many kilometres of seismic cut lines through the LSA, RSA and beyond (Figure 9.2-6, page 9-83, EIS and Appendix 9B). Because of this, YNLR maintains that in order for the Project to meaningfully attempt to mitigate this concern, the company must work with Indigenous partners to create an effective habitat offset plan for this species. This should form part of any project approval. Such a plan should, for instance, include steps to restore the considerable caribou habitat degraded by past mineral exploration activities.**



**Comment 27: Indigenous People have brought forward concerns with the extensive network of seismic cut lines at several places in the EIS.**

**Comment 28: While the overall direct footprint of the Project is relatively small, YNLR maintains that any wildlife habitat destroyed or altered by the Project should be more than offset or compensated for in some fashion. One example would be the additional disturbance created by the proposed Highway 914 extension. This needs to be accounted for by Denison.**

*The Project is within the Nuhtsiye-kwi Benéne of ERFN, the traditional territory of Kineepik Metis Local #9, and near the southern extent of the Nuhenéné of the Athabasca Denesųliné communities. Much of the documented shared use of land and resources by Indigenous communities occurs close to their primary populated communities, although some uses are documented in proximity to the Project footprint and surrounding areas such as Russell Lake and along the Wheeler River. Recorded uses include hunting sites (moose and woodland caribou), the gathering of plants for food or subsistence purposes, trapping of aquatic furbearers (including beaver and muskrat), and fishing (including Walleye, Northern Pike, Lake Trout, Lake Whitefish, and Arctic Grayling). Proximal to the Project, many of the most recent uses were by an ERFN Trapper who passed away prior to the filing of the EIS. Additionally, all three Indigenous groups have documented uses on Russell Lake, south of the Project Area. (Page 59)*

**Comment 29: As stated above, the Athabasca Denesųliné people are rights holders and not stakeholders with respect to the Project. These rights include full access and use of the natural resources of the area. Any proposed infringement on these rights by the Project will need to be discussed well ahead of the Project's start date.**

*Monitoring and follow-up programs for the Project will be integrated within Denison's overall EMS framework (see Section 3.4.4) and implemented through the various programs, plans, and procedures that would be developed therein. Generally, Denison is anticipating establishing monitoring and follow-up programs in relation to the following VCs (as outlined in the various subsections of Section 5):*

- *Air Quality and Noise;*
- *Groundwater;*
- *Surface Water Quantity and Quality;*
- *Fish Habitat and Health;*
- *Terrain and Soil;*
- *Vegetation and Ecosystems, Listed Plant Species, and Wetlands;*
- *Ungulates, Furbearers, and Woodland Caribou;*
- *Raptors and Migratory Breeding Birds;*
- *Human Health and Worker Health and Safety;*
- *Indigenous Land and Resource Use, Other Land and Resource Use, and Heritage Resources; and*

- *Economy. (Page 74)*

**Comment 30:** As indicated above, YNLR expects to be included as part of the design and implementation of all monitoring programs. All such programs should be transparent, arm's length, include significant involvement and participation of Indigenous People, communities, and organizations and be statistically robust.

*On the basis of the Project information and related evaluation and assessment of effects, Denison believes that the Project can be constructed, operated, and decommissioned in a manner that is not likely to cause significant adverse effects to the biophysical or human environments. (Page 76)*

**Comment 31:** This is perhaps an overly optimistic conclusion. However, YNLR is willing to discuss how the company moves forward and is interested in creating more formal processes to achieve this, such as the signing of an impact benefit agreement.

## B. Project Introduction and Overview (Page 1-1, EIS)

*The Wheeler River Project (the Project) is a proposed in situ recovery (ISR) uranium mine and processing plant in northern Saskatchewan, Canada (Figure 1-1). It is located in Saskatchewan's Athabasca Basin approximately 4 km west of Highway 914 (Figure 1-2). The approximate UTM coordinates of the property are 477,000E and 6,374,000N (NAD83, Zone 13). The Project is a joint venture between Denison Mines Corp. (Denison; 90%) and JCU (Canada) Exploration Company Ltd. (JCU; 10%). Denison is also a 50% owner of JCU, which means that Denison has an effective 95% ownership interest in the Project. (Page 1-1, EIS)*

*English River First Nation, the traditional territory of the Kineepik Métis Local #9, the homeland of the Métis, and the Nuhenéné. The Project is also located within the Northern Saskatchewan Administration District (Figure 1-3; Figure 1-4). The Northern Saskatchewan Administration District includes approximately 250,000 km<sup>2</sup> (44% of Saskatchewan's land area) and is home to approximately 36,000 people (3.2% of Saskatchewan's population; Statistics Canada 2022). (Page 1-1, EIS)*

*The main land use activities in the area by Indigenous and other land users are hunting, trapping, and fishing. There are recreational and traditional resource user leases nearby. The closest recreational lease is located approximately 2.5 km away. The closest traditional resource user lease is located approximately 12 km away. (Page 1-5, EIS)*

**Comment 32:** Because the Project is located within Nuhenéné, YNLR is providing these comments on the draft Wheeler River EIS. Comments on the Executive Summary of the EIS can be found above. Of principal concern to YNLR is that the Project be fully sustainable with respect to cultural rights and traditions, socioeconomic equity, and environmental protection. To achieve this end, YNLR expects Denison to work collaboratively with the people of Nuhenéné through the YNLR office.

*Hand-in-hand with the rising demand for reliable and low-cost energy is the discussion surrounding greenhouse gas (GHG) emissions and climate change. Despite numerous environmental initiatives and on-going research, global climate change continues at an alarming rate. In 2019, global energy-related carbon*

dioxide (CO<sub>2</sub>) emissions rose to 33.5 billion tonnes, the highest on record, which was approximately 45% above the total in 2000 (World Nuclear Association 2021; Canadian Nuclear Association 2021; Figure 1.3-1). One of the most influential energy sources available to combat the rise of CO<sub>2</sub> emissions is nuclear power. If all of the world's coal and natural gas plants were replaced with low carbon nuclear, CO<sub>2</sub> emissions would be reduced by nearly 13 billion tonnes annually (Canadian Nuclear Association 2021). (Page 1-18, EIS)

**Comment 33: YNLR supports the sustainable mining of uranium within Nuhenéné. See previous comment.**

### C. Aquatic Environment (Page 8-1, EIS)

*Flows and water levels in lakes and rivers within the LSA will realize some adverse change (reduction) as a result of overprinting drainage areas reporting specifically to Whitefish Lake and water taking from this same waterbody. However, under all scenarios, including under low flow (5th percentile), the reduction in flow is expected to be less than 3% and, therefore, below the criteria for magnitude of 5%. (Page 8-38, EIS)*

**Comment 34: The EIS recognized that the utilization of water will result in an adverse impact on the drainage but dismissed the issue given that a reduction in the stream flow rate is expected to be less than 3%. It would therefore be prudent to closely monitor the flow regime to identify possible adverse effects throughout the life of the Project.**

*Determinations of significance of residual adverse effects related to Surface Water Quantity are provided in association with receptor VCs in Sections 8.3, 8.4, and 8.5 (Fish and Fish Habitat, Sediment Quality and Benthic Invertebrates and Fish Health, respectively). (Page 8-39, EIS)*

*The Project is situated approximately 35 km northeast of the Cameco Key Lake Operation and 35 km southwest of the Cameco McArthur River Operation. The Project is located approximately 85 km southwest of the Cameco Cigar Lake Mine. These projects do not overlap spatially with the LSA of the Project and are, therefore, not further considered in the cumulative effects assessment. (Page 8-40, EIS)*

**Comment 35: Utilizing the extent of the LSA and the fact that it does not overlap with projects located within the same drainage system seems to be quite arbitrary and convenient. By this criterion, each mine does not trigger a cumulative effect according to the EIS, although they are all additive to the water flow regime. This methodology then arbitrarily and conveniently determines that “mitigation measures” for each of the mines is not warranted since there was a determination of no cumulative effects (see below).**

#### *8.1.7.1: Additional Mitigation Measures*

*Additional mitigation measures were not warranted as no potential cumulative effects were identified for the Surface Water Quantity VC. (Page*

#### *8.1.7.2: Cumulative Effects Characterization and Determination of Significance*

*A determination of significance was not warranted as no potential cumulative effects were identified for the Surface Water Quantity VC.*

#### **8.1.7.3: Cumulative Effects Assessment Summary**

*No cumulative effects were identified for the Surface Water Quantity VC as no project and/or activity that may be considered as reasonably foreseeable overlaps with the defined RSA.*

#### **8.1.7.4: Environmental Monitoring and Follow-Up**

*Additional monitoring and follow-up were not warranted as no potential cumulative effects were identified for the Surface Water Quantity VC.*

**Comment 36: Again, the determination of Cumulative Effects Characterization and the resultant Determination of Significance is highly subjective, therefore a much more extensive monitoring program is required. Such a program should start prior to the construction phase and carry on at least several years into the operation portion of the Project to at least demonstrate local and cumulative effects of mining projects within the watershed.**

*The long-term hydrological monitoring study at the Project site has been in place since 2011. The program should remain consistent to allow for the continued establishment of long-term streamflow trends at the site through relationships to long-term operating hydrometric gauging stations in the same watershed. (Page 8-42, EIS)*

**Comment 37: YNLR agrees that the hydrological monitoring program remain throughout the life of the Project but as per the above, the study should have a much broader mandate in order to measure local and regional effects on VCs.**

#### **Human Health**

*Consideration is given to people drinking surface water as part of the Human Assessment. Based on the above and the assessment approach described in Section 5, the Surface Water Quality VC is considered an intermediate VC. The assessment of the Surface Water Quality VC provides a full evaluation of residual effects with the determination of significance completed on receptor VCs such as Sediment Quality, Benthic Invertebrates, Fish and Fish Habitat, Fish Health, and Human Health. (Page 8-48, EIS)*

**Comment 38: YNLR supports detailed, rigorous, and extensive monitoring and reporting of surface water quality for the life of the Project given the consideration that it is used as drinking water and is integral to ecosystem health.**

**8.2.4.2.5: Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries - During the 'future centuries' phase as described in Section 8.2.1.3, remediation works will be completed, and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport.**

**Comment 39: Recognition that bench-scale testing indicated that groundwater plumes may develop because of mining activity provides more impetus for extensive water quality monitoring, especially in Whitefish Lake.**

#### *Operation*

*During Operation, the primary potential water quality effect from the Project is the discharge of excess water from the site water management system to Whitefish Lake (LA-5). Discharge to Whitefish Lake South has the potential to change the concentrations of water quality constituents from background.*

*For planning purposes, a continuous (year-round) discharge at an expected average effluent discharge rate of 0.0101 m<sup>3</sup>/s (or 36.5 m<sup>3</sup>/hr) was used during Operation, despite the likelihood that effluent discharge will not be continuous, and Denison will only discharge when the site water balance requires (based on water storage capabilities). (Page 8-92, EIS)*

*Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process, and, therefore, not discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment. (Page 8-93, EIS)*

*Water quality predictions did not consider physical or chemical processes that may attenuate concentrations in the receiving environment. An example of such a process would be partitioning of constituents from the water column to Whitefish Lake sediments. No attempt has been made to adjust water quality predictions to account for this partitioning, despite using this relationship to consider the potential effects of discharge on Sediment Quality. (Page 8-96, EIS)*

**Comment 40: There are several comments in the EIS that recognize the potential for a negative effect on water quality from the site water management system into Whitefish Lake.**

**Statements taken from residents have identified concerns about the release of elements such as “mercury” because of the mining activity. While the report recognized that detectable concentrations of mercury will not be produced, the local comment should be considered as a proxy for a variety of contaminants such as selenium, arsenic, cobalt, zinc, etc., as well as the concern expressed by residents, rather than being taken literally as mercury as the only contaminant of concern.**

**YNLR reiterates that concerns about water quality are warranted given that the EIS indicates that there will be a continuous (year-round) average discharge of water from the mine site of more than 36,000 litres/hour for the entire life of the Project. This discharge will be especially evident during low flow periods.**

#### *Future Centuries*

*The 2013 Key Lake ERA indicated that during the 10,000-year post-decommissioning period, predicted exposure levels may affect lower trophic level aquatic biota on a population or community level within*

*some isolated lakes in the SSA, but adverse effects on the ecology of the Outlet Creek drainage, and therefore further downstream were not expected during the post decommissioning phase (Cameco 2013). The results of the 2020 ERA for the Key Lake Operation*

*were consistent with the findings from the 2013 ERA in that there were limited significant risks posed to aquatic receptors situated in the area surrounding the Operation, but not to areas farther downstream. The 2020 ERA concluded that environmental health in the vicinity of the Key Lake Operation will remain protected (Cameco 2020). (Page 8-98, EIS)*

*The results of the numerical modelling for the Project, as provided in Section 7 and Appendix 10-A in Section 10, support the conclusion that with the implementation of appropriate mitigation during the decommissioning and mining area remediation phase of the Project, the residual effects of the Project on the intermediate Groundwater VC will not result in an adverse effect to surface water.*

**Comment 41: YNLR is concerned that the conclusion that the residual effects from Project operations will not have an adverse effect on surface water is highly speculative. Again, this indicates the need for a comprehensive monitoring program to validate the speculation on water quality with rigorous statistical evidence.**

#### *8.2.7.1: Additional Mitigation Measures*

*Additional mitigation measures not warranted as no potential cumulative effects were identified for this VC.*

#### *8.2.7.2: CE Effects Characterization and Determination of Significance*

*A determination of significance is not warranted as no potential cumulative effects were identified for this VC.*

#### *8.2.7.3: Cumulative Effects Assessment Summary*

*Surface water impacts on the aquatic environment from the Key Lake Operation are expected to remain localized and not extend to the Wheeler River system or Russell Lake. Likewise, impacts on surface water quality from the Project are expected to remain localized (Whitefish Lake) and not extend to Russell Lake. Effects on the aquatic environment due to changes in surface water quality associated with the Key Lake Operation are not anticipated to spatially overlap with those from the*

*Project during operation/decommissioning or during “future centuries” and therefore a cumulative effect is not expected.*

**Comment 42: YNLR questions the logic track that states, “additional mitigation measures not warranted” because of the determination of no cumulative effects, then “a determination of significance is not warranted” as no cumulative effects were identified for water quality because surface water impacts are expected to remain localized...for all the mining operations in the region. Impacts on water quality and mitigation measures “not warranted” should be demonstrated through field studies and research rather than relying on a theoretical modelling approach.**

## *Monitoring and Follow-up*

*For the purposes of this EIS, monitoring and follow - up are defined as follows:*

*- monitoring programs are designed to meet regulatory requirements (e.g., permit or license conditions) and/or to demonstrate compliance with environmental commitments made in the EIS.*

### *8.2.9: Surface Water Quality Summary*

*The Project Area is in primarily undisturbed area of the boreal forest and the existing water quality in the LSA lakes and rivers is indicative of a low level of disturbance.*

*Monitoring programs are recommended for confirming the effectiveness of mitigation measures and predictions made in the assessment and will include measurement of radiological and non-radiological water quality parameters to meet regulatory criteria. Monitoring will occur within the collection ponds, and the receiving water (Whitefish Lake). Specific follow-up and monitoring plans will be prepared to refine and finalize approach in consultation with Indigenous groups, other stakeholders, and relevant federal and provincial agencies with interest in the development and implementation of this VC specific program. (Page 8-102, EIS)*

**Comment 43: While appreciating current water quality standards, YNLR suggests that monitoring programs be designed to more than meet regulatory requirements of the license conditions. The EIS recognizes that the Project area lies primarily within an undisturbed area of the boreal forest (aside from the extent of seismic activity carried out within this area). YNLR would like to be involved in specific follow-up and monitoring plans as identified in the EIS.**

### *8.3: Fish and Fish Habitat*

*This section addresses the potential effects of the Project on the Fish and Fish Habitat VC.*

#### *8.3.2: Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Assessment*

*At its broadest level, IK can be understood as the unique and collective knowledge of Indigenous peoples that may include, but is not limited to, the environmental, cultural, economic, political, and spiritual conditions of a community or region. In this section, IK and LK are viewed as complementary and influential alongside western science to produce a full understanding of the potential effects of the Project, whether measurable or perceived. Both forms of information have been given full and fair consideration.*

*Baseline fish and fish habitat surveys for the Project were performed in a combination of lentic (lakes and ponds) and lotic (streams and rivers) environments. Aquatic habitat surveys were undertaken in September 2016, coincident with biological sampling (fish and benthos) that was conducted at that time, and included the collection of bathymetric and water quality data, as well as observations of physical shoreline and lake/pond/stream substrate features, and aquatic vegetation, fish, and benthic communities. (Page 8-117, EIS)*

**Comment 44:** It is noted that the aquatic survey and fish sampling were carried out in 2016, which is now somewhat dated.

*Plan in-water works, undertakings, or activities to respect timing windows to protect fish and fish habitat, including their eggs, juveniles, spawning adults, the organisms upon which they feed, and the areas where they migrate. In-water works should be deferred based on the specific waterbody and known species that inhabit the waterbody (Saskatchewan Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat [DFO 2020d]). (Page 8-140, EIS)*

- Spring spawning species (northern Saskatchewan) – avoid work between May 1 and July 15.*
- Fall spawning species (northern Saskatchewan – Lake Trout present) – avoid work between September 1 and July 15).*
- Fall spawning species (northern Saskatchewan – Lake Trout absent) – avoid work between October 1 and July 15).*
- Where possible, conduct instream work during periods of low flow (e.g., summer or winter) to further reduce risk to fish.*
- In discussion with responsible authorities, prepare a fish salvage plan to relocate fish prior to in-water works.*

**Comment 45:** It appears that from the above noted restrictions, work that would affect fish and fish habitat could/should only be carried out between July 16 and September 30<sup>th</sup>, as both spring and fall spawning species were collected in the fish sample. Of particular note - YNLR would be eager to see how “a fish salvage plan to relocate fish prior to in-water works” might be carried out? Such an approach may not be practicable or effective.

*-Workforce members will be transported to/from site via a fly-in/fly-out rotation and will, therefore, not use ground travel options during shift changes, which will eliminate fishing on local lakes during commutes to/from the site and during time off work. Denison site vehicles will not be available for recreational purposes. While at the Project site and off duty, workers may opt to fish local waterbodies. To protect sustainable use of resources, only catch and release of fish will be encouraged, and fish storage or cooking facilities will not be provided.*

**Comment 46:** While the sentiment of the above fish management strategy is laudable, it is not practical in terms of preserving fish numbers given the increased human access to the lakes that the mining activity will create.

The EIS does recognize the value of sucker species to residents, which is a positive step, as these fish species are netted for a variety of purposes. Increased local traffic will also undoubtedly provide more access for both subsistence and recreational fishing.

As part of the mitigation measures YNLR proposes working with authorities to regulate recreational fishing prior to the onset of the construction phase of the Project and revisiting these regulations at intervals throughout the mine’s operation and decommissioning.



*The Cameco Key Lake Operation has the potential to interact with the Fish and Fish Habitat VC for the Project (Figure 5.9.1) via the surface water quality pathway. The site has been in operation since 1983. In 2018, sustained low uranium prices resulted in a decision to curtail production for the foreseeable future and place the operation into safe care and maintenance. On February 9, 2022, Cameco announced plans for the operation's gradual return to production. Cameco's Key Lake Operation will overlap spatially and temporally with the Project. (Page 8-151, EIS)*

*The Project is situated approximately 35 km northeast of the Key Lake Operation and both are located in watersheds that ultimately report to Russell Lake. Releases to the aquatic environment from the Key Lake Operation are received by the David Creek, McDonald Creek, and Outlet Creek drainages. These three drainages join the Wheeler River, which then flows to Russell Lake (Cameco 2020). Therefore, a potential spatial overlap was identified for the Project and the Key Lake Operation and further assessed or cumulative effects.*

*The assessment of cumulative effects on the Surface Water Quality VC considered releases from the Project and the Key Lake Operation during all phases of the Project. The key Project component contributing to potential cumulative effects is the discharge of treated effluent to the aquatic environment during Operation and Decommissioning which may interact with Cameco's current releases to water including treated water released to David Creek drainage, treated groundwater and diverted surface water to the McDonald Creek drainage (Cameco 2020).*

**Comment 47: The statement on page 8-151 recognizes that the discharge of treated effluent during the Operation and Decommissioning phase may interact with Cameco's current releases contributing to cumulative effects. It is recommended that a study be undertaken to assess the basin effect of water discharges.**

*Potential Project residual effects on surface water quality relate to changes (increases) in constituent concentrations that are related to the controlled discharge of Project site waters into local receiving environments (Whitefish Lake). Such changes are predicted to be negligible to low in magnitude and limited to the LSA. For example, during Construction, no discharge from the Project site is planned. During Operation, treated effluent will be discharged to Whitefish Lake. The Whitefish Lake discharge will be the only routine discharge location during Operation. Water quality and sediment quality in Whitefish Lake and, by extension, sediment quality downstream of Whitefish Lake, are expected to meet appropriate benchmarks for the protection of aquatic life in consideration of a small mixing zone in the lake, which is anticipated to remain within tolerable HQs for fish. Following Decommissioning and the restoration of drainage patterns that are similar to pre-mining conditions, water quality is expected to meet appropriate benchmarks for the protection of aquatic life in Whitefish Lake and downstream. This includes Russell Lake of which the Icander River system is associated. (Page 8-152, EIS)*

*In consideration of the above discussion, effects on the aquatic environment due to changes in surface water quality from the Key Lake Operation are not anticipated to spatially overlap with those from the Project and therefore a cumulative effect is not expected.*

**Comment 48:** The above states that sediment quality of Whitefish Lake and downstream is not “anticipated” to overlap with the Key Lake Operation. It would be prudent to test this hypothesis to ensure that water quality in the flowage is maintained given the high value placed on these waters by residents.

#### *8.3.7.2: Additional Mitigation Measures*

*Additional mitigation measures are not warranted as no cumulative effects are expected on the Fish and Fish Habitat VC.*

#### *8.3.7.3: Cumulative Effects Characterization and Determination of Significance*

*A determination of significance is not warranted as no cumulative effects are expected on the Fish and Fish Habitat VC.*

#### *8.3.7.4: Cumulative Effects Assessment Summary*

*Effects to Fish and Fish Habitat VC due to changes in surface water quality from the Key Lake Operation are expected to remain localized and not extend to the Wheeler River system or Russell Lake. Likewise, impacts on surface water quality from the Project are expected to remain localized (Whitefish Lake) and not extend to Russell Lake. Effects on the aquatic environment due to changes in surface water quality associated with the Key Lake Operation are not anticipated to spatially overlap with those from the Project during operation/decommissioning or during “future centuries” and therefore a cumulative effect is not expected.*

#### *8.3.7.5: Environmental Monitoring and Follow-up*

*Specific monitoring and follow-up for Fish and Fish Habitat related to cumulative effects is not warranted as no cumulative effects are expected on the Fish and Fish Health VC. Monitoring and follow-up specific to the Project is detailed in Section 8.3.8.*

**Comment 49:** YNLR disagrees with the assumptions used, which “assume” specific monitoring and follow-up for Fish and Fish Habitat related to cumulative effects is not warranted. Further, YNLR would like to be involved in designing and carrying out of a monitoring program, which would test the “no cumulative effect” assumption.

#### *8.4.7.4: Cumulative Effects Assessment Summary*

*Impacts on the aquatic environment (including sediment quality and benthic invertebrates) via the surface water quality pathway from the Key Lake Operation are expected to remain localized and not extend to the Wheeler River system or Russell Lake. Likewise, impacts on sediment quality and benthic invertebrates via the surface water pathway from the Project are expected to remain localized (Whitefish Lake) and not extend to Russell Lake. Effects on the aquatic environment due to changes in surface water quality associated with the Key Lake Operation are not anticipated to spatially overlap with those from the Project during operation/decommissioning or during “future centuries” and therefore a cumulative effect is not expected.*

#### 8.4.7.5: Environmental Monitoring and Follow-up

*Specific monitoring and follow-up for Sediment Quality and Benthic Invertebrates related to cumulative effects is not warranted as no cumulative effects were identified for the Sediment Quality and Benthic Invertebrates VCs. Monitoring and follow-up specific to the Project is detailed in Section 8.4.8.*

#### 8.4.8: Monitoring and Follow-up

*For the purposes of this EIS, monitoring and follow - up are defined as follows:*

*-monitoring programs are designed to meet regulatory requirements (e.g., permit or license conditions) and/or to demonstrate compliance with environmental commitments made in the EIS; and follow - up programs are those that are proposed to address any uncertainties identified during the EA process (e.g., to verify predictions made during the EA; to determine the effectiveness of proposed and implemented mitigation measures) and to determine if and when to implement adaptive management measures.*

*Monitoring and follow-up are recommended for the Sediment Quality and Benthic Invertebrates VCs to verify the accuracy of the predicted effects and effectiveness of proposed mitigation measures. The sediment quality and benthic invertebrate monitoring program should be considered in conjunction with the surface water quantity (hydrology) (Section 8.1.8) and surface water quality (Section 8.2.8) monitoring programs as sediment quality and benthic invertebrates are specifically tied to surface water quantity and quality from the perspective of pathways of effects. Specifically, monitoring of TSS in the effluent monitoring ponds and other catchment ponds prior to discharge to the environment will be important to provide context to further evaluate Project-related effects on sediment and benthic invertebrate communities in the receiving water environment (Whitefish Lake). (Page 8-209, EIS)*

**Comment 50: Specific monitoring of sediment quality and benthic invertebrates related to cumulative effects was deemed to be “not warranted” while specific monitoring “is recommended to verify the accuracy of the predicted effects.” By extension of the proposed monitoring program, the mine could demonstrate conclusively that cumulative effects due to mining operation are or are not an issue. We support such an approach.**

#### *Construction*

*The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features as a result of land disturbance and clearing. According to the site water balance (Figure 2.2-14 in Section 2), there is no planned discharge to Whitefish Lake during Construction.*

*In the event that releases to the natural environment are necessary, they will only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, or fish health are expected. (Page 8-232, EIS)*

**Comment 51: Water management during construction indicates that there is to be no planned discharge to Whitefish Lake. If a release of water from the mine site becomes necessary, in addition to monitoring**

**suspended solid levels, there should be a communication plan to inform area residents of the pending release and its duration.**

#### *Operation*

*During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, IWWTP, and Effluent Monitoring and Release Ponds. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No downstream effects on surface waters, natural sediments, or fish health are expected.*

*Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process and therefore, not discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment. (Page 8-237, EIS)*

*Monitoring and follow-up are proposed for the Fish Health VC to verify the accuracy of the predicted effects and the effectiveness of the proposed mitigation measures. The fish health monitoring program should be considered in conjunction with the surface water quality monitoring (Section 8.2.8), fish and fish habitat monitoring (Section 8.3.8), and sediment and benthic invertebrate monitoring (Section 8.4.8) programs as it is specifically tied to these monitoring programs from the perspective of pathways of effects. Specifically, monitoring of water quality in the effluent monitoring ponds and other catchment ponds prior to discharge to the environment will be important to provide context to further evaluate Project-related effects on Fish Health in the receiving water environment (i.e., Whitefish Lake). (Page 8-252, EIS)*

**Comment 52: YNLR would like to be involved in a monitoring program for fish health. Further, this monitoring program should continue for the life of the Project or until it is demonstrated that the current filtering programs are effective.**

## **D. Terrestrial Environment (Page 9-1, EIS)**

### **9.1 Terrain, Soil, and Organic Matter/Peat (Page 9-5, EIS)**

*This subsection addresses potential effects from the Project on Terrain, Soil, and Organic Matter/Peat, respectively, as VCs. This section comprises the following steps as part of the assessment:*

- *scope of the assessment;*
- *summary of existing conditions relevant to VCs;*

- *identification and description of potential interactions between the Project and VCs;*
- *identification and description of mitigation measures applicable to VCs to eliminate, reduce, or control the potential adverse Project-related effects);*
- *identification and characterization of predicted Project residual effects for VCs after mitigation;*
- *characterization of significance and assignment of the level of confidence in the predictions; and*
- *identification and characterization of potential cumulative effects.*

*The summary of the assessment and characterization of Project-related residual effects specific to the VCs for Terrain, Soil, and Organic Matter/Peat is presented in Table 9.1-10. For each VC, the residual effects were predicted to be not significant: the effects are not expected to cause a change in the VCs and/or their respective KI(s) to the extent that they will alter their status or integrity beyond an acceptable level (i.e., where they are not sustainable or are unavailable to contribute to ecological functions). (Page 9-47, EIS)*

*Based on available information and understanding of other past, present, and reasonably foreseeable projects or activities within the RSA for Terrain, Soil, and Organic Matter/Peat, there is potential for cumulative effects pertaining to the VCs for Terrain, Soil, and Organic Matter/Peat. Potential cumulative effects are associated with clearing of vegetation, stripping and salvaging of soil, and surficial earthworks. The KIs and associated MPs for Terrain (change in terrain morphology and change in terrain stability), Soil (change in soil quantity and change in soil quality) and Organic Matter/Peat (change in the quantity of organic matter/peat) are expected to be within the natural range of variation; no additional mitigation measures are recommended. After characterization of the cumulative effects, the significance of the cumulative effects was deemed not significant for both VCs; the level of confidence in these predictions is moderate. (Page 9-59, EIS)*

**Comment 53: YNLR is concerned about the potential residual and cumulative effects of the extensive seismic network on the soils of the RSA and LSA (Fig 9. 2-6, page 9-83, EIS). Were these and other potential network effects considered in the analyses?**

**Comment 54: Note that Appendix 9B (page 60) states that 100% of the LSA and 82% of the RSA are already disturbed by buffered anthropogenic disturbances in the form of exploration lines, exploration trails, and seasonal roads. During the consultation process, residents raised the issue of the high degree of human disturbance.**

## 9.2 Vegetation and Ecosystems, Listed Plant Species and Wetlands (Page 9-68, EIS)

*This subsection addresses potential Project-related effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. This subsection includes the following steps as part of the assessment:*

- *scope of the assessment;*
- *summary of the existing conditions of the VCs;*
- *identification and description of potential interactions between the Project and the VCs;*

- *identification and description of mitigation measures and monitoring activities to eliminate, reduce, or control the potential adverse Project-related effects on VCs;*
- *characterization of potential Project residual effects on VCs (i.e., after mitigation) including determination of significance and level of confidence in the predictions; and,*
- *identification and characterization of cumulative effects.*

*The results of the characterizations for these residual effects are summarized in Table 9.2-18. The residual effects of the Project on the vegetation abundance and constituent concentrations in vegetation KIs were predicted to be not significant. Thus, the residual effects of the Project on the Vegetation and Ecosystems VC is predicted to be not significant. Similarly, the residual effects of the Project on the listed plant species, and wetlands KIs, were predicted to be not significant. Thus, the residual effects of the Project on the Listed Plant Species and Wetlands VCs are predicted to be not significant. (Page 9-133, EIS)*

*As detailed above, the residual effects of the Project, in conjunction with the comparable residual effects from past, present, and reasonably foreseeable future projects on the vegetation abundance and constituent concentrations in vegetation KIs were predicted to be not significant. Thus, the cumulative effects are not expected to alter the integrity of the Vegetation and Ecosystems VC (i.e., it remains sustainable and available to contribute to ecological functions) and is predicted to be not significant. Similarly, the residual effects of the Project, in conjunction with the comparable residual effects from past, present, and reasonably foreseeable future projects on the listed plant species and wetlands KIs were predicted to be not significant. Thus, the cumulative effects are not expected to alter the integrity of the Listed Plant Species VC and Wetlands VC (i.e., they remain sustainable and available to contribute to ecological functions) and are predicted to be not significant. (Page 9-149, EIS)*

**Comment 54:** As with the Project soils, YNLR is concerned about the potential residual and cumulative effects of the extensive seismic network on the vegetation and wetlands of the RSA and LSA (Fig 9. 2-9, page 9-139, EIS), particularly from edge effects (page 9-101, EIS). Were these and other possible effects of the network considered? If so, how were they included? See above comment regarding Appendix 9B.

**Comment 55:** Indigenous People highlighted concerns about the broad network of linear disruptions in numerous places across the EIS.

### 9.3 Ungulates, Furbearers, and Woodland Caribou (Page 9-161, EIS)

*This subsection addresses potential Project-related effects on the Ungulates, Furbearers, and Woodland Caribou VCs and their associated KIs. In support of the assessment, this section covers the following aspects:*

- *scope of the assessment;*
- *influence of IK, LK, and engagement on the assessment;*
- *description of the existing environment for the VCs and associated KIs;*
- *identification of potential interactions between the Project and the VCs and associated KIs;*

- *identification and description of potential Project-related effects on the VCs and associated KIs;*
- *identification and description of mitigation measures to avoid or minimize the potential adverse Project-related effects on VCs,*
- *description and characterization of potential Project residual effects on VCs and associated KIs, including determination of significance and level of confidence in the predictions;*
- *identification and characterization of cumulative effects; and*
- *identification and description of monitoring and follow-up programs and activities.*

*Terrestrial RSA: the area established to assess the potential, largely indirect, effects of the Project on the terrestrial VCs (including the Ungulates, Furbearers, and Woodland Caribou VCs) in the broader, regional context. It also provides the regional context in which cumulative effects on terrestrial VCs may occur. The Terrestrial RSA (i.e., 40,173.6 ha) is defined as a minimum of a 6.6 km buffer around the Wildlife LSA and has been delineated to capture regional effects on wildlife species with large home ranges. (Page 9-168, EIS)*

**Comment 56: Wilson et al. (2018) recently summarized the home ranges of 25 woodland caribou populations in Canada. The average home range varied 28-fold, from 312 to 8,838 sq. km. The RSA delineated for assessing cumulative effects on caribou (40,174 ha ~ 402 sq.km.) is thus inadequate for this purpose, and the conclusions of project residual and cumulative effects non-significance are highly suspect. The same could be said for other wide-ranging species such as wolverine.**

*The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA. (Page 9-211, EIS)*

**Comment 57: Was the current RSA anthropogenic disturbance estimate (599 ha) inclusive of the many kilometres of existing seismic cut lines? (Fig 9. 2-9, page 9-139, EIS). Did the estimate include consideration of the compounding ‘edge effects’ from these linear disturbances? If not, why not? See previous comments on the very high level of existing human disturbance in the LSA and RSA highlighted in Appendix 9B.**

*Wolverines were not observed during baseline studies (Appendix 9-B). While they are not encountered regularly in the region, LK holders noted no change in frequency of wolverine observations over the years (19-LK-ERFNTrip-134.162). They are known to occur in low densities across all forest stand and vegetation types, they are absent from most areas of human development and activities, and they avoid linear infrastructure (ABMI 2020a). Based on this evaluation, year-round available wolverine habitat in the*

*Project study areas was determined as comprising all ecosites except for anthropogenic development and waterbodies. Figure 9.3-10 depicts available wolverine habitat in the project study areas. (Page 9-239, EIS)*

**Comment 58:** Again, the direct and indirect effects of the existing seismic disturbance seem not to have been considered in this assessment, particularly because wolverines ‘avoid linear infrastructure.’ In fact, one can also see that woodland caribou avoid areas of historic seismic disturbance by directly comparing the figures on page 9-139, EIS (vegetation) and 9-202, EIS (caribou sightings). Appendix 9B gives a summary of the impacts of linear disturbances on boreal forest wildlife.

*In accordance with ECCC’s (2019) assessment of disturbed areas, which buffered (500 m) anthropogenic disturbances to evaluate woodland caribou habitat, the alteration of available woodland caribou habitat is quantified in this EIS by applying a buffer of 500 m around the Project Area in which Project effects in the form of sensory disturbance are likely to affect available woodland caribou habitat and make it functionally unavailable for use. (Page 9-269, EIS).*

**Comment 59:** Was the 500m buffering of anthropogenic disturbances also applied to the network of seismic cut lines to account for edge effects? If not, why not? Buffered disturbance is included in Appendix 9B but appears to have been ignored in the effects assessment.

*Direct habitat loss is calculated as the area of available woodland caribou habitat lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available woodland caribou habitat is still predicted to be cleared during Construction. In the Project Area, 142 ha or 100% of available woodland caribou habitat is assumed to be removed and will not be available to caribou for the duration of the Project (Table 9.3-23). This represents a loss of 3.8% of available woodland caribou habitat within the Wildlife LSA and 0.5% in the Terrestrial RSA (Table 9.3-23). An additional 1,165.3 ha (27.7%) of available caribou habitat in the Wildlife LSA may experience habitat alteration stemming from indirect Project effects, such as sensory disturbance, relating to 3.8% of available woodland caribou habitat likely affected in the Terrestrial RSA (Table 9.3-23). Mitigation measures outlined in Section 9.3.5 are anticipated to reduce the effects of alteration and/or loss of habitat on woodland caribou, but not eliminate them entirely. (Page 9-270, EIS).*

**Comment 60:** Is the amount of initial ‘available woodland caribou habitat’ in Table 9.3-23 inclusive of the direct and indirect seismic cutline network effects? If not, why not? Irrespective of this, it appears that the LSA is being written off for woodland caribou for decades to come. See above comments with respect to Appendix 9B.

*The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant. The level of confidence of this prediction is moderate. The effects of habitat loss and alteration on woodland are well understood, and mitigation measures have been proven effective during past projects and activities. However, some level of uncertainty exists related to the available background and baseline information used to identify available woodland caribou habitat in this assessment. (Page 9-275, EIS).*



**Comment 61: YNLR disagrees with this residual effects conclusion. The buffered direct habitat loss alone eliminates the LSA and RSA for caribou habitation for decades to come (Appendix 9B), so how can it ‘sustain the regional woodland caribou population’ in any way? The reference to ‘proven’ mitigation measures is rather vague and requires further explanation. YNLR is unaware of these proven mitigation measures, other than isolation from human disturbance.**

*The residual effects evaluation process in Section 9.3.6 assessed the following residual effects of the Project on the Ungulates, Furbearers, and Woodland Caribou VCs:*

- *alteration and/or loss of habitat; and*
- *change in mortality.*

*The evaluation process characterized the residual effects of the Project on the respective VCs, the results of which are summarized in Table 9.3-26 and Table 9.3-27. The residual effects of the Project are not expected to result in a change to the viability and persistence of the VCs and associated KIs and were, therefore, predicted to be not significant. (Page 9-280, EIS)*

**Comment 62: Again, YNLR disagrees with this overall residual effects conclusion for these wildlife VCs, especially in regard to woodland caribou (Appendix 9B). The reasons for this will be summarized after the following comments on the cumulative effects assessment for wildlife.**

*Wildlife habitat within the Terrestrial RSA has experienced historic anthropogenic disturbance such as line cutting, drilling, and access development in support of past exploration and mining activities, and future exploration activities within the Terrestrial RSA are likely. Such exploration activities are expected to contribute to the cumulative effects on the Ungulates, Furbearers, and Woodland Caribou VCs through habitat loss, increased sensory disturbance (e.g., noise and dust deposition), potential wildlife-vehicle collisions, increased hunting and predation pressure, increased risk of human-wildlife encounters, and deposition of trace metals and radionuclides to soil, vegetation, and waterbodies in the Terrestrial RSA. (Page 9-287, EIS)*

**Comment 63: YNLR agrees. The extent of past seismic line cutting is very high for both the LSA and RSA (Fig. 9.3-15, page 9-289, EIS and Appendix 9B). However, its direct and indirect (edge) effects on wildlife, especially woodland caribou, seem to have been overlooked or minimized. Future exploration disturbance should have been estimated and included based on the rate of historic disturbance if nothing else.**

*Vegetation clearing is anticipated to be required for the Project and most of the ongoing and reasonably foreseeable projects and activities; however, the amount, location and timing are unknown. Mining exploration and development are expected to be responsible for most of the ongoing and future habitat loss and alteration within the Terrestrial RSA. The spatial and temporal extent of these activities are unknown, but it is anticipated that all future exploration and development will be conducted in accordance with applicable provincial and federal approval processes and will follow BMPs and implement effective mitigation measures (Page 9-300, EIS)*

**Comment 64:** See above comments on the lack of assessing the impacts of the existing seismic line clearing. In addition, the reason why SK1 holds one of the very few sustainable caribou populations despite a high level of forest fire, is because of currently very low levels of human intrusion, which suggests that the provincial and federal approval processes, BMPs, and mitigation measures have not been sufficient in the rest of the species' range throughout the entirety of Canada.

**Comment 65:** Is it not possible to conduct modern mineral exploration without cutting miles and miles of seismic lines across the boreal forest?

*It is not expected that the cumulative effect of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effect resulting from the Project's residual effect interacting with residual effects from other projects and activities is predicted to be not significant. (Page 9-302, EIS).*

**Comment 66:** YNLR disagrees, again because the past and future direct and indirect effects of seismic line clearing appear to have been ignored in this assessment (Appendix 9B). The fact that most caribou sightings occurred away from seismically disturbed areas independent of habitat type supports this observation. YNLR believes that, at a minimum, Denison should commit to an aggressive caribou habitat offset plan before work on the Project begins. A woodland caribou 'management' plan is not sufficient. Offset activities should include the ongoing restoration of the existing seismic lines, among other things. This work is best accomplished in consultation and collaboration with Indigenous People, their communities, and organizations.

*Ungulates, Furbearer, and Woodland Caribou Summary (Page 9-308, EIS)*

*The terrestrial wildlife VC's (and KI's) considered in this EIS are Ungulates (moose), Furbearers (wolverine, pine marten, mink, and muskrat) and Woodland Caribou (woodland caribou). Proposed mitigation measures include:*

- *Reduced project footprint*
- *Avoidance of wildlife 'sensitive periods'*
- *Pre-clearing wildlife surveys*
- *Woodland caribou management plan*
- *Facilitated access to undertake Treaty Rights*
- *No staff wildlife interaction policy*
- *Road signage*
- *No littering policy*

**Comment 67:** Most of these mitigation measures are quite superficial and would contribute little to the long-term conservation of wildlife in the RSA and LSA. The proposed caribou management plan needs to be a fully developed Caribou Habitat Offset Plan given the extent of already altered habitat by seismic activities. Also note that this has a high potential for a direct impact on Aboriginal and Treaty rights.

**More, some Indigenous People will likely take offence at the idea of the company ‘facilitating access’ to their inherent Treaty Rights. Significant consultation and collaboration with Indigenous People is required.**

*With the implementation of the above (and additional) mitigation measures, the residual effects on the Ungulates, Furbearer, and Woodland Caribou VCs were assessed as follows:*

*Moose. Not significant: the residual effects of alteration and/or loss of available habitat and of change in mortality are not expected to result in a change that will alter habitat integrity to the point where it would not be able to sustain the regional ungulate populations or the integrity of the regional moose population to the point where it could not be sustained.*

*Furbearers. Not significant: the residual effects of alteration and/or loss of available habitat and of change in mortality are not expected to result in a change that will alter habitat integrity to the point where it would not be able to sustain the regional furbearer populations or the integrity of the regional furbearer populations to the point where they could not be sustained.*

*Woodland caribou. Not significant: the residual effects of alteration and/or loss of available habitat and of change in mortality are not expected to result in a change that will alter habitat integrity to the point where it would not be able to sustain the regional woodland caribou population or the integrity of the regional woodland caribou population to the point where they could not be sustained.*

**Comment 68: YNLR believes this summary to be overly optimistic and somewhat inaccurate for the following reasons:**

- **The RSA and LSA are too small relative to the home range of woodland caribou to serve as a basis for assessing residual and cumulative effects on the species.**
- **Large portions of the RSA and LSA have been badly degraded by mineral exploration activities (particularly by line-cutting for seismic surveys; Appendix 9B), yet their direct and indirect (edge) impacts seem not to have been considered in the effects assessments. This is puzzling given the known impact that these features have on wildlife, especially caribou, wolverine, other predators, and many avian species. The EIS maps themselves clearly show an avoidance of these seismically-disturbed areas by woodland caribou.**

**Because of this, YNLR strongly believes that, at a minimum, an aggressive Caribou Habitat Offset Plan should be co-developed before Project work begins, and regular monitoring of the caribou population be conducted throughout the life of the Project.**

**Comment 69: Concern about the extensive network of seismic cut lines were also raised by Indigenous People at several places in the EIS.**

#### ***9.4 Raptors, Migratory Breeding Birds, and Bird Species at Risk (Page 9-320)***

*This subsection addresses potential Project-related effects on the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs and their associated KIs. In support of the assessment, this section covers the following aspects:*

- *scope of the assessment;*
- *influence of IK, LK, and engagement on the assessment;*
- *description of the existing environment for the VCs and associated KIs;*
- *identification of potential interactions between the Project and the VCs and associated KIs;*
- *identification and description of potential Project-related effects on the VCs and associated KIs;*
- *identification and description of mitigation measures to avoid or minimize the potential adverse Project-related effects on VCs;*
- *description and characterization of potential Project residual effects on VCs and associated KIs, including determination of significance and level of confidence in the predictions;*
- *identification and characterization of cumulative effects; and*
- *identification and description of monitoring and follow-up programs and activities.*

*The 10 Key Indicators (KIs) of the three VCs are as follows (Table 9.4-1, page 9-325, EIS):*

*Raptors VC – Bald Eagle, Osprey*

*Migratory Breeding Birds VC – Waterbirds & waterfowl, upland game birds, migratory songbirds*

*Bird Species at Risk VC – Common Nighthawk, Short-eared Owl, Yellow Rail, Rusty Blackbird, Olive-sided Flycatcher*

**Comment 70:** YNLR questions how and why these three avian VCs were selected and grouped. The three VCs include dozens of breeding bird species with hugely varying habitat requirements, so it difficult to see how it is possible to accurately predict Project effects for many of these species, especially when so many are lumped together in only one Migratory Breeding Birds VC. In addition, the scarcity of raptors and avian species at risk makes them poor candidates for effects assessments because of low sample sizes.

*In this assessment, alteration of habitat is defined as indirect habitat alteration where suitable habitat for the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs and their associated KIs remains physically intact but is rendered less suitable or unsuitable for their use. Sources of habitat alteration include Project-related habitat fragmentation (i.e., the breaking apart of continuous habitat into smaller, spatially distinct patches), edge effects (i.e., the influence of recently cleared areas on adjacent habitats), and sensory disturbance. (Page 9-356, EIS)*

*A minimum patch size is often required to fulfill all required life requisites (Robbins et al. 1989, Askins 1994, Vance et al. 2003, Butcher et al. 2010). When available suitable habitat is below a minimum patch size threshold, individual birds may get displaced despite the continued presence of suitable habitat. As a result, patch size at the individual and population level may have a species-specific effect on habitat use and could affect reproductive success, health, and survival (Askins 1994, Villard et al. 1999, Vance et al. 2003, Suorsa et al. 2004, Butcher et al. 2010). (Page 9-357, EIS)*

*Edge effects include the influence of recently cleared areas on adjacent intact habitats. Gradients of light intensity, temperature, wind, relative humidity, as well as snow accumulation and melt may occur along the border between cleared areas and intact habitats (Bannerman 1998, Kremsater and Bunnell 1999), which could alter habitat suitability for avian use. Bannerman (1998) suggested that the richness and density of generalist bird species may increase along forest edges based on the variety of vegetation and abundance of food (e.g., American Crow and Blue Jay. However, numbers of habitat specialist species (e.g., Red-breasted Nuthatch and Pileated Woodpecker may decrease near edges because they use edge habitats less frequently or avoid them (George and Dobkin 2002). The potential influx of individuals into edge habitats, or the potential displacement of individuals into other areas, may increase crowding and subsequent inter-and intra-specific competition for breeding habitat, food, and other resources (Hagan et al. 1996, Schmiegelow et al. 1997, Bannerman 1998, George and Dobkin 2002, Calizza et al. 2017). (Page 9-357, EIS)*

**Comment 71: The above descriptions summarize the potential effects of the Project on breeding bird habitats. When wooded landscapes are subjected to widespread seismic activity, the same effects occur: continuous parcels of forest are divided by miles of cut lines, resulting in smaller habitat patches and greater habitat edge. As a result, bird species that prefer contiguous habitats are declining, while birds that prefer habitat edges are increasing. As with the Project effects assessments for woodland caribou and other mammals, the EIS appears to have ignored the already existing direct and indirect impacts of these historic seismic linear disturbances across the LSA and RSA (Appendix 9B).**

*Mitigation measures for the avian VCs are much the same as for the mammal VCs and include project design, work timing, staff education, policies, and various BMPs (page 9-367, EIS).*

*The residual effect of alteration and/or loss of available Bald Eagle and Osprey habitat is not expected to result in a change that will alter their habitat integrity to the point where it would not be able to sustain the regional raptor population. Therefore, the effect is assessed as not significant. The level of confidence of this prediction is moderate. The effects of habitat loss and alteration on raptor species are well known, and proven, effective mitigation measures will be implemented. However, some level of uncertainty exists related to the available background and baseline information used to identify available raptor habitat in this assessment. (Page 9-384, EIS)*

**Comment 72: With only two water-based species selected to represent all forest raptors in the Project area, the results and conclusions of this assessment are extremely limited.**

*The Migratory Breeding Birds VC is represented by three KIs - water birds and waterfowl, upland game birds, and migratory songbirds. The residual effects evaluation, therefore, assesses Project related effects on these three groups. (Page 9-389, EIS).*

*The residual effect of alteration and/or loss of available habitat for migratory breeding birds is not expected to result in a change that will alter their habitat integrity to the point where it would not be able to sustain the regional migratory breeding bird populations. Therefore, the effect is assessed as not significant. The level of confidence of this prediction is moderate. The effects of habitat loss and alteration on migratory breeding bird species are well known, and proven, effective mitigation measures will be*

*implemented. However, some level of uncertainty exists related to the available background and baseline information used to identify available habitat for the Migratory Breeding Bird VC and its three KIs in this assessment. (Page 9-408, EIS)*

**Comment 73:** As previously stated, this VC contains a large number of very diverse bird species with widely varying habitat requirements and life history strategies, so it is difficult to see how this effects assessment is in any way realistic or accurate. For the forest birds in particular, this is compounded by the non-inclusion of the historic network of seismic cut lines across the landscape (Appendix 9B), and the resulting underestimation of direct and edge effects.

*The Bird Species at Risk VC is represented by five KIs – Common Nighthawk, Short-eared Owl, Yellow Rail, Rusty Blackbird, and Olive-sided Flycatcher. The residual effects evaluation, therefore, assesses Project-related effects on these five species. The assessment of the alteration and/or loss of habitat residual effect considers the direct loss of habitat and the indirect alteration (e.g., sensory disturbances, habitat fragmentation, and edge effects) of habitat during all Project phases. (Page 9-413, EIS)*

*The residual effect of alteration and/or loss of available habitat for bird species at risk is not expected to result in a change that will alter their habitat integrity to the point where it would not be able to sustain their regional populations. Therefore, the effect is assessed as not significant. The level of confidence of this prediction is moderate. The effects of habitat loss and alteration on bird species at risk (i.e., the five KIs) are well known, and effective mitigation measures will be implemented. However, some level of uncertainty exists related to the available background and baseline information used to identify available habitat for the Bird Species at Risk VC and its five KIs in this assessment. (Page 9-441, EIS)*

**Comment 74:** Species at risk generally make very poor indicators of ecological integrity/biodiversity because of their relative scarcity. In fact, three of the VC bird species at risk selected were not even detected during the Project surveys. This very low quantity and data quality greatly weakens any conclusions regarding the Project residual effects.

*The CEA [Cumulative Effects Assessment] considers whether residual adverse effects of the Project on the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs will overlap spatially and/or temporally with the same residual adverse effects resulting from other past, present, and reasonably foreseeable projects or activities. (Page 9-454, EIS)*

*Wildlife habitat within the Terrestrial RSA has experienced historic anthropogenic disturbance such as line cutting, drilling, and access development in support of past exploration and mining activities. Future exploration activities within the Terrestrial RSA are likely. Such exploration activities are expected to contribute to the cumulative effects on the Raptors, Migratory Breeding Birds and Bird Species at Risk VCs through habitat loss, increased sensory disturbance (e.g., noise and dust deposition), potential wildlife-vehicle collisions, increased hunting and predation pressure, increased risk of human-avian encounters, and deposition of trace metals and radionuclides to soil, vegetation, and water bodies in the Terrestrial RSA. (Page 9-455, Figure 9.4-16, page 9-457, EIS)*

**Comment 75:** Despite this statement, YNLR cannot find any mention of the extensive seismic line network impacts (Appendix 9B) included in the effects assessment for birds. This was also the case for the caribou and wildlife assessments.

*The cumulative effect is not expected to alter the integrity of raptor habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effect resulting from the Project's residual effect interacting with residual effects from other projects and activities is predicted to be not significant. (Page 9-460, EIS)*

*The cumulative effect is not expected to alter the integrity of migratory breeding bird habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effect is predicted to be not significant. (Page 9-465, EIS)*

*The cumulative effect is not expected to alter the integrity of bird species at risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effect resulting from the Project's residual effect interacting with residual effects from other projects and activities is predicted to be not significant. (Page 9-469, EIS)*

**Comment 76:** As mentioned before, the selection of weak indicators and the *ad hoc* grouping of dissimilar species make these predictions quite unreliable. This potential error is likely compounded by the apparent exclusion of the direct and indirect effects of the existing seismic cutline network (Appendix 9B).

**Comment 77:** Concern about the extensive network of seismic cut lines were also raised by Indigenous People at several places in the EIS.

**Comment 78:** Why were amphibians excluded as a VC/KI? Bats? Both were surveyed (Appendix 9B).

*Project monitoring programs specific to Raptors, Migratory Breeding Bird, and Bird Species at Risk VCs are expected to include:*

- *pre-construction nest surveys conducted in accordance with the EMS prior to the commencement of any vegetation clearing or soil disturbance;*
- *avian species routinely monitored throughout the life of the Project (e.g., through the Project wide implementation of the current wildlife card system) in accordance with the EMS (including implemented setback distances during sensitive time periods, if applicable); and*
- *progressive reclamation and revegetation of disturbed areas (i.e., transitioning into avian habitat) monitored in accordance with the Reclamation and Closure Plan (Page 9-474, EIS)*

**Comment 79:** This monitoring is critical, particularly the ongoing repeated surveys throughout the life of the Project, especially given the weak predictive basis for the effects assessments of the Project on breeding bird species.

## E. Land and Resource Use (Page 11-1, EIS)

*Section 11 of the Environmental Impact Statement (EIS) for the Wheeler River Project (the Project) is focused on Land and Resource Use. Resource use is comprised of subsistence, commercial and recreational use of resources derived from the natural environment. (Page 11-1, EIS)*

*Indigenous Land and Resource Use (ILRU) described in Section 11.1 is conducted by Indigenous people and includes hunting, fishing, trapping, and gathering for food production. Gathering includes collection of natural products such as firewood, driftwood, feathers, or other products used for cultural purposes in addition to plants for dietary and medicinal purposes. (Page 11-2, EIS)*

*Other Land and Resource Use (OLRU) described in Section 11.2 includes commercial resource uses such as commercial fishing, commercial trapping, mining, forestry, lodges and outfitters and ecotourism in which both Indigenous and non-Indigenous people participate. Recreational resource use includes recreational fishing, recreational hunting, and cabin use by non-Indigenous people. Protected areas are also described in OLRU. (Page 11-2, EIS)*

**Comment 80: YNLR would like to emphasize that natural resource use by Indigenous Peoples of northern Saskatchewan is of incalculable value, and the Project must not infringe upon the ability of Indigenous Peoples to exercise those constitutionally protected rights.**

*In March 2022, the YNLR transmitted its report entitled *An Exploration of Recorded Athabasca Denesų́liné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project* (YNLR 2022). Denison requested the inclusion of their report into the EIS. This report focused primarily on the Athabasca Denesų́liné First Nations including Hatchet Lake, Black Lake, and Fond du Lac. Indigenous Knowledge and LK within this report, as well as publicly available information, has been integrated into the EIS with focus on the Athabasca Denesų́liné communities. With approval from YNLR, the March 2022 report is included as an appendix to the EIS (see Section 3 Indigenous and Local Knowledge, Appendix 3-A). (Page 11-18, EIS)*

**Comment 81: YNLR notes that the YNLR March 2022 Report has been included into the Project EIS.**

*Terrestrial species important to Indigenous hunting include moose and woodland caribou. Other species, such as waterfowl and snowshoe hare, were identified among traditional food sources, but do not compose the same volume of consumption (CanNorth 2017). Though other large terrestrial mammals are harvested, such as elk and white-tailed deer, these species are not found in sufficient abundance in the LSA to be assessed as part the Project. (Page 11-46, EIS)*

*The ERFN Elders interviewed in 2011 also noted that woodland caribou may be losing their calving areas due to forest fires and may be moving elsewhere to have their calves. Other potential threats to woodland caribou include industry (like mining), exploration, and tourists in the summer (ERFN 2011). Elders have concern that future generations will not see an abundance of wildlife like there used to be and have mentioned that TK is important to the protection of woodland caribou (ERFN 2011). This assessment, therefore, focuses on potential effects to the abundance and distribution of moose and woodland caribou. (Page 11-46, EIS)*



**Comment 82:** The EIS correctly highlights the cultural importance of moose and woodland caribou to Indigenous People, which underscores YNLR's concerns regarding the conclusions of the residual and cumulative effects assessments of these species, particularly for caribou (see Section 9 comments above).

*The potential effect of alteration and/or loss of habitat on woodland caribou is based on vegetation removal and/or ground disturbance due to construction of Project components and infrastructure and edge effects. Habitat alteration through sensory disturbance effects (such as noise, dust deposition, and artificial light) will result in reduced habitat effectiveness near Project components and infrastructure reaching and along roadways in the ILRU LSA. (Page 11-47, EIS)*

*After mitigation, the residual effects of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to a point where populations cannot be sustained. As such, traditional harvest of woodland caribou is unlikely to be affected by the Project. (Page 11-47, EIS)*

**Comment 83:** YNLR considers the ecological effects assessment for woodland caribou to be flawed (Section 9, EIS), and therefore it questions this optimistic conclusion regarding their ongoing availability for traditional use. Woodland caribou populations have strongly declined across Canada despite all types of project mitigation, so YNLR doubts that similar mitigation efforts will be effective here. In addition, it is unclear what constitutes this proposed mitigation. A caribou management plan is proposed (Section 9), however nothing short of a full caribou habitat offset plan will suffice to sustain the region's population.

*Negligible aquatic habitat loss is predicted in LA-5 (also known as Whitefish Lake) due to the installation of a discharge pipeline and diffuser configuration. The total area of the lake substrate that would be overprinted by the pipeline is expected to be approximately 135 m<sup>2</sup>, which will constitute less than 0.05% of the lake's surface area (Section 8.3.6 in Section 8). No other alteration, disruption, or destruction of aquatic habitat in the aquatic environment LSA (Section 8.3.6 in Section 8) is expected. Project induced changes to the abundance and distribution of fish is, therefore, not expected. The effect, if any, is expected to be undetectable to fishers and is, therefore, not carried forward for residual effects assessment. (Page 11-50, EIS)*

**Comment 84:** YNLR acknowledges that the amount of fish habitat directly affected by the Project is small. However, a much bigger concern is the indirect effects of increased human activity in the area over several decades and beyond, particularly with respect to the consequent increase in fish harvest. This will directly affect the ability of Indigenous Peoples to exercise their Aboriginal and Treaty rights.

One indicator of increased human activity is truck traffic (page 11-54, EIS):

*Land users north of the Key Lake gatehouse would expect to see an increase in traffic of 23% during Construction to 30% during Operation (Denison 2022).*

However, these numbers do not include non-truck traffic.

*Contaminated waste management, storage, and disposal of process waste rock and radioactive plant precipitates, and package and transport of nuclear substances, spills or accidents may affect fish and wildlife abundance and distribution, thus reducing or displacing opportunities to conduct ILRU. Potential effects are predicted to begin in Construction, continue through Operation, and cease when reclamation activities have been completed in Decommissioning when Project components are removed, and activities cease. Concerns about the health of moose and their food, caribou and their food, furbearers, fish, and vegetation such as blueberries have been raised by ERFN (ERFN and SVS 2022b). (Page 11-50, EIS)*

*An ecological risk assessment (ERA) was conducted to consider both radiological and toxicological risks to ecological receptors such as terrestrial and aquatic invertebrates, terrestrial and aquatic vegetation, fish, and terrestrial and aquatic mammals and birds, several of which are important to subsistence harvesters. A summary of results is presented in subsequent text, and comprehensive results are presented in Section 10 Human Health. (Page 11-51, EIS)*

*Given that there are no predicted radiological and non-radionuclide COPC [Constituents of Potential Concern] exceedances that would affect the growth, reproduction and survival of terrestrial and aquatic ecological receptors, potential effects on subsistence harvests use are unlikely because the MP [Measurable Parameter] of change in relative abundance and distribution of fish and wildlife species is unlikely. Therefore, the potential for radionuclide and non-radionuclide COPCs affecting wildlife and fish abundance and distribution is expected to be negligible and this pathway is not carried forward for a residual effects assessment. (Page 11-52, EIS)*

**Comment 85: Despite these reassurances, YNLR remains concerned with the potential effects of Project contamination on culturally important natural resources. These concerns stem from the nature of the materials being mined, and the novel method (ISR) by which they are being extracted. Northern residents and Indigenous Peoples will be living here long after the mine is exhausted, thus effective monitoring is critical, as is the inclusion of impacted Aboriginal and Treaty rights holders in the design and implementation of arm's length, transparent, and statistically-robust monitoring programs.**

*Availability/Accessibility to Lands and Waters (Pages 11-52, 11-53, EIS)*

**Comment 86: The EIS again minimizes these effects on northern residents and Indigenous Peoples. However, any impairment to the ability of Indigenous Peoples to utilize their Aboriginal and Treaty rights to the use of natural resources for their traditional activities constitutes an infringement of those constitutionally protected rights and must be justified. Rigorous examination of these impacts and negotiated compensation for these impacts should therefore be seriously considered.**

*The presence of the Project workforce will increase the numbers of people in the ILRU LSA by an estimated 300 during Construction and 180 during Operation and Decommissioning (Section 13.3 in Section 13 Economics). Potential exists for Indigenous users to observe an increasing number of people in the area associated with workforce personnel. Workforce members will be transported to site by a fly-in/fly-out rotation or by a Denison shuttle and will, therefore, eliminate fishing on local lakes during commute to the site and during time off work. Denison site vehicles will not be available for recreational purposes. While at the Project site and off duty, workers may opt to fish local water bodies. To protect sustainable use of*

*resources, only catch and release of fish will be encouraged, and fish storage or cooking facilities will not be provided. Transportation to fishing areas via trucks or boats will not be permitted. Given these mitigations, increased competition for resources will be limited due to a lack of transportation to fishing locations beyond walking distance and prohibition of firearms/hunting. Given that fishing on LA-5 has not been documented, and the effect is expected to be of low magnitude, changes in fish abundance or distribution are not expected to be detectable to Indigenous land users. (Pages 11-57, 11-58, EIS)*

**Comment 87: This is a significant increase in the number and persistence of humans in the area, and despite these vague reassurances, YNLR believes that this increase will affect the ability of Indigenous Peoples to exercise their Aboriginal and Treaty rights and increase the pressures on the natural resources of the area.**

*With the implementation of Project mitigation measures, overall, residual effects on ILRU perceived suitability of lands and resources for safe use are expected to be adverse, low magnitude during all Project phases, located primarily in the LSA, and medium-term in duration. Effects are expected to be continuous in frequency, low in context, and fully reversible following decommissioning. While it is difficult to predict individual perceptions on the suitability of land proximal to the Project for ILRU, resource users may experience disturbances from traffic, noise, air quality changes, changes related to the relationship to the land, and increased competition for resources. Resource users may also be concerned about personal exposure to contamination of surface water and groundwater, soils, and sources of waste. Some perceptions may be strong enough to cause them to avoid practicing in areas proximal to the Project. Overall, given limited use of the ILRU LSA, adverse effects that are low in magnitude, the limited geographic extents of effects, and the reversibility of effects, the conclusion relative to changes to ILRU is not significant. (Page 11-75, EIS)*

**Comment 88: YNLR believes this to be an overly optimistic conclusion regarding the impacts of the Project on traditional resource use by Indigenous Peoples.**

#### *Other Land and Resource Use*

*Other Land and Resource Use activities that tend to occur in the OLRU LSA include trapping, commercial fishing, and leaseholders and cabin owners. The current number of commercial and recreational resource users admitted through the Key Lake gate is strictly limited to those who lease property, hold commercial licenses, or those who operate outfitting businesses. (Page 11-138)*

*With the implementation of Project mitigation measures, overall, residual effects on OLRU perceived suitability of lands and resources for safe use are expected to be adverse, low magnitude during all Project phases, located primarily in the LSA, and medium-term in duration. Residual effects are expected to be continuous in frequency, low in context, and fully reversible following Decommissioning. The overall conclusion relative to changes to OLRU is not significant and the overall confidence in the determination is moderate to high. (Page 11-139, EIS)*

**Comment 89:** As with the impacts on the traditional use of land and natural resources by Aboriginal and Treaty rights holders, the human presence in the region is going to increase, which in turn will put additional pressures on fish and wildlife resources.

## **F. Summary of Residual Effects (Appendix 16-A, EIS)**

*This Appendix summarizes all predicted residual effects of the Wheeler River Project (the Project) and their significance by each Valued Component (VC) considered to inform the assessment. This is intended to provide the context of the residual effects in a transparent, concise approach to show the fulsome, rigorous analysis undertaken for the environmental assessment (EA) of the Project. Using accepted approaches and best practices, the EA of the Project focuses on the VCs that were determined in consultation with Indigenous communities. The previous VC-specific sections in Parts II and III of this Environmental Impact Statement (EIS) identified current baseline conditions, potential effects, and appropriate mitigation measures, characterized the residual effects on each of the Key Indicators (KIs), and then rolled up the ratings of the characteristics to determine the significance of the effect on receptor VC as a result of the Project. Significance determination is not completed on intermediate VCs, but integrated into the residual effect evaluation, residual effect characterization, and significance determination for related receptor VCs. A summary of the assessment outcomes, predicted residual effect, and significance determination (where applicable) for each VC are summarized in the following tables. (Page 1)*

**Comment 90:** There are about three dozen Valued Component/Key Indicators that are assessed for the significance of residual effects (effects that remain after mitigation) from the Project. They include sediment quality, benthic invertebrates, fish and fish habitat, fish health, terrain, soil, organic matter, vegetation abundance, listed plant species, wetlands, ungulates (moose), furbearers (wolverine, pine marten, mink, muskrat), woodland caribou, raptors (bald eagle, osprey), migratory breeding birds (water birds and waterfowl, upland game birds, migratory songbirds), avian species at risk (5), human health and safety, Indigenous land and resource use, other land and resource use, heritage resources, traditional diet, community well-being (income and cohesion), traffic, infrastructure & services, and economics.

**The residual effects of the Project on all of these VCs/KIs are concluded to be non-significant in the EIS.**

YNLR questions this overly optimistic and statistically unlikely prediction. For example, the sheer number of fish and wildlife species that the few selected VC/KIs represent would suggest that some will be adversely affected, even if by chance alone. The assessment effectively states that the Project is advantageous and/or neutral to all biophysical and human values, which YNLR rejects. If the Project proceeds, YNLR will want to be closely associated with all project monitoring programs.

## **G. Summary of Cumulative Effects (Appendix 16-A, EIS)**

*This Appendix [also] summarizes all predicted cumulative effects of the Wheeler River Project (the Project) and their significance. The Cumulative Effects Assessment (CEA) for the Project considers whether residual adverse effects of the Project on a given Valued Component (VC) of the biophysical or human environment will overlap spatially and temporally with residual adverse effects on the same VC that result from other past, present and reasonably foreseeable projects or activities. The approach for assessing cumulative effects considers both the current conditions (which include changes caused by past development, projects, and activities, and are therefore considered in the baseline condition of the VC) and the identified reasonably foreseeable future projects and/or activities.*

**Comment 91:** There are about three dozen Valued Component/Key Indicators that are assessed for the significance of cumulative effects (effects that remain after mitigation) from the Project. These include air quality, noise, terrain morphology and stability, groundwater quantity and quality, surface water quality and quantity, soil quantity and quality, organic matter, sediment quality, benthic invertebrates, fish and fish habitat, fish health, vegetation abundance, listed plant species, wetlands, moose, furbearers, woodland caribou, raptors, migratory breeding birds, avian species at risk, human health, Indigenous land and resource use, other land and resource use, heritage resources, traditional diet, income of workers, community cohesion, traffic, community infrastructure and services, and economics.

As with the summary of the residual effects, the cumulative effects of the Project on all of these VCs/KIs are concluded to be non-significant in the EIS.

Again, YNLR believes this to be an overly optimistic and statistically unlikely prediction for the same reasons as given above, for example, inadequate spatial boundaries, poorly chosen and grouped VCs and KIs, the apparent omission of the existing linear disturbance network in the effects assessments, and the largely qualitative nature of the assessments and their resultant ‘significance.’

## H. Monitoring and Follow-Up Programs (Executive Summary, page 74)

*Monitoring programs are designed to meet regulatory requirements (e.g., permit or license conditions), and/or to demonstrate compliance with environmental commitments made in the EIS. Follow - up programs are those that are proposed to address any uncertainties identified during the EA process (e.g., to verify predictions made during the EA; determine the effectiveness of proposed and implemented mitigation measures) and to determine when to implement adaptive management measures. Monitoring and follow-up programs for the Project will be integrated within Denison’s overall EMS framework (see Section 3.4.4) and implemented through the various programs, plans, and procedures that would be developed therein. Generally, Denison is anticipating establishing monitoring and follow-up programs in relation to the following VCs (as outlined in the various subsections of Section 5):*

- Air Quality and Noise;
- Groundwater;

- *Surface Water Quantity and Quality;*
- *Fish Habitat and Health;*
- *Terrain and Soil;*
- *Vegetation and Ecosystems, Listed Plant Species, and Wetlands;*
- *Ungulates, Furbearers, and Woodland Caribou;*
- *Raptors and Migratory Breeding Birds;*
- *Human Health and Worker Health and Safety;*
- *Indigenous Land and Resource Use, Other Land and Resource Use, and Heritage Resources; and*
- *Economy*

**Comment 92:** YNLR believes there is a lot of uncertainty remaining from this EIS. This stems from several items, including the relatively novel nature of the ISR methodology with its potential effects on water quality and fish health, to the questionable conclusion that the mine will be neutral with respect to the persistence of woodland caribou in the region. If the mine is to be approved, YNLR wants a transparent, independent, statistically robust monitoring program implemented for the life of the Project and beyond. YNLR expects northern Indigenous Peoples to be involved in the design and implementation of such a program.

## Appendix B: Details of Indigenous Rights Review

A note on this Appendix's format: sections of the EIS have been directly copied and indicated in *italics* to provide context and clarity to the comments immediately following them.

### General comment

**Comment 1:** There is inconsistent use of YNLRO and YNLR throughout several sections of the EIS. Specifically, YNLRO in section 3, YNLR in sections 4 and 11. As they are used to represent the same thing, only one format should be used.

### Section 1. Project Introduction and Overview

EIS Page 1-1, second paragraph, first sentence states:

*"The Project falls within the boundaries of Treaty 10, the Nuhtsiye-kwi Benéne (Ancestral Lands) of English River First Nation, the traditional territory of the Kineepik Métis Local #9, the homeland of the Métis, and the Nuhenéné."*

**Comment 2:** YNLR notes that this is a misuse of Nuhenéné as the name of the people. This should be "Nuhenéné, the traditional territory of the Athabasca Denesųliné".

EIS Page 1-5, first paragraph, third sentence states:

*"Calculated using a straight line, the closest communities are approximately 150 km from the site..."*

**Comment 3:** YNLR notes that the Hatchet Lake Denesųliné First Nation, an Athabasca Denesųliné community, is the closest to the Project. The Wheeler River EIS seems to rely on road distance rather than physical proximity. Road distance should not be utilized to determine community importance or impacts since not all travel methods require continuous roads. Travel to this part of our traditional territory is typically achieved cross country rather than by road.

EIS Page 1-5, third paragraph, first sentence states:

*"The main land use activities in the area by Indigenous and other land users are hunting, trapping, and fishing."*

**Comment 4:** In addition, Athabasca Denesųliné land uses include, but are not limited to, large and small game harvesting, gathering activities, and fishing, all of which are of key cultural importance.

EIS Page 1-7 states:

*“Water in the Project Area drains towards Russell Lake, the Wheeler River, and ultimately into Wollaston Lake (via the Geikie River).”*

**Comment 5: It is important to note that the Hatchet Lake Denesų́liné First Nation and the community of Wollaston Post are situated at Wollaston Lake and given their downstream location there is potential for negative impacts.**

## Section 3

### 3.1 The Value of Indigenous Knowledge in Environmental Assessment Practice

The EIS Page 3-1 to 3-2 discuss the value of Indigenous knowledge with statements including:

*“Indigenous Knowledge plays an important role in the environmental assessment of major projects in Canada, with the understanding that different types of knowledge and diverse perspectives are needed to obtain a full understanding of the existing conditions in which a project is proposed, the potential effects of a project, and the significance of those effects, especially to Indigenous Peoples (BC EAO 2020).”*

*Inclusion of Indigenous Knowledge strengthens all stages of EA in the following ways (MVEIRB 2005; BC EAO 2020):*

- *“makes sure the perspectives and concerns of Indigenous peoples are heard;*
- *provides information, including historical information, that may not have been available through other sources;*
- *leads to better decisions, including improved project design and stronger mitigation measures;*
- *identifies and defines valued components; and*
- *identifies potential project effects to be included in the Environmental Impact Statement (EIS).*

*As part of 2022 engagement activities for English River First Nation, Beauval, and Pinehouse, Denison prepared a survey that asked a series of questions relating to the results of the environmental assessment. Responses indicated that Denison could learn from people regarding how to reduce the effects of the project to the environment and that the Indigenous voice should be included in monitoring plans.”*

**Comment 6: YNLR notes that the Wheeler River Project falls within Nuhenéné and Athabasca Denesų́liné perspectives and knowledge should have been sought throughout all stages of the Environmental Assessment (EA). Early inclusion in this project would have been beneficial to both the Athabasca Denesų́line communities and to Denison through increased sharing of knowledge.**

EIS Page 3-5, first paragraph, is the wording in the submitted draft:

*“In March 2022, the Ya’t’hi Néné Lands and Resources Office (YNLRO) transmitted their report entitled An Exploration of Recorded Athabasca Denesų́liné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project (YNLRO 2022) and*



*expressed support for inclusion in the report in the EIS. This report, funded by Denison, focused primarily on the Athabasca Denesų́liné First Nations including Hatchet Lake, Black Lake, and Fond du Lac. At the YNLRO's request, the March 2022 report is included as an appendix to the EIS (See Appendix 3-A)."*

**Comment 7: YNLR notes that while the above wording is an improvement from the May 2021 draft, it does not make clear that no Wheeler River site specific Athabasca Denesų́liné knowledge or land use studies were undertaken and that the information presented is from a variety of other projects with differing objectives and study areas. The YNLR note that this issue is better captured/described in the EIS on page 11-39:**

*"The YNLR note that these are likely only to be a sample of the collective knowledge and land use of the Athabasca Denesų́liné and are not specific to the Wheeler River site (YNLR 2022; see also Figure 6 in Appendix 3-A of Section 3)."*

EIS Page 3-10, last paragraph, first sentence reads:

*"The Ya'thi Néné Lands and Resources Office, the point of contact for and representative of the Athabasca Denesų́liné communities of Black Lake, Fond du Lac, and Hatchet Lake Denesų́liné First Nations, as well as the northern hamlets/settlements of Stony Rapids, Wollaston Lake, Uranium City, and Camsell Portage, that summarized traditional knowledge and land use and occupancy information collected for various other projects and initiatives and documented Athabasca Denesų́liné use in the Project area, although not considered as a site-specific study."*

**Comment 8: YNLR notes that there appears to be grammatical errors. A suggested edit would be:**

**"Ya'thi Néné Lands and Resources, the point of contact for and representative of the Athabasca Denesų́liné communities of Black Lake, Fond du Lac, and Hatchet Lake Denesų́liné First Nations, as well as the northern hamlets/settlements of Stony Rapids, Wollaston Lake, Uranium City, and Camsell Portage, provided their report; An Exploration of Recorded Athabasca Denesų́liné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project, that summarized traditional knowledge and land use and occupancy information collected for various other projects and initiatives and partially documented Athabasca Denesų́liné use in the Project area, although it is not considered as a site-specific study."**

#### 3.4.8 Lands Taken Up from an Indigenous Perspective

Page 3-18 re: How Indigenous Perspectives Influenced the Cumulative Effects Assessment.

*"Much of the information shared by the Indigenous COI reflects upon their experience with past industry and other colonial factors that have shaped the existing environment, combined with their knowledge and understanding of the resources that support each communities' continued ability to express their Indigenous and Treaty Rights."*

**Comment 9: YNLR notes that as the Athabasca Denesų́liné were not considered to be an Indigenous COI (see discussion below), the opportunities to contribute to our knowledge to this discussion were**

diminished or lost. In fact, only 4 of 31 aspects influenced (from EIS Table 3.5-1) for Indigenous knowledge and 3 of 37 aspects influenced (from EIS Table 3.5-2) for local knowledge were taken from Athabasca Denesųline knowledge sources.

## Section 4 Engagement

EIS Page 4-5, Figure 4.2-1 identifies Hatchet Lake First Nation, Fond du Lac First Nation and Black Lake First Nation as Other Indigenous Communities rather than an Indigenous Community of Interest.

EIS Page 4-vii defines a Community of Interest (COI) as:

*“A community whose traditional land or potential or established Aboriginal and/ or Treaty rights are in proximity to the Project or has existing transportation infrastructure that would be used by the Project. An Indigenous Community of Interest is more likely to experience impacts from the Project.”*

**Comment 10:** YNLR notes that by this definition, the Athabasca Denesųliné communities should be considered an Indigenous COI as they are/have:

- signatories of Treaty 10 and Athabasca Denesųline traditional territory is within the Project area
- established Treaty rights in proximity to the Project
- more likely to experience impacts, for example, water drainage as indicated on page 1-7 of the EIS ultimately flows into Wollaston Lake where the Athabasca Denesųline community of Hatchet Lake is located

Further, EIS Page 4-12 indicates the criteria used to determine status as Indigenous COI including:

- *“Treaty 10 signatory (Treaty in which the Project is located);”*

**Comment 11:** YNLR notes that Hatchet Lake First Nation is a signatory to Treaty 10 as recognised on page 4-47 of the draft EIS.

- *“potential or established Indigenous and/or Treaty Rights within the Project Area;”*

**Comment 12:** YNLR notes that the Project is located within Nuhenéné (the Athabasca Denesųliné traditional territory) as recognised on page 4-61 of the draft EIS. Further, Hatchet Lake First Nation is a signatory to Treaty 10, while Black Lake First Nation and Fond du Lac First Nation are signatories to Treaty 8, and as such all have Treaty Rights within the Project area.

- *“geographic proximity of community and/or reserve land to the Project site;”*

**Comment 13:** YNLR notes that Hatchet Lake First Nation is located 150 km...Black Lake First Nation is located 180 km...and Fond du Lac First Nation is located 230 km away from the Project as recognised on page 4-47 of the draft EIS. Our community members generally access the Project area via overland routes rather than the established Provincial Road network.

- *“known traditional territory in and around the Project site;”*

**Comment 14:** YNLR notes that the Project is located within Nuhenéné (the Athabasca Denesų́liné territory) as recognised on page 4-61 of the draft EIS.

- *“history of relationship with operating companies, the CNSC, and the Province in relation to other projects located near the Project (McArthur River, Key Lake, Millennium);”*

**Comment 15:** YNLR notes that the Athabasca Denesų́liné has relationships with other projects such as McArthur River and Key Lake as indicated in ROC-78, page 504, Combined Appendices for the Wheeler River Project Draft EIS.

- *“the potential for collective exercising of Indigenous and/or Treaty Rights in proximity to the Project.”*

**Comment 16:** YNLR notes that the Project is located within Nuhenéné (the Athabasca Denesų́liné territory) as recognised on page 4-61 of the draft EIS; that the Athabasca Denesų́liné First Nations are signatories to Treaties 10 and 8; that our communities are in proximity to the Project and have demonstrated traditional activity.

**Comment 17:** Given these EIS defined criteria, YNLR has difficulty understanding why the Athabasca Denesų́liné have been excluded from Indigenous COI status for this project. Exclusion of COI status means loss of opportunity for the communities to be part of greater engagement throughout all stages of the Project. Lost opportunities are considerable and include loss of participation at all phases of the Project and include influence regarding the boundaries of the study areas, possibilities for increased discussions regarding environmental and health concerns, mitigation procedures, and planned remediation, potential to participate in monitoring and research projects and future opportunities such as employment.

**Comment 18:** Exploring the Project benefits listed in chapter 2 of the EIS (EIS 2-92), it appears that employment opportunities available will consider qualified applicants from the COIs in priority to other Indigenous or Northern Saskatchewan communities. Additionally, goods and services requirements will be prioritized to the COIs before looking elsewhere. With expected operating costs of approximately \$39 million annually, designation as CI represents the lost opportunity for significant financial benefits to both the Athabasca Denesų́liné and the Athabasca Basin Communities.

**Comment 19:** The mis-categorization as the Athabasca Denesų́liné an Indigenous Community rather than as an Indigenous COI is a step backwards rather than forwards with regards to reconciliation. A letter to Denison dated July 29, 2022, we critiqued the designations of COI and IC as being artificial and marginalizing. Denison responded October 28, 2022, after the submission of Wheeler River EIS with an alternative view.

EIS Page 4-14 states:

*“The Project is located at the southern edge of Nuhenéné (the Athabasca Denesų́liné territory). Engagement with YNLR is captured under Section 4.3.4.2.”*

**Comment 20:** YNLR note that project is within Nuhenéné. There is no need to state the southern edge. It could be argued that the Project is on the northern edge of other Indigenous groups areas. Such descriptions have been applied inconsistently to the groups. Territories should be described in an unbiased manner.

EIS Page 4-47, the last paragraph discussing road distance from the project states:

*“In terms of travel distance by existing transportation routes Hatchet Lake First Nation is located 945 km away from the Project. In terms of direct linear distance, Black Lake First Nation is located 180 km away from the Project. In terms of travel distance by existing transportation routes Black Lake First Nation is located 1130 km away from the Project. In terms of direct linear distance, Fond du Lac First Nation is located 230 km away from the Project. In terms of travel distance by existing transportation routes Fond du Lac First Nation is more than 1,200 km away, a portion of which is only accessible via winter road.”*

**Comment 21:** YNLR notes that the Hatchet Lake Denesųłiné First Nation, an Athabasca Denesųłiné community, is the closest to the Project. The Wheeler River EIS seems to rely on road distance rather than physical proximity and fails to recognise that transportation via the provincial road network is not the only means of accessing the Project area. Road distance should not be utilized to determine community importance or impacts since not all travel requires roads. Athabasca Denesųłiné travel to this part of our traditional territory is typically cross country via snowmobile or waterways rather than by road.

EIS Page 4-61 again states:

*“The Project is located within Nuhenéné (the Athabasca Denesųłiné territory), at its southern edge.”*

**Comment 22:** YNLR note that there is no need to state the “southern edge”, the Project is within Athabasca Denesųłiné territory (as discussed previously for page 4-14 above).

EIS Page 4-61 states that:

*“A Letter Agreement outlining a mutually agreeable process by which the YNLR would author a report for Denison to consider and include, as appropriate, into the EIS.”*

**Comment 23:** YNLR notes that the EIS text should recognise that this report was a compilation of existing YNLR data from a variety of projects with differing objectives and study areas, and that no research was commissioned (as discussed for Section 3 page 3-5 above).

EIS Page 4-64 – Engagement Focus: Post-Project Description: Notes that these discussions have been deferred.

**Comment 24:** YNLR looks forward to these discussions.

(EIS) on page 4-65 states:

*“YNLR expressed concern regarding the classification of the Athabasca Denesų́liné First Nations (specifically Hatchet Lake First Nation) as Indigenous Communities rather than Indigenous Communities of Interest. Denison responded to this concern in a letter to YNLR in early October, 2022, which also included a disposition table responding to each specific concern identified by YNLR. As necessary, Denison has also addressed these other concerns in the relevant sections of the EIS.”*

**Comment 25: YNLR believes that this is referring to the letter sent by Denison dated October 28, 2022 rather than in early October as stated in the draft EIS. Given the draft EIS was submitted to the CNSC on October 24, 2022, four days before Denison responded to YNLR concerns, further opportunity to provide clarifications or specific details for inclusion in the EIS were lost. YNLR does not agree that all our concerns have been addressed in the EIS.**

## Section 11 Land and Resource Use

EIS Page 11-8, 11.1.1.1 Valued Component Selection, states:

*“Valued Components are aspects of the biophysical and human environments that may be affected (adversely or positively) by the Project. The value of a component not only relates to its role in the environment, but also the value people place on it (Denison 2020). An initial VC list was developed for engagement purposes based on a scan of other Environmental Assessments (EAs) conducted in northern Saskatchewan, combined with regulatory expectations and professional experience; ILRU was among the VCs identified (Denison 2020). Additional input into VC selection was obtained through discussions with Indigenous Communities of Interest (COI), government agencies, and the public. Denison Mines Corp. (Denison) reviewed and considered this input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to focus the detailed assessment for the EA.”*

**Comment 26: YNLR notes that the Athabasca Denesų́liné had limited opportunity to contribute to VCs. One community virtual meeting was presented to the Athabasca Denesų́liné, while there appears to have been approximately 12 events for other First Nation communities (combined) including workshops, school presentations, meetings (in person and virtual) and open houses (draft EIS pp 4-16 to 4-86). While we appreciate the opportunity to participate and recognize the impacts of Covid-19, the difference between Athabasca Denesų́liné participation and other groups is stark.**

EIS Table 11.1-2: Description of Spatial Boundaries and Study Areas (page 11-13) and Figure 11.1.4: Indigenous Land and Resource Use Study Area (page 11-14) identifies the regional and local study areas for indigenous land use.

**Comment 27: YNLR notes that the Athabasca Denesų́liné have demonstrated land use in both the local and regional land use as per our report (YNLR 2022). YNLR has reported 371 Athabasca Denesų́liné Traditional Land Use and Occupancy data entries within the Denison regional study area. These include 18 points for harvesting of big game, such as barrenground caribou, moose, and woodland caribou, 29**

overnight sites, 21 points where birds or eggs such as duck and spruce grouse were harvested. Other activities include furbearer harvesting, fishing, including commercial and tourism related activities such as guiding. A map of these activities is reiterated here.

EIS section 11.1.2.4, Page 11-18 states:

*“The YNLR was created as a not-for-profit organization to be the single point of contact between industry, government, and the local Athabasca communities of Hatchet Lake First Nation, Black Lake First Nation, Fond du Lac First Nation, Camsell Portage, Stony Rapids, Uranium City, and Wollaston Post. Denison has been engaging with YNLR since 2019 to understand any interest or concerns about the Project that the YNLR may have. Denison and YNLR agreed on a workplan proposal to carry out research associated with better understanding land use activities in or around the Project.*

*In March 2022, the YNLR transmitted its report entitled An Exploration of Recorded Athabasca Denesų́́né Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project (YNLR 2022). Denison requested the inclusion of their report into the EIS. This report focused primarily on the Athabasca Denesų́́né First Nations including Hatchet Lake, Black Lake, and Fond du Lac. Indigenous Knowledge and LK within this report, as well as publicly available information, has been integrated into the EIS with focus on the Athabasca Denesų́́né communities. With approval from YNLR, the March 2022 report is included as an appendix to the EIS (see Section 3 Indigenous and Local Knowledge, Appendix 3-A).”*

**Comment 28:** YNLR notes our previously raised concerns that the submitted report was an amalgamation of known information within YNLR’s database and that no Wheeler River specific works were undertaken or commissioned. The wording suggested for 3-5 is more appropriate. Further, YNLR indicated to Denison in July 2022 that some of the publicly available information is the draft EIS was misleading and of limited relevance to this project.

EIS Page 11-37. Map of BQ caribou range.

**Comment 29:** YNLR notes that the Map of BQ Caribou Range in draft EIS Section 11.1.3.3.26 is misdated, it should be BQCMB 2012. The original source map is dated 2000, but includes telemetry data from 2012 so is more appropriately dated as 2012.

EIS Page 11-40 states:

*“Additional sources, including the Community Based Environmental Monitoring Program (2018; 2019) and the socio-economic baseline assessment for the Tazi Twé Hydroelectric Project EIS (Golder 2013), recorded harvests of fish, moose, berries, snowshoe hare and spruce grouse in locations close to communities and distant from the Project.”*

**Comment 30:** YNLR notes, as we did previously, that we are unclear what the relevance of including these sources is, since neither the CBEMP nor the Tazi Twé project investigated land use in the Wheeler River area. The March 2022 YNLR compilation report provides clear indications that the Athabasca Denesų́́né communities utilise the areas in the vicinity of the Project.

EIS Page 11-40 states:

*“A careful review of the local map of recorded Athabasca Denesų́liné land use information in the vicinity of the Project (YNLR 2022) illustrated one harvest site of large game on the shore of Russell Lake, and one big harvest site proximal to Key Lake in the LSA. The timeframe of these harvests is not known, though the use was recorded over the last 20 years. No other harvests are recorded in the LSA including harvests of small game, woodland caribou, fish, berries, or wood. Woodland caribou were sighted by Athabasca Denesų́liné members in the LSA and tracks have also been observed but no harvests were documented (YNLR 2020).*

*Overall, limited contemporary ILRU has occurred in the LSA, except for a single big game harvest reported on Russell Lake.*

*Occupancy, Sacred and Cultural Sites, Access and Navigation*

*Important sites were recorded on the YNLR (2020) local map of recorded Athabasca Denesų́liné land use information in the vicinity of the Project including overnight (tent) sites near Holgar and McIntyre lakes located within the LSA and east of Cree Lake.”*

**Comment 31: YNLR notes that Denison’s understanding of the nature of the 2022 YNLR Report is incomplete. As we noted many times, this report is an amalgamation of known information contained within YNLR’s database. It comes from a variety of projects each with differing objectives and geographic scope. It is not a Wheeler River-specific Athabasca Denesų́liné Knowledge, Land Use, and Occupancy (ADKLUO) Study. This, in our opinion, leads to misunderstandings and misrepresentations within the draft EIS.**

As noted above, additional clarifications are that our report is not a Wheeler River-specific TLU study, nor were any such specific works undertaken or commissioned. This is important because it sets the tone for comparisons with other Indigenous groups who have met with Denison far more frequently and conducted far more intensive and focused works. Additionally, the limited engagement with did not allow for a shared Athabasca Denesų́liné – Denison in-depth exploration of Athabasca Denesų́liné experiences.

Using the YNLR Report requires an understanding that the amalgamated information comes from a variety of projects and was collected for a variety of purposes. For example, the report mentions woodland caribou values, tracks, and sightings within the EIS study area. This information comes from various caribou studies and our database records project information. This information clearly demonstrates that Athabasca Denesų́liné members were in the EIS area, that harvesting or other values were not recorded is a function of the purpose of the woodland caribou study rather than an indication that Athabasca Denesų́liné do not utilize the area for other traditional purposes. Other such interpretations or misrepresentations exist within the report. Additional engagement with the Athabasca Denesų́liné communities and YNLR could have ensured further clarification.

**Comment 32: Additionally, information from the 2022 YNLR Report Section 3.3 appears to have been disregarded in the draft EIS. This information includes references to activities mentioned during duty-**

to-consult works for other projects with the LSA. This includes hunting, fishing (including commercial) and the gathering of berries and medicines. The responses also indicate that the land is used for therapeutic purposes, youth gatherings, fish camps and general camping. Further the responses note that areas were utilized year-round for hunting, trapping, and fishing, with activities such as berry picking occurring in summer. Impact concerns raised by the interviewees included damage to the lands and water, how wildlife will be affected, disruption to traditional activities and accessibility to the areas while projects are ongoing. Surely, this information is relevant to the Wheeler River project and should be included with the EIS?

Lastly, the YNLR notes that the two highlighted citations are listed as YNLR 2020 and should likely be 2022.

EIS Page 11-41 states:

*“Current sites, such as cabins, were not documented in the LSA. Camping sites and navigation were documented based on historic use of the LSA by the Hatchet Lake First Nation.”*

**Comment 33:** YNLR notes that the use of the term *historic* is prejudicial and incorrect. We were assured by Denison that they had removed the term *historic* during earlier discussions.

EIS Pages 11-94 to 11-95 states:

*“In March 2022, the Ya’Thi Néné authored a report entitled An Exploration of Recorded Athabasca Denesų́líné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project (YNLR 2022) and shared this with Denison. This report focused primarily on the Athabasca Denesų́líné First Nations including Hatchet Lake, Black Lake, and Fond du Lac. Indigenous Knowledge and LK within this report, as well as publicly available information, have been integrated into the EIS with focus on the Athabasca Denesų́líné communities. The March 2022 report is included as an appendix to the EIS (see Appendix 3-A in Section 3).”*

**Comment 34:** Again, YNLR notes that this should mention that the report was a compilation of YNLR database materials for other projects and is not Wheeler River Project-specific (as discussed above).

EIS Page 11-95 states:

*“An Engagement Database was used to store and retrieve engagement, IK, and LK data. The Engagement Database is continuously updated and adapted to store comments made by Interested Parties organized by topic categories. Engagement, LK, and IK comments are stored in the Engagement Database for integration into the existing environment and assessment sections....”*

**Comment 35:** YNLR notes that the engagement database demonstrates that their opportunities to contribute were limited. For example, of the approximately 101 pages of Engagement Database tables that are dispersed through several sections of the appendices for the EIS (2022), there are 6 entries credited to the Athabasca Denesų́líné. Given an average of 3 to 5 entries per page in the tables, this



**means that only 1-2% of the contributions were made by the Athabasca Denesų́liné. These limited opportunities may well be the result of the exclusion of Athabasca Denesų́line from the COI category.**

EIS Page 11-100 third- and fourth-lines states:

*“The YNLR described trapping activity by one of its Athabasca Denesų́liné member at Keefe Lake to the east of the RSA but did nor report any trapping in N-14 (YNLR 2022).”*

**Comment 36: YNLR notes that the reference to trapping in N-14 is perplexing as the Saskatchewan Trappers Association map shows that N-14 is south of the Project area. Further there is a typo: “not” instead of “nor”.**

## Summary of Recommendations

The Project falls within Nuhenéné and Athabasca Denesų́liné perspectives, knowledge, and interests must be sought throughout the Project's life cycle. If this is done, the Project has the potential to achieve reduced aboveground disturbance when compared to conventional uranium mining operations. However, without this level of involvement, potential Project-related environmental and rights impacts will be difficult to fully detect and mitigate.

Our concerns have highlighted how the designation of Athabasca Denesų́liné in the Project assessment has undermined participation and compounded information gaps. This includes those related to the resources Athabasca Denesų́liné rely upon for traditional activities where skills and knowledge (including language, ecological knowledge, oral history, spirituality, harvesting/processing/preserving skills) are intergenerationally transmitted with respect to fish, wildlife, and medicine, resulting in concerns that some factors were not adequately addressed in the EIS's impact characterization and estimation of statistical significance on impacts on ecosystem components.

If left unaddressed, it could mean that impacts on Athabasca Denesų́liné cultural practices, food security, and land use will not be fully understood. Any potential impairment to the ability of Indigenous People to use natural resources on which they rely may constitute an infringement of their traditional rights. These concerns are best addressed by proactively engaging with YNLR and other Indigenous communities and organizations in the design and implementation of all monitoring programs, including associated reporting and verification.

Monitoring and adaptive management developed in collaboration with all potentially impacted Indigenous Peoples are critical components of sustainable uranium mining. A key component of this is Indigenous-led, life-of-project, community-based monitoring, and reporting, aided by on-the-ground community monitors informed by Indigenous Knowledge and ways. These programs should include YNLR and be negotiated together, either in the form of an environmental management agreement or other similar arrangements. This will not only serve to promote greater trust and support for environmental management outcomes, but a better-informed system for ensuring the protection of Indigenous culture, resources, and land use going forward.

We thank you for considering our comments and recommendations for continued work. YNLR remains committed to working with Denison and all parties to fill the gaps that have been identified and to ensuring the Project is carried out in a manner that is acceptable to the Athabasca Denesų́liné and Basin communities we represent.



**Prince Albert Grand Council's Position on the Wheeler River Mine Project Draft  
Environmental Impact Statement (EIS)**

*“This document is not meant to address and accommodate the duty to consult and it must be  
addressed with the rights holders (First Nations)”*

**Prince Albert Executive:**

Grand Chief Brian Hardlotte

Vice Chief Joseph Tsannie

Vice Chief Chris Jobb

**Consultants:**

Mr. Robin McLeod

Dr. Abdullah Al Mamun

**Contributors:** TBD

## **Introduction**

The Prince Albert Grand Council (PAGC) leadership would like to thank the CNSC for arranging the review of the report on the Draft Environmental Impact Statement (EIS) for the Wheeler River Project proposed by Denison Mines.

The PAGC is a First Nations organization representing 12 treaty First Nation governments encompassing the territories of Treaties 5, 6, 8, and 10. With 28 communities, its administrative area occupies two-thirds of northern Saskatchewan. Its members include Dene, Cree, and Dakota Nations. The PAGC region is known for its diverse biophysical features, which include boreal forests and ecozones such as the boreal shield and boreal plain. It also encompasses Lake Athabasca, Black Lake, Reindeer Lake, Churchill River, and Saskatchewan River.

These diverse landforms not only create habitats for numerous plants and animals, but also support Indigenous hunting- and trapping-based livelihoods. Having lived on the lands for centuries, the Indigenous communities of the region maintain a complex relationship with the land and its resources. They actively avoid over-harvesting - a practice that is rooted in their belief in interconnected nature and society. They strongly believe that a healthy environment is the key to their survival and they want to maintain this relationship for the present and future generations.

However, these relationships are interrupted by human activities such as mining, logging, road construction and hydro corridors. Other disturbances include wildfires which are increasing in number and intensity over time. Wildfires also affect Indigenous livelihoods by clearing vast tracts of lands, and releasing toxic materials into the water and air that affect their health and food supply.

These changes have caused the decline of many species of plants and animals in the PAGC region, including the boreal and barren land caribou.

The decreasing woodland and barren land caribou populations in northern Saskatchewan are of particular concern to PAGC nations due to their cultural connections with the animals. Many communities have historically hunted caribou for food, clothing, crafts, and tools, and continue to engage in this practice to this day. However, this is now threatened by the existence of fatal chronic wasting disease and meningeal worm that may spread from southern boreal deer to woodland caribou. It is only a matter of time before these diseases are transmitted to barren land caribou and lead to further declines in deer, moose and caribou. People are also seeing increased incidences of bird flu in the regions, which affects another of their major food sources.

Overall, these changes interfere with the dynamic relationship between Indigenous peoples and nature that is entrenched in their cultural worldview. Their mixed economy does not converge with the western economic model of concentrating resources and maintaining financial institutions controlled by private entities through market integration in natural goods and services. . Rather it is a collective approach based on sharing what the land can offer ('take what you need'). They prefer to maintain land based livelihoods that support mental, spiritual and physical health and wellbeing . Changes that affect their ability to live off the land are of great concern to them, yet their questions about the quality of the water, air and wildlife often go unanswered. Indigenous communities are often the poorest in Canada and many have intergenerational trauma due to cultural genocide, impacts of residential schools and other effects of colonialism. **They experience high rates of cancer and diabetes while their mineral/resource-rich lands are**

**exploited in the name of development. This is what the western economy brings for them, the first people of Canada.**

In light of the above changes and their desire to maintain their livelihoods, exercise their treaty rights, and land entitlements, the PAGC leadership has carefully reviewed the above document and has prepared this submission as a response. The current response is created by PAGC review team members with expertise in the areas of traditional ecological knowledge and science as they relate to wildlife, waters, food systems and other ecosystem properties. The concerns included in this document are closely linked to the views of our Elders, knowledge keepers and land-based persons. Our PAGC team requests that the CNSC team review our submission to ensure that the concerns listed above and therein are addressed before making any final decisions on the Wheeler mining project.

We also request that the CNSC reply in writing to the General Manager Lands and Resources Secretariat Mr. Robin McLeod indicating how each of the outlined concerns will be addressed. *Please note the PAGC is an umbrella organization of their 12 Nations and is happy to provide oversight of the EIS document in particular and the Denison's Wheeler Mine in general. However, actual consultation and engagement regarding mining operations must be done with the Nations affected by the operations.* Their comments are as follows:

**Overall comments:**

We are thankful that the CNSC has given PAGC a chance to provide oversight on the Wheeler Mine EIS on behalf of the Nations whose territories intersect the proposed project area, especially

La Ronge, Black Lake and Hatchet Lake, SK. The team acknowledges that Denison has compiled a considerable amount of information on the mines in a comprehensive document called Draft Environmental Impact Statement (<https://www.ceaa-acee.gc.ca/050/documents/p80178/145552E.pdf>). This document takes into consideration the area's ecosystem, plants, animals and human inhabitants, and includes its cultural significance of the areas. It discusses information on Indigenous land-based activities, and existing and proposed infrastructure and construction. The document broadly reviews activities related to the in situ recovery (ISR) mining method and describes the process of acidification during uranium ore harvest. It uses mostly scientific procedures and some Indigenous knowledge to explain the management of radiation and chemical pollution in surface and underground waters and tailing ponds, as well as pollution control and mitigation and decommissioning processes. The document also highlights outcomes such as local job creation and carbon reduction through nuclear fuel supplies as economic and green energy benefits to Canada and the rest of the world. Moreover, it has provided information on the consultation and engagement processes, and on opportunities for Indigenous partnership in current and future activities including decommissioning programs. Furthermore, it describes how the mining operations would comply with section 3.1 of the Constitution Act 1982, Canadian Environmental Assessment Act 2012, provincial environmental acts and all related regulations. This information gives communities and organizations who might be affected by the Wheeler River project a chance to know more about the impact of the project on the landscape and Indigenous livelihoods.

Although comprehensive in nature, our observation indicates that the EIS falls short on several grounds. It does not properly address multiple issues related to ecosystems, human health, and the long-term sustainability of the project, particularly Indigenous concerns regarding the loss of

caribou, wolverine, and other culturally significant animals. These animals are described as threatened or endangered by the Species at Risk Act (SARA) due to the effect of human disturbances on their populations. . Furthermore, there are no details on Indigenous partnership in the economic benefit of the mines, including equity-based participation in the workforce with training opportunities for Indigenous personnel to operate in management roles. Here we further elaborate on this.

### **Caribou and Elders' knowledge:**

The EIA ignores our Elders' understanding of the human impact on wildlife including s caribou and other species at risk, and the resulting effect on Indigenous livelihoods. Caribou is a keystone species in this region, and the mines are located in an area that is used by both barren land caribou and boreal caribou.

The EIA, like many previous documents, acknowledges that our Elders prioritize the removal or reduction of human disturbances to the landscape by blocking or deactivating access roads as a means of aiding caribou recovery (Personal experience, June 2022 meeting on SK2 East Range planning and others). The Elders also wish to avoid projects that have a significant environmental impact. Given this context, it is understandable that the already threatened boreal caribou and endangered barren land caribou will be more vulnerable if the further disturbance is encouraged in this area which currently hosts mining operations at Key Lake and McArthur River. The regions have a history of mismanaged mining operations, as shown by the 38 abandoned mines in the Athabasca region. It is believed that these regions were polluted for decades with little intervention except for some containment and recovery trials at Beaverlodge Mine. The lack of consideration



for these critical aspects of the conservation of the keystone species leads us to believe that Indigenous views are not being truly understood in the decision-making process.

In this regard, we have concerns about the efforts made by the company to properly review the available relevant reports on woodland caribou conservation, especially Mamun and Brook's report on woodland caribou traditional ecological knowledge (2017). This report includes the many changes that have occurred in caribou lands such as recent forest fires and human disturbances and the effect of predators on the caribou population. There are also concerns about the vulnerability of the northern environment to climate change, which affects the Indigenous Nations and animals and plant communities that live there. The information in Michel et al.'s 2018 report on the effect of these changes on northern Indigenous livelihoods and the health of the ecosystem would provide insight into the unique challenges of the people and the region. We believe that a thorough review of these reports would allow Wheeler Mines' EIS to better approach the mining activities in a way that conserves the caribou and preserves human health.

#### **Application of traditional ecological knowledge:**

It has become a common practice to highlight traditional ecological knowledge as a contributor to scientific findings. This EIA report is no exception. We strongly believe that Indigenous knowledge is sufficient to gather information similar to that obtained through science-based methods. Indigenous Knowledge has contributed significantly to information on the changes in caribou habitats. For example, our members have observed that woodland caribou are moving further north due to climate change and increased human disturbances in the southern boreal region. Similarly, barren land caribou are no longer coming further south as winter temperatures are not low enough to prompt their migration into southern regions. Indigenous peoples have seen woodland caribou in areas that were not utilized by caribou in the past, such as Black Lake, SK.

Unfortunately, limited use is being made of Indigenous Knowledge in delineating caribou habitats despite the data and woodland caribou traditional ecological knowledge available in the report published by Mamun and Brook (2017).

### **Roads/transportation, and electric corridors:**

As stated in the report, the existing infrastructure in the area includes Highway 914, the provincial power line adjacent to the highway, and infrastructure for the Key Lake Operation and McArthur River Operation (Figure 1-2). The EIS further states that existing disturbances in the area are mainly from exploration activities, such as line cutting, drilling, and creating access routes. A general description of how disturbances from these activities will be managed is provided, such as a plan for the reduction of noise from transportation. However, this is far from convincing. There is little evidence that the affected areas can be restored to their former state despite the measures taken. Woodland caribou are sensitive to ecosystem changes and it is doubtful that they will return to their habitat once disturbed. Indeed, it is unlikely that the original state of the forest can be restored after the topsoil is stripped, particularly in northern regions with lower vegetation growth. This was seen in steep rock mines in Atikokan, ON where replanting efforts were unsuccessful even after treating the area with organic manures (Personal observation).

Although the use of existing roads and the construction of short roads to the highway and power lines appear to offer an appealing promise from the mining authority, the additional traffic would still be a major concern. The associated noise will always be an issue. We suggest putting speed limits of about 70 km/ hour for trucks in the boreal forest where woodland caribou reside and are used by barren land caribou in the winter.

## Science-based modeling issues:

We have observed in this and many other EIA reports concerning northern Canada that mining industries rely heavily on the models to predict and understand potential risks. These include underground water modeling, GIS modeling of changes to landscape features and biophysical processes, and modeling of human exposure to radiation such as ALARA (As Low As Reasonably Achievable)<sup>1</sup>. Although they are often helpful, excessive reliance on science-based models in an EIS report puts Indigenous people at a disadvantage. Here we provide the appropriate contexts and the proposed solutions.

Indigenous communities are not involved in the collection, analysis, and interpretation of data used by the models presented in most cases. This has become a source of suspicion when they do not see the evidence for these scientific findings at the community level. For example, the findings may state that water and air at Athabasca Basins are safe for both humans and wildlife. However, Saskatchewan is known for its comparatively increased incidence of lung cancers, and people of Indigenous heritage in the Athabasca regions constitute a large portion of cancer patients. The decline in wildlife, especially the caribou, demonstrates the limitations of these models in predicting outcomes and supporting the management of industrial activities.

Indigenous culture does not make use of models. Instead, they follow the natural changes and patterns as signals such as being fewer populations of woodland caribou or moose readily help them believe something wrong with the natural ecosystems they rely on. In this context, asking Indigenous communities for feedback on a report full of models prepared without their

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<https://www.cdc.gov/nceh/radiation/alara.html#:~:text=ALARA%20stands%20for%20%E2%80%9Cas%20low,time%2C%20distance%2C%20and%20shielding..>

involvement has limited value as our members have not been fully engaged throughout the process. This approach is somewhat disrespectful to Indigenous communities as they are not part of the development of the report and therefore do not have a complete understanding of its contents. They have every right to reject any such report including EIA or EIS. We believe that true engagement in the planning process requires a commitment from Denison to get Indigenous communities involved in each stage of the documentation and report preparation process.

**One way could be arranging long-term funding for youth education in science that would prepare them for careers in biology and environmental science, which is very uncommon among Indigenous communities. Per Statistics Canada's estimation, Indigenous communities represent 5% of the Canadian population but only 0.9% of science graduates come from among Indigenous communities. Indigenous people currently make up 14% of the population of Saskatchewan and are expected to increase to 50% by 2050. Increasing their representation in science and technology, and their participation in development planning is therefore a valuable long-term goal.**

#### **Addressing Indigenous worldviews: Eco-cultural approach?**

Our Elders have repeatedly stated, especially in the Caribou range planning meetings and many events with CNSC regarding mining, that they do not want to see any animals or plants disappear from the landscapes they use based on their traditional understanding of the relationship between humans and nature. When woodland caribou and other animals are lost, the cultural use of the land dies. Indigenous peoples cannot practice their treaty rights and entitlements to the lands which affect their physical and mental health, and their mixed economy connected to hunting and

gathering. And when culture dies, the conservation of ecosystem values, including biodiversity, becomes impossible.

We urge the company to understand and take an eco-cultural approach to preserve wildlife and landscape health<sup>2</sup>. This will allow Indigenous communities to maintain their cultural connections with the lands to manage biodiversity and ecosystem productivity. It has been proven globally that Indigenous peoples are the best conservators of ecosystems, as they live sustainably in the most biodiverse areas in the world. Therefore, it is advisable that the industries including Denison focus on preserving the eco-cultural significance of the lands when planning mining operations and decommissioning processes.

Denison can implement programs to help Indigenous communities to maintain their ecosystem affiliations, such as encouraging the ceremonial use of lands. It can also support land-based learning programs and cultural camps where youth from Indigenous communities can learn about interconnected nature, conservation processes, and living harmoniously with nature from Elders and university researchers. PAGC currently uses these formats in our ongoing climate and fisheries monitoring programs and we would gladly provide guidance on the best practices.

Although a great deal of literature exists on the eco-cultural aspects of natural resource projects, the current EIA provides a highly science-based generalization of the complex issues surrounding the Denison operation regarding Wheeler Mine and its related management activities. We doubt the effectiveness of this approach, as the financial and other models included in the EIA highlight the economic impact and ignore social issues, including Indigenous livelihoods. For example, the

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<sup>2</sup> <https://www.communityconservation.net/wp-content/uploads/2019/03/Oloriz-Presentation-May-28-2018-halifax.pdf>

impact of the mines on woodland caribou and its effects on Indigenous communities are not adequately considered or assessed.

### **Conclusion: Meaningful participation**

Although we have discussed our concerns toward the Denison project and the limitations of the EIS, we believe that solutions can be found through proper consultation with Indigenous communities at all stages of the project including fact-finding. ‘Checkbox consultation’ no longer has a place in the era of reconciliation. We require serious consideration of the concerns raised and seek meaningful engagement on how they should be addressed. As per our knowledge, inadequate involvement of Indigenous communities has continued to be a concern in the EIA process, with minimal consideration of the issues raised by our Nations that may be affected by the proposed mining operation. Ministerial veto powers affect the process by proposing financial packages in exchange for community support. However, communities accept the financial incentive for its short-term benefits but do not consent to the mining operation and its long-term consequences. Such practice takes advantage of already vulnerable communities.

Our thoughts above highlight the loopholes in the consultation process and a lack of meaningful engagement. As per our knowledge, First Nations are unwilling to be treated as yet another stakeholder and would prefer to be a partner in the EIA process. Most Indigenous communities are now considered to be stakeholders in the same category as businesses and other public organizations, which is somewhat of a distortion of the provisions made under Section 35.1 of the Constitution Act 1982. The Act makes special reference to and affirms the existing rights of Indigenous communities, which elevates their claims over those of stakeholders such as mining companies or non-Indigenous members involved in the mining and extraction process. Our review team emphasizes active engagement in every phase whether it is assessment, management,

decommissioning or recovery programs concerning the wheeler river mine. We stress that Denison's wheeler river mines can set an example for other mining companies through activities such as providing training for Indigenous members to run mining-related businesses, or participate in environmental monitoring. For example, in addition to reducing carbon by using uranium as a nuclear power source, we recommend the inclusion of some other established green technologies such as solar panel-adapted buildings with Indigenous community partners. Currently, 33% of green energy projects in Canada are Indigenous-led and managed which demonstrates their strength in this field. We also suggest that the company consider the use of hydrogen fuels in appropriate areas if the project proceeds -based on the consent of the affected Indigenous groups. Indigenous communities can benefit economically from partnerships in all these associated projects. While the PAGC oversight team may offer recommendations, the final decisions still lie with the communities in the Athabasca region where the Wheeler River project is proposed.

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Annex 1 Responses to Information Requirements

**Federal Indigenous Review Team (FIRT) – Denison’s Responses to Information Requirements for the Wheeler River Project Environmental Impact Statement**

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-01	English River First Nation (ERFN)	Current use of lands and resources for traditional purposes	General	<p><b>Context:</b> Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the <i>Traditional Knowledge Study and Health and Socio-Economic Study Report</i>. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN’s rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user.</p> <p><b>Rationale:</b> It is important for the proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and sociocultural and economic perspective.</p>	<p>The draft EIS should be revised to reflect the totality of ERFN TK and land use information.</p> <p>Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated.</p>	<p>Denison has met with ERFN regarding the IR and has gained a better understanding of the specific concern raised in the IR. ERFN's relationship and connection to the land is important. Denison will continue to work with ERFN to refine its understanding of this relationship and will work with ERFN to make sure this is accurately reflected in the final EIS.</p> <p>Despite the passing of the late trapper/resource harvester referred to throughout draft EIS, ERFN has communicated to Denison that ERFN considers his use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use. Changes will be made throughout the EIS to reflect that the late ERFN land user is but one of many current and future land users, and should be considered as representative of future land uses and expression of rights.</p> <p>For example, statements about the land being inactive at this time or statements that suggest that other land users are limited or have not provided documented use of the area will be removed and repositioned so as to reflect the importance of the area to ERFN. This may result in the inclusion of additional mitigation and enhancement measures. Denison will continue to work with ERFN on the list of Project elements that ERFN feels required additional refinement or that are sources of concern as the EIS review process continues.</p>	<p>As noted in the IR response, the final EIS will be updated. To support review of the response, a few examples of updates to the draft EIS are provided, with new text in <b>bold</b>, and deleted text in <del>strike</del>through:</p> <p>Example 1:</p> <p><i>10.1.6.1.4 Human Health Risk Assessment Results</i> (excerpt only) The ingestion rate for caribou, based on engagement with a local fisher/trapper, was 175 kg/yr of caribou (equivalent to approximately 2 to 3 servings per day). This ingestion rate is conservative compared to an annual caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) from the ERFN’s Country Food Study (CanNorth 2017) and 54.4 kg/yr for the total game diet for a high traditional foods consumer in the Boreal Shield as per the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al. 2018). Thus, the local fisher/trapper <b>represents</b> <del>is relatively extreme</del> <b>an intensive land user</b> with respect to local game consumption. <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 2:</p> <p>10.1.6.2 Residual Effects Characterization (excerpt only)</p> <p>For non-carcinogens, the results of the HHRA predicted no exceedances of the HQ benchmark (HQ&lt;0.2) for human receptors for non-carcinogens (cadmium, copper, chromium, cobalt, molybdenum, uranium, and zinc) during all phases of the Project. The one exception was selenium for the fisher/trapper at Russell Lake, where the incremental Project HQ for the fisher/trapper from fish ingestion (northern pike and white sucker) was predicted to be 0.93. <del>The traditional foods diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper which is representative of one person, who consumes a unique composition and quantity of traditional foods. Most</del> <b>Many</b> people fishing, hunting, and trapping in the Project Area would consume traditional foods more consistent with the average traditional foods consumer diet, which was developed from the ERFN country foods study (CanNorth 2017). <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 3:</p> <p>11.1.2.1 English River First Nation</p> <p>Indigenous Knowledge (referred to as Traditional Knowledge or TK by the ERFN) was provided by ERFN for consideration in the EIS. This included several reports:</p> <ul style="list-style-type: none"><li>• <i>Wheeler River Project – Summary of Health and Socio-Economic Study Results</i>, which summarizes results from 16 interviews that were conducted for the health and socio-economic topics (ERFN and SVS 2022a).</li></ul>

<sup>1</sup> Unless otherwise stated, the section noted refers to the draft EIS.  
<sup>2</sup> Where IR contents note “See also related IR(s)”, responses from Denison may be similar or provided in a single detailed response, but it was preferred to keep original IRs distinct.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
							<ul style="list-style-type: none"><li>• <i>Wheeler River Project - Summary of Traditional Knowledge Study Results</i>, which analyzed and presented results from 21 land use interviews that provided both IK and LK and included details on ERFN’s resource harvesting locations, species harvested, travel routes, cabins and special sites (ERFN and SVS 2022b).</li><li>• <i>The English River First Nation Country Foods Study Final Report</i>, which conducted in 2016 through funding secured from the First Nations Environmental Contaminants Program to complete a country foods study. The study involved three components: a dietary study, a sampling program, and a human health risk evaluation. The overall study objectives were to examine country food usage by ERFN community members and to assess if the country foods are safe to eat. The involvement of ERFN community members was one of the fundamental goals of the study, which relied heavily on TK to identify what and where to sample (CanNorth 2017a).</li><li>• <i>The English River First Nation Aboriginal Traditional Knowledge Summary Report</i>, which was compiled by Environment Canada on behalf of ERFN to summarize information for the purposes of recovery of the Woodland boreal caribou population. Ten individuals (mostly Elders) were selected by ERFN to complete TK interviews to understand boreal Caribou in the English River Traditional Territory (ERFN 2011).</li></ul> <p>Local Knowledge also was provided by an ERFN trapper, fisher, and resource harvester (ERFN Trapper) who resided in and conducted resource use in the Project Area. The ERFN Trapper explained the use of the area by outfitters and cabin lease holders, fish and wildlife abundance and distribution, species harvested for traditional use, and navigation and travel along waterbodies and roads. On October 29, 2019, at Denison’s Project exploration camp, the resource user attended a full-day interview. Notes from this interview were finalized on January 2, 2020, with their approval and are used in most ILRU components herein. Unfortunately, prior to the filing of the EIS, the ERFN Trapper passed away. <b>Despite his passing, ERFN considers the ERFN Trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use.</b></p>
IR-02	Canadian Nuclear Safety Commission (CNSC)	Mitigation Measures	General  Appendix 16-C	<p><b>Context:</b> Denison’s 2019 Wheeler River Terms of Reference states: “The EIA will also discuss the monitoring programs required to demonstrate regulatory compliance and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.”</p> <p>The CNSC’s <a href="#">Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS)</a>, also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p><b>Rationale:</b> The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p>	CNSC staff expect Denison to provide a comprehensive list of commitments along with the next version of the EIS, including any commitments made to Indigenous Nations and communities and other stakeholders (As committed in the Wheeler River Terms of reference, and as noted in the November 28 <sup>th</sup> , 2022 email from CNSC staff to Denison: <i>Future Submission of a Commitments Table for Wheeler River EIS</i> ).	A list of commitments, including specific commitment or mitigation measures related to Project effects as an outcome of engagement, made in the draft EIS, throughout the Federal information request period and the Provincial comment response period, will be included with the submission of the revised draft EIS. For clarity, this would not include any private, confidential accommodations made under contractual agreements.	No EIS updates are anticipated to address this IR at this time.  Denison acknowledges that a comprehensive list of Project-related commitments will be provided for the record as part of the process of finalizing the EIS.
IR-03	CNSC	Site preparation	Section 1.3.2 Temporal Boundaries	<p><b>Context:</b> The EIS and TSD-ERA provide assessment on the project timeframe, including construction, operation, and decommissioning phases.</p> <p><b>Rational:</b> The site preparation phase is not included in the timeframe</p>	Please provide an assessment of those facility characteristics and activities that may interact with the environment during the site preparation phase, along with an assessment of their potential effects, in order to reflect the entire lifecycle or provide a rationale for its exclusion.	The EIS phase 'Construction' includes site preparation activities and as such these site preparation activities have been assessed within the EIS and the supporting documentation, including Appendix 10-A.	Section 5.3.4 of the final EIS will be modified as follows:  Temporal boundaries are based on the different phases of the Project: <b>Construction (including</b>

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			Appendix 10-A (ERA)	(EIS and TSD-ERA). As per REGDOC 2.9.1, the sub-section 4.1.1 Complexity of the environmental risk assessment requirements states that “The applicant or licensee shall identify facility characteristics and activities that may interact with the environment during the relevant phase of the facility or activity’s lifecycle (for example, site preparation, construction, operation, and decommissioning.”		<p>EIS Section 5 Approach and Methodology of the Assessment, Section 5.3.4 outlines the temporal boundaries for the assessment and the Project activity tables used throughout the EIS include elements of site preparation in the Construction phase. The list of key project activities included in the Construction phase are included below; elements related to site preparation are shown in <b>bold</b>:</p> <p>Construction Activities</p> <ul style="list-style-type: none"><li>• <b>Development of access roads and air strip</b></li><li>• <b>Site preparation and earthworks; clearing, levelling, and grading of the Project Area</b></li><li>• Power generation - generators</li><li>• Installation of main substation and distribution of power around site</li><li>• Wellfield and freeze hole drilling; ground freezing</li><li>• Batch plant operation (concrete); crusher at borrow area</li><li>• Development of surface infrastructure (camp, operations centre, plants, ponds, pads, and support facilities)</li><li>• Waste management (composting, domestic and industrial landfill operation, recycling)</li><li>• Water management (including treatment and site runoff)</li><li>• Groundwater supply</li><li>• Surface water withdrawal</li><li>• Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)</li><li>• On-site and off-site operation of vehicles and transport of materials</li><li>• Air transportation for workers</li><li>• Regulatory site inspections</li><li>• Engagement – site visit from Interested Parties</li></ul>	<p><b>site preparation), Operation, Decommissioning, and Post-Decommissioning</b>, as described in Table 5.3-3.</p> <p>Section 1.3.2 of Appendix 10-A will be modified in the final EIS as follows:</p> <p>Consistent with the Wheeler River Project EIS, the temporal boundaries of the assessment include the following Project phases: construction (<b>which includes site preparation</b>), operation, decommissioning, and post-decommissioning (Table 1-1).</p>
IR-04	Environment and Climate Change Canada (ECCC)	Fish and fish habitat	Section 2, Project Description Section: Glossary	<p><b>Context:</b> The Proponent defines ‘clean waste rock’ as “Waste rock generated as sandstone cuttings and core from drilling activities associated with well and freeze hole development that does not have uranium containing materials”.</p> <p>ECCC notes that the use of the term “Clean Waste Rock” could be misunderstood to mean that the waste rock is devoid of any contaminant. Even when the waste rock referred to as “clean waste rock” does not contain uranium materials, it could contain other metals or contaminants that could have adverse environmental effects. It is also not clear whether the “clean waste rock” is characterized for Acid Rock Drainage/Metal Leaching (ARD/ML) given that some portion of the basement rock is to be drilled out to anchor the freeze walls and may have ARD/ML potential.</p> <p><b>Rationale:</b> The current definition of ‘clean waste rock’ in the draft EIS could lead to inappropriate handling and disposal if it is assumed to be devoid of any metals or other contaminants that might negatively affect the environment.</p>	Provide a clear and more detailed definition of the term ‘clean waste rock’.	<p>Clean waste rock is defined as non-mineralized and non-potentially acid generating (PAG) rock. Clean waste rock will be sent to a storage pad (clean waste rock pad) that is proposed to be lined with an impermeable geomembrane collecting precipitation that will be monitored for quality and would allow for treatment if necessary.</p> <p>The clean waste rock pad is expected to hold approximately 7,800 m³ of clean waste rock.</p> <p>Further characterization and test work are ongoing to confirm the ARD/ML characteristics of this waste rock. From the historically completed testing it is recognized that the non-mineralized mine rock is expected to include both non-PAG and PAG mine rock.</p> <p>The clean waste rock pile is being evaluated for potential segregation of the PAG mine rock. However, it is noted that, as observed in the six field barrel tests on Phoenix mine rock, including four bins that were identified as containing PAG mine rock, no net-acidity was observed over at least the first two years of the field barrel testing. In all barrel tests the pH values were greater than 7 and were producing substantial alkalinity (SRK, 2020). This indicates that the potential lag-time to net-acid generation would be on the scale of years and monitoring/collection/potential treatment could be pursued as conditions at the clean rock pile develop.</p> <p>It is noted that the non-mineralized mine rock is expected to have central tendency (i.e., median) solids contents that are generally similar to the average upper continental crustal abundance contents (Rudnick and Gao, 2014).</p> <p>The field barrel tests have all maintained neutral pH conditions and metals concentrations and their respective loading rates have generally either been stable or decreasing over the test duration (SRK 2020). However, further testing is required to confirm the expected behaviour at field-scale over operational-timescales.</p> <p>It is noted that comparing field barrel leachate concentrations are not directly representative of expected contact water within an at-scale storage pad; however, it is recognized that the clean waste rock pad is of a modest size and that loadings to contact water are expected to be directly correlated with the quantity of rock held within a catchment. Further, the barrel tests were performed on materials that were crushed to less than 1mm, field-scale mine rock of larger grain sizes would be expected to have appreciably lower mass loading rates than the unit rates observed in the field cells.</p> <p>Confirmatory sampling of both the waste rock and drainage at the clean waste rock is planned during both construction and operations.</p> <p>References:</p> <p>Rudnick, R.L. and S. Gao. 2014. Composition of the Continental Crust. Treatise on Geochemistry (Second Edition) Volume 4, 2014, Pages 1-51</p> <p>SRK Consulting Inc. (SRK).2020. Wheeler River On-site Kinetic Leach Tests, Progress Update – Draft. Prepared for Denison Mines Corp. January 2020.</p>	<p>Section 2.2.4.8 of the final EIS will be updated as follows:</p> <p>Clean waste rock (<b>non-mineralized and non-potentially acid generating [PAG] rock</b>) will be generated as sandstone cuttings and core from drilling activities. Based on the current wellfield and freeze wall design, approximately 7,800 m³ of clean waste rock will be generated. Clean waste rock will be stored on a 2,500 m2 single geomembrane liner (Figure 2.2-26) and can be used for road construction and/or concrete production. <b>The clean waste rock will be assayed and tested for PAG during Operations to ensure the material can be reused when required.</b></p>
IR-05	CNSC	Change to an environmental component due to hazardous contaminants	Section 2.2.1.2	<p><b>Context:</b> Water volumes for mud/diamond drilling is listed as minimal as the mud will be re-used. The mud is identified as a mixture of water, clay, and environmentally friendly polymers that clean out the cuttings and help to keep the drilling bit cool.</p> <p><b>Rationale:</b> Although the mud for drilling will be re-used, there could be environmental impacts should there be an accident while drilling.</p>	Please identify the components of the environmentally friendly polymers for the drilling mud and potential environmental impacts should the mud not be recovered.	Two primary drilling methodologies are planned for the development of the wellfield that will be comprised of monitor, injection, recovery and freeze wells. The two primary forms of drilling are diamond and mud rotary drilling. Diamond drilling will be used for freeze, monitor and small diameter injection wells. Mud rotary drilling will be used for recovery and larger diameter injection wells. Both methodologies employ similar mud management programs as part of the drilling process in that they both use a combination of light polymer and bentonite products to stabilize the subsurface formation during drilling and well installation.	No EIS updates are anticipated to address this IR at this time.

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						<p>Various products are used at specific depths to stabilize the formation and include Ultra PAC, Sawdust, Prima Seal, Premium Gel, Prairie Drill, KCl, Hyper drill, Hydrated lime, Envirofloc, Caustic Soda, Calcium Chloride, Purevis and bentonite. All products used on the Wheeler River Project are considered environmentally friendly and safe for use for workers as indicated by their respective safety data sheet (SDS) and product data sheet (PDS. The use of drilling muds was addressed within the A&amp;M hazards screening (Table 3-2; in Appendix A of Appendix 14-A) and characterized it as a low risk event.</p> <p>Potential worker safety risks primarily include slipping hazards at the worksite as the products generally create non-adhesive bonds in surfaces that are contacted.</p> <p>All of the products used are routinely landspread on farmer’s fields in the Oil and Gas industry in both Saskatchewan and Alberta at the same quantities or greater proposed for use on the Wheeler River Project. As a vast array and combination of products are used, the specific compositions are not presented herein but are available upon request.</p>	
IR-06	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>• feasibility of meeting remediation targets.</li><li>• groundwater flow conditions and validation of flow models.</li><li>• mobilization of contaminants (e.g., Al, Se or V).</li><li>• potential for free gas evolution/two-phase flow.</li><li>• identifying composition of lixiviant and production solutions.</li><li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>	Please see Attachment IR-06.	<p>The following text will be added to the final EIS, under a new heading, Section 2.2.1.6 ISR Mining-Related Inputs for the EIS:</p> <p>It is important to note that Denison is completing a sequential EA and licensing process for the Project (see Section 1). Detailed ISR mining-related information needed to support licensing and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.</p> <p>For the EIS, an understanding of ISR design is needed to describe potential effects related to Project activities within the biophysical environment (EIS Part II, Section 6 to 9), human environment (EIS Part III Sections 10 to 13), and accidents and malfunction (Section 14) assessments. Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.</p> <p>Importantly, since the mine design includes the freeze wall, movement of mining solution is restricted and contained horizontally during operations. Wellfield pumping provides the hydraulic containment to keep mining solution within the 50 m mining area (see Section 2.2.1.4.2). During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface water or down gradient groundwater environments, and the groundwater assessment (Section 7) focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions. During mining area remediation (see Section 2.3.3.1.1), the freeze wall will remain in place until decommissioning objectives are achieved. Refinement of the mining area decommissioning objectives and associated modelling will be done through updates to the Decommissioning Plan, and will be bounded by the objectives evaluated in the EIS.</p>
IR-07	ECCC	Fish and fish habitat	Section 2.2.1.4.2, Wellfield Operation  Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	<p><b>Context:</b> The description in Sections 2.2.1.4.2 and 2.2.1.4.2.2 refer to the differential rates of injection and withdrawal, which implies that more solution will be withdrawn through the recovery well than volume of mining solution injected. According to the description of the site, a freeze wall will create a barrier between the uranium deposit to be mined and outside the isolated area to prevent inflow of groundwater from the sandstone outside the freeze wall. Secondly, it was indicated that the basement rock below the uranium deposit will prevent infusion of groundwater from below.</p> <p>The Proponent stated that inward hydraulic gradient will be created</p>	Clarify where the extra groundwater will come from to sustain this differential rate of injection and withdrawals during operation and if this extra water has been accounted for in the model and the amount of water that ends up in the receiving environment.	<p>The freeze wall will provide hydraulic containment between the internal wellfield and the external regional groundwater system with each well pattern maintaining a minimum 1% 'bleed' to maintain hydraulic gradients towards recovery wells.</p> <p>The "extra" water pumped (i.e., the water pumped in excess of injection) will be derived from stored groundwater within the sandstone units above the ore zone, and from the underlying paleoweathered zone, within each phase of Operation that is surrounded by freeze walls. The volume of stored water was estimated using the calibrated groundwater flow model, which contains 3D volumes for the saturated soil and rock within each of the walled phases, including appropriate porosity values. These volumes of stored water were compared to the volume pumped within each phase of operation, over the expected period of extraction</p>	No EIS updates are anticipated to address this IR.



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				<p>by recovering more solution than is being injected. In general, the wellfield will operate to draw a minimum of 1% more solution out of the wellfield compared to solutions injected in. This will help avoid increased subsurface pressures from injection pressure build up within the deposit.</p> <p><b>Rationale:</b> It is not clear where the extra groundwater will come from that will sustain this differential rate of injection and withdrawals as the freeze wall and bedrock basement will isolate the injection well from groundwater.</p> <p>If it is assumed that there is limited amount of groundwater present in the sandstone layer above the uranium deposit, that amount of groundwater in the sandstone layer is finite and will be exhausted at some point. Therefore, it is not clear where the extra groundwater will come from. If the extra volume of water is not accounted for in the modelling, that would ultimately affect the volume of water that ends up in the receiving environment and likewise the amount of contaminants contained.</p>		<p>based on the mining plan. The stored volume of water was calculated to be 3.4 (Phase 1) to 9.7 (Phase 4) times the estimated excess pumped volume. In other words, there is ample stored water within each walled phase to supply the excess pumped volume. The excess pumping creates a hydraulic gradient toward the ore zone within each walled phase, which will help to avoid vertical spreading of the UBS during operations. If monitoring during operations indicates water levels are falling quicker than anticipated, additional water could be added within the walled phase, within the Upper Sandstone Aquifer.</p> <p>The volume of water reduction within each phase of operations was evaluated within model simulations presented in Appendix 7C, Section 2.7. The volume reduction within mined phases was found to be minor compared to the volume of water pumped from the Upper Sandstone Aquifer located outside the freeze wall confines and within the regional groundwater system during decommissioning (i.e., pumping at 35.5 m<sup>3</sup>/hr). The pumping of groundwater for process water results in an order of magnitude more water volume extraction than the estimated volume required to replenish stored water when the freeze walls are thawed.</p>	
IR-08	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.1.4.2.2 Project Description	<p><b>Context:</b> This section describes how an inward hydraulic gradient will be created within the mining area as a secondary containment method for control of mining solution. While the process is described, there is no information on contingency measures in place for pump failure or system maintenance solutions. There is also no information on how quickly the hydraulic gradient, and therefore secondary containment, would be compromised if any pumps stopped working. It is also unclear how primary containment (i.e., well design) failure, such as physical/mechanical issues compromising casings, would affect the creation of the hydraulic gradient and secondary containment as well.</p> <p><b>Rationale:</b> It is important to have contingency planning in place in the event that there are any issues with the hydraulic gradient and secondary containment system for control of the acidic mining solution.</p> <p>There is no information in this section on how the hydraulic gradient (i.e., secondary containment) would be maintained if a well or pump (i.e., Primary containment) experienced problems.</p>	Provide further information regarding how the inward hydraulic gradient system functions, with particular focus on how the hydraulic gradient and secondary containment will be maintained if any wells or pumps were compromised.	<p>The following highlights the three levels of containment that will be in place to mitigate the potential for loss of containment of the mining solution. Mining solution containment was discussed in the draft EIS, Section 2.2.1.4.2 Wellfield Operation. As noted in the IR, the hydraulic gradient created in the mining zone between injection and recovery wells provides for secondary containment.</p> <p>i. Primary Containment (Well Design) The well configuration is designed to make sure fluids, whether injected or extracted, are confined to set depth locations. In the case of most injection and extraction wells, this would refer to the surface injection point and the screened location at the ore zone depth. The cased and sealed well in all other portions of the well design ensure no interaction with groundwater from other formations from surface to the deposit depth, thus preventing dilution from inward fluid flow of formation waters or outward migration from the well. Well integrity is monitored through live pressure monitoring systems in the annulus of the wells for leak detection and scheduled compliance checks via wireline tools of well integrity.</p> <p>ii. Secondary Containment (Hydraulic Gradient) Hydraulic gradients within the wellfield are maintained initially on a per pattern basis comprising of a single extraction well with four injection wells. In this initial stage of wellfield operations, all solutions from the four injection wells are drawn towards the single extraction well. As wellfield development progresses subsequent adjacent patterns are constructed. In these subsequent stages, the fluid from the injection wells is now drawn toward multiple extraction wells, essentially dividing the recovered solution between the number of operating extraction wells. As subsequent progression of wellfield development evolves, the inward hydraulic gradient of fluids injected will be further divided by adjacent extraction wells.</p> <p>In upset conditions, such as pump failure, or during scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. This is a standard approach used in ISR mining. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.</p> <p>iii. Tertiary Containment (Freeze Wall) The freeze wall provides two main benefits:</p> <ol style="list-style-type: none"> <li>A defined area for the mining process to occur with the establishment of clear ‘no flow’ boundaries being the freeze wall itself.</li> <li>Essentially removes the effects of the regional groundwater system and regional hydraulic gradient within the confines of the freeze wall. In the event of an upset condition, groundwater velocity is essentially null preventing any migration of fluids up or down gradient. This allows time to recover any fluids in a controlled manner while re-establishing operating conditions in what would otherwise be considered a ‘stagnant’ system.</li> </ol>	<p>The following text will be added to the final EIS in section 2.2.1.4.2.2 Secondary Containment of Mining Solutions.</p> <p>“In the case of an upset condition, such as pump failure, or scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.”</p>
IR-09	CNSC	Geology and Groundwater	Section 2.2.1.4.2.2	<p><b>Context:</b> This section indicates that mining solution within the mining area can primarily be controlled by maintaining an inward hydraulic gradient. The inward hydraulic gradient will be created by recovering more solution than is being injected.</p> <p><b>Rationale:</b> If, for some reason, the recovered solution is much more than that being injected, an excessive drawdown could be created. If, by accident, mining solution is leaking into the upper sandstone aquifer through crack in injection/recovery well casing at the same time, it would be challenging to remediate the upper sandstone aquifer in dry conditions (due to excessive drawdown).</p>	Please clarify if any measure will be implemented to avoid excessive drawdown and develop contingency measures to address such accident.	<p>The measures that will be implemented to avoid excessive drawdown are as follows:</p> <p>Continuous (real-time) water level monitoring will be implemented for hydraulic head measurements in individual wells as well as the surrounding open aquifer system contained within the boundaries of the freeze wall. These monitor wells will be installed at various depths throughout the mining area (i.e., within the freeze wall) ranging from the shallow groundwater system to the deposit depth and further, through the paleoweathered zone, into basement rock below the deposit and mining horizon. The mining methods operational success and efficiencies are benefitted by maintaining a shallow depth to water to reduce the magnitude of hydrostatic head needed to be applied to pump within each recovery well.</p> <p>In the event that excessive drawdown was identified through the monitoring system, it could be mitigated. Water would be pumped into the overburden aquifer to offset such injection and pumping imbalance. Water sources would include those from both groundwater and surface sources previously assessed.</p> <p>It is noted that leakage of “mining solution” into the upper aquifer is a hypothetical accident</p>	No EIS updates are anticipated to address this IR.

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						or malfunction that would not be allowed to persist as it would be identified by monitoring. Individual wells will be monitored for integrity and well operation would stop if a leak were detected to prevent or limit migration of fluid outside of the mining zone. Further, all monitor, injection and recovery wells can be retrofitted with down hole pumps to recover solution that may have leaked or migrated in an upset condition. Additional recovery wells can be installed at select depth to further increase recovery if the need should arise.	
IR-10	ECCC	Fish and fish habitat	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>	<p>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</p> <p>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</p> <p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p><b>Technical Discussion Required:</b> Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause.</p>	Denison met with the FIRT reviewers on April 19, 2023 to discuss the response to IR-10. Greg Newman, from Newmans Geotechnique Incorporated, attended the meeting to provide information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting Saskatchewan mining operations. A written response to IR-10, summarizing the material presented by Greg Newman, is included here as Attachment IR-10.	No EIS updates are anticipated to address this IR.
IR-11	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3 Project Description	<p><b>Context:</b> It is unclear how much contact water may be produced during the drilling of the mine well field during the construction phase of the proposed Project. Figure 2.2-14 indicates that no water will be produced during the drilling process in the construction phase. In Section 2.2.1.2 both mud rotary drilling and diamond drilling are proposed for the creation of wells. Both processes require water, however only mud rotary drilling produces liquid mud that is then reused in the drilling process.</p> <p><b>Rationale:</b> It is unclear if the liquid mud produced during drilling can be reused indefinitely with further water additions, or if this eventually becomes the clean sand grain cutting and how it will be disposed of (i.e., liquid or solid waste). If the mud produced from drilling is classified as liquid waste and disposed of as contact water, it is not clear if this is accounted for in the site water management plan and water balance during the construction phase. Contact water from well drilling during the construction phase has not been quantified or accounted for in Figure 2.2-1, and therefore it is unclear if proposed infrastructure during the construction phase has the capacity to contain this waste stream in addition to the waste streams currently outlined in Figure 2.2-1.</p>	Provide further information on potential wastewater produced during the construction phase from drilling processes, and if proposed infrastructure can contain any water produced.	A centrifuge will be used for separating out solids during both diamond and mud rotary drilling to recycle fluids. Only solid drill cuttings, not wastewater, will be produced and all muds and waters will be recycled as part of the drilling process. Upon completion of a drilling campaign, all remaining mud and water will be stripped of remaining solids, treated with mud zymes to break down polymers, and injected back down into the mineralized horizon. During active drill campaigns clean water will be held in approved tanks as part of the drill program between well drilling.	No EIS updates are anticipated to address this IR.
IR-12	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p>	<p>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</p> <p>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</p>	<p>1. and 2. Denison's approach to site water management is keep non-contact water “clean” – that is, the management approach provides that non-contact water does not come into contact with site aspects that may impart constituents/contaminants of concern and that non-contact water mingles with contact water. Contact water is water expected at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17), and also includes leachate collected from landfills. As such, runoff from the airstrip and site roads is considered non-contact water and will not be actively managed. However, should a spill occur, the spill response plan will be followed. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs.</p> <p>By following best practice and mitigation measures outlined in the EIS, Denison does not anticipate a need to continually manage water at the airstrip or along site roads as the water here will be clean, non-contact runoff. Examples of relevant mitigation measures include:</p> <ul style="list-style-type: none"><li>• Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li><li>• Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li><li>• Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li><li>• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li></ul> <p>Refer to Section 14 of the draft EIS for the screening and evaluation of various accident and malfunction scenarios. Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Additionally, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water</p>	No EIS updates are anticipated to address this IR.

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				<p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>		<p>removal means such as vac trucks or sump pumps could be employed and the areas would be re-graded to minimize water accumulation.</p> <p>3. As indicated in the response to IR-12, points 1 and 2 above, Denison expects contact water requiring management is at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17). For this area, the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m<sup>3</sup>. The wellfield runoff pond has been sized appropriately (38,200 m<sup>3</sup> with 1 m of freeboard) to contain this volume of water.</p> <p>4. Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.</p>	
IR-13	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	<p><b>Context:</b> The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).</p> <p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p><b>Rationale:</b> ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>	<p>Please provide:</p> <p>1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching;</p> <p>a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML.</p> <p>b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.</p> <p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>	<p>1. The waste rock from the basement is potentially acid generating due to localized pyrite mineralization. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units. Rock recovered from basement during drilling will be further characterized prior to or during drilling activities.</p> <p>1a. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further explorative works are ongoing part of ongoing Engineering activities and with confirmation of characterization through assays of representative samples.</p> <p>1b. Basement rock will be tested for potential for acid generation. It is expected that a portion will be potentially acid generating. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units.</p> <p>2. All basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. See also response to IR-04</p> <p>3. Clean waste rock will be generated as sandstone cuttings from drilling activities. Clean waste rock will be stored on the clean waste rock pad. The clean waste pile will be assayed and tested for Potential Acid Generation (PAG) during operations to ensure the material can be reused when required. Potentially acid generating waste rock will be stored on the special waste pad. Special waste is defined as mineralized materials that cannot be disposed of in the clean waste pile. It is primarily made of drill cores and cuttings from wellfield construction. A double-lined process water pond with leak detection has been designed to capture water from various areas, including the process precipitates storage pad and special waste pad. The pond will be designed to hold up to 30,000 m<sup>3</sup> of water and will be located next to the processing plant. The pond has been designed to hold a probable maximum precipitation event. The pond will be able to receive water from all site ponds and monitoring wells.</p> <p>The ponds that are designed to receive materials recovered during drilling activities are all lined with a leachate collection pond that will be monitored for water quality. The environmental monitoring program that will be presented during licensing will cover characterization of materials placed in the clean and special waste ponds to ensure environmental protection.</p>	<p>Section 2 of the final EIS will be updated per below:</p> <p>2.2.4.7 Special Waste and Special Waste Pad</p> <p>During Operation, the special waste pad is expected to contain special waste that is primarily mineralized core, <del>and</del> cuttings from wellfield development, <b>basement rock, and any waste rock determined to be potentially acid generating (PAG)</b>. Special waste from drilling activities is defined as uranium containing materials that cannot be disposed of in the clean waste pile, <b>including PAG waste rock</b>. Special waste will be determined by Denison geologists based on ore zone intersection expectations, <del>and</del> probe reading taken during wellfield drilling activities, <b>and results of systematic assays to characterize the acid generating potential of the waste rock</b>. Based on the current wellfield and freeze wall design, approximately <del>150</del> <b>2,000</b> m<sup>3</sup> of special waste rock will be generated.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings generated during wellfield development to recover uranium. This reprocessing may be done by placing the material in tanks with mining solution or placing the material underground into the mining area at the end of a well's production.</p> <p>The special waste pad may be used to temporarily store other materials that may be radioactive (e.g., contaminated soil) prior to final disposal in the industrial landfill or a licensed off-site facility.</p> <p>The special waste pad is estimated to be 2,500 m2 in size and will be constructed with a double composite liner system with leak detection capabilities (Figure 2.2-25). Any contact water coming off the special waste pad will be directed to the wellfield runoff pond (Section 2.2.3.5).</p> <p>2.9.1.3.3 Waste Management Program</p> <p>The Waste Management Program would include requirements and processes to ensure that Denison's activities that involve planning for, handling, transporting, processing, storage, and disposal of wastes are performed in a manner that complies with applicable regulatory and licence requirements and protects workers, the public, and the environment.</p> <p>The Waste Management Program would include identification of waste inventory and the characteristics of the waste (radiological and hazardous non-radiological), waste segregation, waste packaging and transfer requirements, and the plan for storage or disposal of the wastes. <b>The Waste Management Program will detail the plans for waste rock segregation based on mineralized content and acid generating potential.</b></p>



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IR-14	CNSC	Wastes and Decommissioning	Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)  Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)	<p><b>Context:</b> The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)</p> <p>Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as <i>Complete</i>.</p> <p><b>Rationale:</b> Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.</p>	How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?	<p>Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached. Please see response to IR-28 for information on how Denison will provide this information as the EA process advances.</p> <p>The option to leave concrete foundations in place will be discussed with Indigenous Nations and communities as decommissioning plans become more defined.</p> <p>The conceptual decommissioning plan (CDP) included in the draft EIS contains the appropriate level of detail for this stage of the Project. As described in Section 2.3.3, the details of the decommissioning plan will evolve and become more specific as the Project advances. The subsequent iteration of the plan is the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan will evolve over time and the plan will become more refined as the Project advances. Denison is committed to continue to engage with Indigenous Nations and communities to solicit input.</p> <p>The comment in Section 4 on page 4-33: "Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?" was addressed in the draft EIS in the following manner:</p> <p>- Concern about responsible authority for restoring the environment, including contaminants when mining concludes: Denison is responsible for decommissioning. Denison’s decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure.</p> <p>- How long will it take to have the environment fully restored: Based on best practice and technical studies completed for the Project, the active decommissioning phase is anticipated to be 5 years. The Post-Decommissioning phase extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program (Government of Saskatchewan 2009) or direct release of the land back to the Crown. Post-Decommissioning is expected to last 15 years and during this phase, monitoring will be conducted until the site-specific decommissioning and reclamation objectives for the Project are met.</p> <p>- if Denison is no longer the operator, how will this be completed?: The financial assurance process provides certainty that the Project can be decommissioned as planned. The Project will not be issued an approval to operate until the decommissioning plan and associated cost estimate are accepted by the Minister of Environment and the financial assurance is in place. If Denison is unable to complete the decommissioning for any reason (e.g., bankruptcy), the finances are available for the Province of Saskatchewan to complete the activities as planned. The PDP will include an associated estimate for the decommissioning costs and Denison will provide financial assurance to confirm the identified decommissioning activities can be completed as planned. Updates to the financial assurance are done in conjunction with updates to the decommissioning plan, on a frequency of every five years during operations.</p> <p>References: Government of Saskatchewan. 2009. <i>Institutional Control Program: Post Closure Management of Decommissioned Mine/Mill Properties Located on Crown Land in Saskatchewan</i>. Ministry of Energy and Resources. December 2009.</p>	Refer to IR-28 for information on EIS updates related to issues and concerns.
IR-15	ECCC	Fish and fish habitat	Section 2.2.3.4 Project Description  Section 8.1.3.4.2, Aquatic Environment	<p><b>Context:</b> In Section 2.2.3.4 it is stated that the estimated PMP event for Project infrastructure planning is 483.3mm. In Section 8.1.3.4.2 it is stated that the PMP is 489.3 mm.</p> <p><b>Rationale:</b> It is unclear which value is the correct PMP value and if Project infrastructure has been planned correctly.</p>	Provide the correct PMP value and verify that Project infrastructure has been designed utilizing the correct value.	<p>The PMP event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program (1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes.</p> <p>The PMP value in Section 2 will be updated from 483.3 mm to 493 mm in the final EIS. The PMP value used in Section 8 (489.3 mm) will not be updated because it is less than the design PMP and, as such, was conservative.</p> <p>References:  Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.  Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>	Section 2.2.3.4 of the final EIS will be updated as follows: “The pond will be surrounded by a 2.0 m berm, have capacity for 0.5 m storage from a probable maximum precipitation (PMP) event estimated to be <del>483.3 mm</del> 493 mm, and allow for maintenance of 1.0 m of free board.”

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IR-16	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> The EIS and technical supporting documents do not provide sufficient justification for the selection of the proposed wastewater treatment systems for the industrial wastewater treatment plant or the domestic wastewater treatment plant.</p> <p>In addition, it is not clear how the upper bound of the industrial wastewater treatment plant effluent quality was obtained.</p> <p><b>Rationale:</b> Draft REGDOC-2.9.2 formally documents the CNSC’s expectations to licensees for controlling releases to the environment. For proposed new facilities, these expectations include conducting a best available technology and techniques, economically achievable (BATEA) Assessment, and determining key parameters necessary to support the EIS. These include identifying:</p> <ul style="list-style-type: none"> <li>environmental release targets to inform the design of wastewater treatment systems to constrain the quantity and concentration of contaminants and physical stressors released into the environment,</li> <li>the best available technology and techniques through an options analysis; and</li> <li>the anticipated influent characteristics, overall treatment efficiencies, and maximum predicted design release as the output of the assessment.</li> </ul> <p>Consideration of the principle of pollution prevention and BATEA is also a requirement of REGDOC-2.9.1.</p> <p>CNSC staff have met with Denison to discuss the expectations in draft REGDOC-2.9.2.</p>	<p>Please provide a summary of the BATEA assessment to justify the selection of the wastewater treatment plant system.</p> <p>As part of the summary, please identify the anticipated environmental release targets used to inform the design, as well as the maximum predicted design release concentrations and loadings to the receiving environment. The maximum predicted design releases should be used in the ERA to demonstrate protection of people and the environment.</p>	<p>Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (e.g., effluent quality) needed for the EIS were developed by Denison’s Project engineers early in the EA process to allow for the biophysical and human assessments to advance. An example of one of these outputs is the IWWTP effluent quality. The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects.</p> <p>As stated in the Draft REGDOC 2.9.2 Denison understands that a BATEA assessment be conducted to determine the predicted design release characteristics as part of the licence application for a new facility or activity.</p> <p>Outside of the EIS process, the Project detailed engineering is progressing, including the design of the IWWTP and associated refinement of effluent quality predictions. Denison is following Draft REGDOC 2.9.2 to arrive at a treatment option that remains within the bounds of the EA, which ultimately predicts no significant impacts to the receiving environment. The maximum design release characteristics for the IWWTP will be provided as part of Denison’s licence application to the CNSC.</p> <p>Denison met with the CNSC specialist from the Health Sciences and Environmental Compliance Division on December 7, 2022 to discuss the approach associated with a sequential EA and Licensing, and it was agreed that the above approach is acceptable.</p> <p>Denison is committed to completing the BATEA and providing the details to the CNSC.</p>	No EIS updates are anticipated to address this IR.
IR-17	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> It is also acknowledged that Denison stated in meetings with CNSC staff that Denison intends to propose final release targets to the CNSC as part of the licence application submission.</p> <p><b>Rationale:</b> It is not clear in the submission whether Denison has considered whether any applicable technology-based performance standards exist in Canada or internationally, and would be relevant as effluent discharge targets, in order to ensure principles of pollution prevention are applied. Consideration of this would help ensure that the proposed effluent discharge targets harmonize with existing federal, provincial/territorial, and/or municipal requirements. For example, there are release limits for radium-226, TSS, and pH outlined in the federal Metal and Diamond Mining Effluent Regulations, which have been demonstrated to be achievable in the uranium mine and mill industry.</p> <p>In addition, countries like the United States, where in-situ recovery has been conducted in the past, have specific technology-based limits. These are known as New Source Performance Standards and are identified in US Code of Federal Regulations (US CFR) 40, Chapter 1, Subchapter N, Part 440 - Ore Mining and Dressing Point Source Category. It is not clear whether these have been considered in Denison’s assessment. These should be considered when identifying suitable achievable technologies.</p>	Denison should harmonize their proposed Effluent Release Targets with the technology-based performance standards that exist in the Metal and Diamond Mining Effluent Regulations where applicable, or other suitable international regulations.	<p>Denison appreciates the comment and is committed to meeting all MDMER release targets.</p> <p>The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects. Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (effluent quality) developed for the IWWTP were necessary and determined by Denison’s Project engineers early in the process to allow for the EIS biophysical and human assessments to advance.</p> <p>Proposed effluent release to the environment starts at Operation phase and BATEA information will come with the application for the license to operate. Please also see response to IR-117.</p> <p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three."</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project (see IR-16). The effluent quality predictions provided in the EIS will continue to bound the assessment, and provide a conservative representation of risk to human health and the environment.</p>	No EIS updates are anticipated to address this IR.
IR-18	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description Appendix 8-E	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The</p>	<ol style="list-style-type: none"> <li>Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</li> <li>Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</li> </ol>	<p>Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria and other requirements of the regulations. The lack of the MDMER general parameters and Schedule 4 substances in the draft EIS table 2.2-1 should not be misconstrued to mean Denison was not intending to meet these requirements. Rather these tables were developed based on rigorous screening to identify COPCs and then model these in the receiving environment. Table 2.2-1 in the draft EIS is not reflective of the proposed monitoring parameters during effluent release. Regardless, Denison will update the table; please see the response below.</p> <p>1) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p>	Table 2.2-1 and Appendix 8-E will be updated in the final EIS; the updated version of the table is provided in attachment IR-18.



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				<p>proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	<p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>	<p>2) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted.</p> <p>3) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p> <p>4) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Applicable screening criteria have been updated to identify most applicable acute or chronic thresholds for the protection of aquatic life.</p> <p>5) As noted in response to IR-16 and IR-17 effluent discharge criteria as depicted in the draft EIS provide a bounding scenario of the basis of the assessment of Project effects and final effluent quality will meet prescribe limits developed through licensing and permitting, as informed by the BATEA evaluation process. In that context, it is expected that the uranium concentration in effluent would be lower than assumed for the purpose of the evaluation in the draft EIS and it is understood that uranium concentrations (or concentrations of other constituents) that resulted in acute toxicity would be not be permitted. Accordingly, the need for and types of mitigation measures as might be needed for uranium (or other constituents) would be developed as part of the process of developing final effluent quality limits in the permitting and licensing processes.</p>	
IR-19	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.4 Project Description	<p><b>Context:</b> In this section, it is proposed that the IWWTP precipitate pond will have a single geosynthetic composite liner system, which is used for ponds/pads that only store non-radioactive materials.</p> <p>However, from Section 2.2.3.9 on industrial wastewater treatment, it is unclear if the precipitates from the stage three neutralization process that are pumped to the IWWTP precipitates pond will have any residual radioactivity.</p> <p><b>Rationale:</b> For the protection of the surrounding environment, it is important that any ponds/pads that are expected to store radiological contaminants be designed to have proper controls (i.e., liners with monitoring systems) in place.</p>	<p>1. Confirm the characterization of the precipitates that are to be stored in the IWWTP precipitate pond.</p> <p>2. If radiological constituents are expected within those precipitates, update the draft EIS to ensure the proposed geosynthetic liner system for the IWWTP precipitate pond will be adequate to ensure the protection of the surrounding environment.</p>	<p>1. The IWWTP precipitate pond will contain non-radiological, gypsum-like material. As outlined in Section 2.2.4.5 and 2.2.4.6, any radioactive precipitates generated during the first stage of the IWWTP will be directed to the process precipitate pond, not the IWWTP precipitate pond.</p> <p>Waste segregation and management will be important for Denison during Operation. The Waste Management Program will be established and approved by the CNSC as part of licensing. Denison will conduct regular assays of slurry sent to the IWWTP precipitate pond during Operation to confirm the quality of these precipitates.</p> <p>2. In consideration of the above, radiological constituents are not expected within the IWWTP precipitate pond.</p>	No EIS updates are anticipated to address this IR.
IR-20	NRCan	Fish and fish habitat	Section 2.3.3.1.1 Appendix 7-C	<p><b>Context:</b> The proponent’s objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent’s acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCan’s opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent’s decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>	<p>NRCan requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	In the final EIS, Table 3-5 in Appendix 7-C will be updated. The updated table is provided here as Appendix B to Attachment IR-20, IR-67, IR-69.
IR-21	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.3.3.1.3, Project Description	<p><b>Context:</b> The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p><b>Rationale:</b> From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>	<p>Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.</p>	<p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p> <p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface. Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p> <p>Further, this potential subsidence, if it were to occur, would be limited to the footprint directly above the deposit which will not contain any decommissioned waste management infrastructure. Two main Project components containing waste in the Post-Decommissioning</p>	No EIS updates are anticipated to address this IR.

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						<p>period will be the IWWTP precipitate pond (which will contain non-radioactive gypsum-like material) and the Industrial Landfill. All other wastes will be disposed of off-site. Spatially, the mining area is about 500 m from the IWWTP precipitate pond and about 800 m from industrial landfill.</p> <p>Given the negligible risk and magnitude of surface subsidence (2.4 to 2.8 mm) which would be limited to the footprint directly above the deposit, along with the distance from this area to on-site decommissioning wastes, there is negligible risk for effects of subsidence to the planned decommissioning of waste management infrastructure.</p>	
IR-22	NRCan	Fish and fish habitat	Section 2.10  Appendix 2-C, section 1.1.1.4	<p><b>Context:</b> With respect to the choice of In-Situ Recovery (ISR) mining solution, two alternatives were assessed: alkaline and acidic lixivants (Appendix 2-C, sec. 1.1.1.4). In the consideration of technical and economic feasibility of the alternatives (Table 2, Appendix 2-C), the proponent concludes that: Option 1 (alkaline) is not technically feasible based on the uranium deposit geochemistry. Option 2 (acidic) is technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium. Accordingly, the alkaline alternative was not carried forward into the Environmental Assessment (EIS, Table 2.10-1; Appendix 2-C, Table 3).</p> <p>While acidic ISR solutions are widely used internationally (e.g., Kazakhstan), in the United States, where the environmental regulatory regime is more strict, alkaline solutions have been used exclusively since 1970.</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent should provide a more thorough technical justification for adopting an acidic ISR lixiviant.</p>	<p>In the Alternative Means Assessment (Appendix 2-C), NRCan requests that the proponent provides a more thorough technical justification for selecting an acidic ISR lixiviant rather than a less environmentally problematic alkaline leach used exclusively in the USA.</p>	<p>The following additional information will be added to Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution:</p> <p>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</p> <p>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth, grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>22-</sub> complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previously examined in detail.</p> <p>As noted in Table 2 of Appendix 2-C, the alkaline leach option for mining solution was determined to not be technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium.</p>	<p>Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution will be updated as follow (additions in <b>bold</b>, deletions in <del>strike</del>through):</p> <p><b>Two options were considered for mining solution: Option 1: alkaline solution and 2. acidic solution.</b></p> <p>Factors determining the choice between acid or alkaline ISR technology are: composition of the host rock and ores, reagent cost and consumption, the degree of uranium recovery, and the intensity of the process (IAEA 2001). The leach intensity is determined as the sum of the leach duration, solution ratio (liquid/solid), and average uranium concentration in the recovery solution.</p> <p><del>1. Alkaline solution</del> Alkaline or high-pH mining solutions are used at a number of uranium ISR operations. The mining solution is typically made with carbonate or bicarbonate. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. Ores with a higher carbonate content normally require alkaline (bicarbonate) leaching.</p> <p><del>2. Acidic solution</del> Acidic or low-pH mining solutions are used at a number of uranium ISR operations. The acidic mining solution is typically made with dilute sulfuric acid. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. For economic sulphuric acid leaching, the carbonate content should not exceed 2% CO<sub>2</sub>.</p> <p><b>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</b></p> <p><b>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth,</b></p>

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							<p>grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub> complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previous examined in detail.</p>



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IR-23	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	<p><b>Context:</b> There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.</p> <p>A few examples:</p> <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There's lots of heavy muskeg there. A lot of us have been there, and we'd like to know there'll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn't happen. Even the permafrost is now further down. In the Wheeler River area, where there's some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> <p><b>Rationale:</b> Appendix 2-C, Alternative Means assessment, states (p.3): "Engagement with Interested Parties naturally included alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and <i>Appendix 2-A Engagement Database Summary – Project Description</i> for details of engagement information referenced in this alternative means assessment."</p> <p>It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.</p>	Please explain how comments and concerns collected during Denison's engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it's appendices.	<p>Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement topics, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. Two main areas where comments and concerns fed into and informed the Alternatives Assessment are: 1) Appendix 2-C, Section 1.2 Consideration of Technical and Economic Feasibility along with Land Use Screening, and 2) Appendix 2-C, Section 1.4 Evaluation of Alternative Means.</p> <p>The comparative evaluation of alternative means is presented in Appendix 2-C, Table 6 to Table 22. The evaluation considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in Appendix 2-C, Table 5, following the application of mitigation measures described in Appendix 2-C, Table 4. In each case, the preferred alternative and rationale for its selection were identified. In addition, specific input received from Indigenous groups and other Interested Parties that contributed to the selection of the preferred option was highlighted, when applicable. The alternative means assessment provided in the tables in this section was conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives.</p> <p>To follow-up on one of the examples listed in the context and rationale section of this IR, 16-EN-DesNd-101.1 was a comment related to interest in business opportunities. As noted in Appendix 2-A, this comment factored into the comparative evaluation of alternative means for waste management, domestic waste disposal in the section outlining input received from Interested Parties. For additional background, two options were under evaluation: Option 1 was collection and disposal off-site by a third-party contractor and Option 2 was collection and disposal in an on-site domestic landfill. The following text is available in Appendix 2-C, Table 17: Waste Management – Domestic Waste Disposal - Alternative Means Assessment:</p> <p>During seven years of engagement activities for the Project, Denison has understood the importance of designing a project that minimizes interactions with the biophysical environment and the importance of continued land use by Indigenous groups. Looking at domestic waste disposal options, the option to transport domestic waste off site to a nearby licensed facility may generate a local economic opportunity (16-EN-DesNd-101.1, 19-EN-VB-132.5, 21-ENSUR-446.48). However, the transport of material off site would increase traffic, which may have a negative effect on traditional land use, infrastructure and services, and wildlife (16-EN-ERFN-100.15) (21-EN-SUR-446.68). Increased traffic would also increase greenhouse gas emissions. Concerns related to climate change were raised during engagement and consultation activities completed by Denison (e.g., 22-EN-ERFN-621.15, 22-EN-SUR-652.57). It should be noted that these concerns pertain to climate change rather than GHG emissions specifically. The concerns included observations of climate-related changes that have been noticed by the English River First Nation (e.g., depth of permafrost; 16-EN-ERFN-100.17) and observations by the English River First Nation Trapper who provided local knowledge in support of the EIS (19-LK-ERFNTrap-134.232). While no specific feedback was received on the domestic waste disposal options, the above provides context on how Denison's fulsome engagement activities have influenced the selection of a preferred alternative for domestic waste disposal.</p> <p>Based on the evaluation of alternative means, a preferred alternative means for each respective Project component or activity was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided and input received by Interested Parties is presented. As shown in the above example, the input received from Interested Parties was an important part of the multifaceted evaluation.</p>	See attachment IR-24 for proposed content for final EIS Section 2.10, which, relative to the draft EIS, includes the addition of Section 2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment.
IR-24	CNSC	Alternative Means	Section 2.10.2 Alternative Means	<p><b>Context:</b> While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p><b>Rationale:</b> As noted in the Agency's <a href="#">Operational Policy Statement on Addressing "Purpose of" and "Alternative Means" under the CEAA 2012</a>: "If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice."</p>	Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.	Additional details from Appendix 2-C will be provided in Section 2.10 of the final EIS. Also, an example of alternative means evaluated for mining method will be added into Section 2.10.2 in the final EIS. It is noted that no new information would be presented in the final EIS Section 2.10.2 beyond that which was presented in the draft EIS Appendix 2-C.	See Attachment IR-24 for proposed updates to Section 2.10.2.
IR-25	CNSC	Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p><b>Context:</b> The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: "As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS." (p. 11-36)</p>	Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.	<p>A study agreement was signed with the MN-S to complete a Metis Knowledge Study by the end of October 2023. Denison has met with the MN-S to discuss the next steps and anticipated timeline, however no information has been provided to Denison, to date. When the study is completed within the agreed upon timeframe, Denison will update the final EIS to include relevant information in the assessment.</p> <p>It is important to note that Denison has incorporated Metis land use information and perspectives into the draft EIS, through the funding of the Kineepik Metis Land and Occupancy information along with the KML VEC statement, of which relevant information has been incorporated directly into the draft EIS to determine effects to the human environment.</p>	The final EIS will be updated with applicable information pertaining to the effects assessment from the Metis Knowledge Study when provided within the agreed upon timeframe (end of October 2023).

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				<p><b>Rationale:</b> More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.		
IR-26	CNSC	Precautionary principle and approach	Section 3.4.8 Lands Taken Up from an Indigenous Perspective (p. 3-14)	<p><b>Context:</b> Denison states: “Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach. Examples of concrete actions to address uncertainty in cases where IK and LK have differing conclusions on predicted Project effects include addressing uncertainty through monitoring and follow-up programs and communicating results of those monitoring and follow-up programs to demonstrate they have been responsive to the IK shared.” (p. 3-14)</p> <p><b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “In documenting the analyses included in the EIS, the proponent will demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.</p> <p>A document by Canada’s Privy Council Office, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a>.” (Section 2.5)</p>	Please clarify how the precautionary principle, and the Privy Council Office’s, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a> has been considered and incorporated into the EA described in the EIS.	<p>Page 3-14 of the EIS notes that "Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach."</p> <p>The precautionary approach to the evaluation of effects is described in Section 5.8.1.2.2 of the EIS, which specifically deals with the confidence of predictions and states:</p> <p>"In this EA, the precautionary approach to the evaluation of potential effects was adopted, recognizing areas of uncertainty and uses conservative assumptions and approaches within the assessment process. Areas of uncertainty in the process and in predictions for each VC are identified and discussed in each VC-specific section, or on a KI-specific basis as applicable."</p> <p>"Confidence predictions are defined as low, moderate, or high. Where a high degree of uncertainty regarding a residual adverse effect is evident, the confidence level may be low. A high level of confidence is assigned to predictions that have direct, site-specific quantitative data to support the predictions. Low or moderate degrees of uncertainty are manageable through monitoring and follow-up programs to confirm the absence, presence, and extent of residual adverse effects."</p> <p>The Privy Council Office’s, A Framework for the Application of Precaution in Science-based Decision Making About Risk was not specifically referred to in making decisions regarding discrepancies among IK and western scientific knowledge. Rather ERFN, KML/Pinehouse, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML/Pinehouse declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). An example of where greater precaution was exercised is found in the conclusions for effects on Indigenous Land and Resource Use, in which the overall confidence rating was moderate based on the communities’ previous experience with the uranium industry, but could not "be considered as high as the Indigenous COIs lack certainty about ISR mining technique" (Section 11.1.6.4).</p>	No EIS updates are anticipated to address this IR.
IR-27	CNSC	Cumulative Effects Analysis	Section 3.4.8	<p><b>Context:</b> During an outreach and engagement trip by CNSC in October 2022, an abandoned exploration camp adjacent to the proposed Wheeler River site was observed. This site has not been identified within the EIS as part of the cumulative effects assessment. As noted in section 3.4.8, KML has also raised concerns with Denison related to abandoned camps and industrial waste left with no programs for clean-up.</p> <p><b>Rationale:</b> Section 9.4.3 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> states that “The applicant shall assess any residual adverse environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area.”</p>	Please specify why abandoned exploration camps and industrial waste aren’t taken into consideration when completing cumulative effects assessment.	<p>Section 5.9 outlines the general methods and approach for cumulative effects assessments, while each biophysical and human environment assessment provides details on their Valued Component (VC)-specific approach. The inclusion list in Section 5 does include exploration and mining activities, and options for other projects and activities, as appropriate.</p> <p>With this approach the footprint of the abandoned exploration camp was considered within the terrestrial cumulative effects assessment.</p> <p>Section 11 Land and Resource Use notes that existing projects or activities were not considered as part of the cumulative effects assessment because they were captured and assessed within baseline conditions or existing conditions. This approach would include the abandoned exploration camp adjacent to the proposed Wheeler River site.</p>	No EIS updates are anticipated to address this IR.
IR-28	CNSC	Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>3. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>	Please see response in Attachment IR-28.	<ul style="list-style-type: none"><li>• Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices</li><li>• Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)</li><li>• Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)</li><li>• Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)</li><li>• Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)</li><li>• Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)</li><li>• Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)</li><li>• Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)</li><li>• Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)</li><li>• Table 4.3-10: Key Issues and Concerns from Ya’thi Néné Lands and Resources Office (and corresponding table in the IER)</li></ul>

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							<ul style="list-style-type: none"><li>Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse</li><li>Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval</li><li>Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse</li></ul> A new table will be included for Peter Ballantyne Cree Nation as well into the final EIS and in the IER. <ul style="list-style-type: none"><li>Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description</li><li>Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description</li><li>Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater</li><li>Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment</li><li>Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment</li><li>Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health</li><li>Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use</li><li>Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life</li><li>Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics</li><li>Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions</li><li>Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project</li></ul>
IR-29	CNSC	Current use of lands and resources for traditional purposes	Section 4.3.2 and IER	<p><b>Context:</b> In this section, Denison includes the engagement with BNDN and includes a summary of issues and concerns table for the Nation. Within the history of interactions (Section 4.3.3.2.1).</p> <p><b>Rationale:</b> Denison states that they have been providing information on the project to BNDN in 2019, 2021 and again in 2022 and that Denison and BNDN have not responded to date in order to advance further engagement and dialogue.</p>	Please ensure updated information of any additional engagement activities that Denison has completed with BNDN related to understanding their current and traditional land use and potential interests near the proposed project is provided.	<p>Denison is able to provide the following information with respect to engagement with BNDN.</p> <p>Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.</p> <p>On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.</p> <p>On May 10, 2023, Denison met with BNDN again, to discuss a process for engagement going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison’s access to data BNDN previously referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to further funding from Denison to BNDN. Denison continued to request the available site-specific information in order to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN in order to potentially adjust engagement approaches with BNDN.</p> <p>On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided further information from BNDN that BNDN would connect with Denison in the future to determine next steps together.</p> <p>On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.</p> <p>Subject to the development of a specific engagement process between Denison and BNDN, as identified above, Denison is committed to maintaining an open dialogue with BNDN regarding their interests in the Project. Denison will make sure the above information, and any further information in this respect, including potential resolution of issues, will be included in the final EIS and an update to the IER.</p>	Updates will be included in the final EIS Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER) as part of response to IR-28.
IR-30	CNSC	Indigenous physical and cultural heritage	Section 4.3.2.1.3, Table 4.3.2	<p><b>Context:</b> Concerns were raised during engagement sessions that “Elders are not being consulted as most of the engagement has been through online means and without a translator”.</p>	How has Denison adapted engagement with Elders from the ERFN since receiving this comment on March 31, 2021?	Since receiving the comment about the challenge with virtual engagement activities and associated translation for those requesting it, Denison has incorporated simultaneous Dene translation into the Zoom virtual meeting feature. This was used in a virtual meeting	No EIS updates are anticipated to address this IR.



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				<b>Rationale:</b> There’s no indication that a translator has been employed to engage with Elders since 2021 in the engagement Table 4.3.2.		undertaken for the Athabasca Basin First Nations and Communities, in September 2021. The feedback received was overwhelmingly positive. Going forward, should Denison have to deploy virtual meetings where translations are required, this tool will be deployed again.  For all in person meetings, Denison provides a translator, who can assist with anyone requiring discussion to occur in their language.	
IR-31	CNSC	Indigenous Engagement	Section 4.4.2.1.3, Key Engagement Activities (p. 4-88)	<b>Context and Rationale:</b> Regarding the following: “An open house for the general public was planned to be hosted in 2022 on preliminary effects and mitigation, but due to concerns identified by MN-S about hosting a public open house in a community with a significant Métis population, this meeting was postponed by Denison. Denison looks forward to rescheduling the meeting in collaboration with the MN-S.” (p. 4-88)	Please provide an update on the evolution or progress of this engagement with local communities, following collaboration with MN-S (or otherwise).	Denison continues to respect the delegated Duty to Consult to the Metis Nation - Saskatchewan for a number of communities with strong presence of Metis Citizens for engagement about the Wheeler River Project. As such, Denison will follow the Metis Nation - Saskatchewan direction in this regard until such time as this direction changes.  Denison is pleased to report that on February 11 and 12, 2023, the MN-S coordinated a meeting for Denison, the CNSC, the Province of Saskatchewan and the Metis Locals from Northern Regions 1 and 3 to provide an overview of the Project and respond to questions and concerns.	Updates will be included in the final EIS accordingly.
IR-32	CNSC	Current use of lands and resources for traditional purposes	Section 5.3  Section 9.0 Terrestrial Environment	<b>Context:</b> Some sections of the EIS (such as Fish and Fish Habitat, Indigenous Lands and resource use) indicate that Indigenous and/or local knowledge was considered when defining the spatial boundaries. However, this is not included in other sections, such as Terrestrial Environment.  <b>Rationale:</b> Section 5.2.2 of CNSC’s Generic EIS Guidelines require that spatial boundaries be defined by considering, but not limited to, the following criteria: Community and Indigenous traditional knowledge, ecological and technical considerations.	Please provide any additional details about how any comments or concerns raised were considered in defining the spatial boundaries with Indigenous Nations and communities with respect to spatial boundaries, for the Terrestrial Section and which specific Indigenous Nations and communities were engaged on these topics and how their input and knowledge was incorporated into the EIS.  If already presented in the EIS text body, please indicate where this information can be found or link to Section 4 of the EIS or in the IER.	The rationale for the definition of study areas for the purpose of the assessment of the Terrestrial Environment valued components (VCs) is described in Section 9.1.1 of the draft EIS. The Project Area and Local Study Area (LSA) were delineated based on the expected extent of potential direct (footprint) and indirect (sensory disturbance) Project effects; whereas, the Regional Study Area (RSA) considered an 8 km buffer around the Project Area to provide an appropriate spatial scale upon which potential Project effects could be evaluated at the landscape scale where key Terrestrial Environment VCs reside and move within and upon which cumulative effects could be assessed.  No specific comments or concerns were raised on the spatial scale of the Terrestrial Environment study areas during engagement activities, though considerable input was solicited / received regarding many of the Terrestrial Environment VCs that helped to contribute how the assessment study areas were defined. This is especially true in consideration of the relatively high number of comments received through engagement regarding wildlife (as represented by ungulates, furbearers, woodland caribou, and birds in the draft EIS) and wildlife use by local and Indigenous people/ communities (see Sections 9.3.3.1.2, 9.3.3.2.2, 9.3.3.3.2, 9.4.3.1.2, 9.4.3.2.2, 9.4.3.3.2 in the draft EIS Appendix 9-A for details). Cumulatively, this input puts high importance on and speaks to the broad knowledge of wildlife in the vicinity of the Project, informing the need to define the RSA to an appropriate spatial extent, as was the case on the draft EIS.  In addition, and within the context of the IR, it is appropriate to also consider the assessment of terrestrial environment from the perspective of Land and Resource Use per Section 11 of the draft EIS, since the two (Terrestrial Environment and Land Are Resource Use) are so intimately related. For context the Terrestrial Environment RSA, fits within the Indigenous Land and Resource Use RSA. Section 11 of the EIS is focused on Land and Resource Use and includes consideration for various terrestrial VCs and key indicators (KIs) as resources. With respect to Indigenous Land and Resource Use, the definition of spatial boundaries is offered in Table 11.2-2 which notes that the LSA is inclusive of direct and indirect effects to relevant VCs will occur, including the maximum combined extent of supporting VCs associated with the aquatic, terrestrial, noise, and health LSAs. It is inclusive of trapping, fishing, and travel through and adjacent to the Project Area. The RSA is inclusive of trapping block N-18, which represent a familiar reference for local Indigenous communities and capture the broad land usage patterns of local communities. Trapping blocks are defined regions and have membership that is regulated by a local trapping association and membership is generally only open to local Indigenous community residents though non-Indigenous trappers may also participate as members of the trapping association. If resource use activities were displaced, it is likely this would still occur within the N-18 trapping block area where individual resource users already have familiarity.	No EIS updates are anticipated to address this IR.
IR-33	CNSC	Residual Effect Characterization	Section 5.8.1, Definitions for Residual Effects Characterization and Significance  Section 5.8.1.1, Residual Effects Characteristics  Section 8, Table 8.3-9: Fish and Fish Habitat - Surface Water Quality	<b>Context:</b> Denison uses specific criteria (Residual Effect Characteristics: Direction, magnitude, geographic extent, duration, frequency, reversibility, context and likelihood) and associated ratings (e.g., adverse/positive, low/moderate/high) for the predicted effects assessment. However, it is unclear whether an aggregation method was used in order to determine whether impacts will be significant or not significant, depending on the combination of rating categories (i.e., weightings that were calculated, use of decision rules).  For example, medium term and long term are both used to represent the same time category: “Effects are expected to last between 3 to 38 years (i.e., effects expected during Construction through to the end of post-Decommissioning).” (See table 8.4-13 on p. 8-200 compared to table 8.4-12 on p. 8-199 and table 8.5-9 on p. 8-246).  <b>Rationale:</b> The Generic Guidelines state: “The method used to describe the level of the adverse effect should be transparent and reproducible.”  In Table 8.3-11, duration was moderate, but again uses same rationale. There is no ‘moderate’ in Table 8.3-8, and by the same rationale, this should be medium-term to be consistent with definitions provided and summary Table 8.3-12.  It was noted that all three tables should be deemed medium-term	If an aggregation method was used and ratings (e.g., High, medium, low) were weighted, what weightings were used, how were these calculated? Please also describe any decision rules that informed the determination of significance.  If no aggregation was used, how did Denison ensure that results were consistent, given the varying rankings for each of the key criteria, and varying combination?  Regarding inconsistencies in ratings, please use consistent terminology for same rating.	Denison did not use an aggregation method with weighted ratings. The assessment approach and methodology was outlined in draft EIS Section 5, Approach and Methodology. Please note that Section 5.8 provided a guide for technical leads to conduct residual effects evaluation; however, Section 5.8 also recognizes that the specific definitions and ratings for some characteristics may be developed on a VC-specific basis as presented in each VC-specific section.  Denison reviewed the draft EIS to ensure results were consistent. This included checks on the consistent application of characteristics and ratings along with any supporting rationale. Nevertheless, as pointed out by the CNSC, there appear to be some inconsistencies in Section 8 of the draft EIS. The final EIS will be updated, specifically Section 8 where inconsistencies were highlighted in IR-33 context and rationale text. Importantly, these are effectively editorial issues and do not change the assessment summaries or conclusions.	Ratings for duration and frequency in Section 8 of the final EIS will be updated. Residual effect characteristics and ratings will be consistent between definitions tables and subsequent summary (results) tables within a section.  This will include consistent use of the ratings for the residual effect characteristic of duration, as follows: <ul style="list-style-type: none"><li>• Short-term – Less than 3 years (i.e., effect happens during Construction only).</li><li>• Medium-term – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</li><li>• Long-term – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</li></ul>

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				based on definitions of ratings outlined in Table 8.3-8. Frequency was also showing up as "continuous" and "continuously" in these tables.			<p>This will include consistent use of the ratings for the residual effect characteristic of frequency, as follows:</p> <ul style="list-style-type: none"> <li>Infrequent – Effect occurs several times at sporadic intervals.</li> <li>Frequent – Effect occurs many times on a regular basis.</li> <li>Continuous – Effect occurs continuously.</li> </ul>
IR-34	CNSC	Cumulative Effects Analysis	Section 5.9.2.2 (p. 5-41)	<p><b>Context:</b> Denison identifies the Gryphon deposit as a project that is not reasonably foreseeable. The direct quote from the EIS indicates that the “Development of the Gryphon deposit as an underground mine was evaluated at the prefeasibility level in 2018 but has not advanced to feasibility study or EA. Denison has not announced an intent to proceed with the development of the Gryphon deposit.” (p. 5-41)</p> <p><b>Rationale:</b> The guidance <a href="#">Assessing Cumulative Environmental Effects under the CEAA, 2012</a> defines <i>Reasonably Foreseeable</i> as a “physical activity [that] is expected to proceed, e.g. the proponent has publicly disclosed its intention to seek the necessary EA or other authorizations to proceed.”</p> <p>In a press release by Denison Mines (2018: <a href="#">Denison announces decision to advance Wheeler River Project following positive PFS results</a>), Denison publicly disclosed intention to seek the necessary EA for Gryphon to proceed: “After careful consideration of the risks and opportunities associated with permitting and concurrent advancement of project engineering activities, the Company has decided to submit a PD and initiate the EA process in early 2019 for the Phoenix ISR operation, and to bring the Gryphon operation forward, at a later date, as required to achieve the PFS plan of Gryphon first production by 2030.”</p> <p>Further, Denison’s <a href="#">Wheeler River Webpage</a> references a “start of pre-production activities for the Gryphon operation in 2026”</p>	Please update the cumulative effects assessment in the EIS to include the Gryphon deposit as a Present or Reasonably Foreseeable Project.	<p>Denison has not publicly disclosed its intention to seek the necessary EA or other authorizations to proceed with mining the Gryphon deposit on the Wheeler River property at this time and does not meet any of the criteria for a reasonably foreseeable project as per the guidance for Assessment Cumulative Effects under the CEAA 2012 (below). A future physical activity could be considered reasonably foreseeable and should generally be included in the cumulative effects assessment if one or more of the following criteria are met:</p> <ul style="list-style-type: none"> <li>The intent to proceed is officially announced by a proponent. This information could be found in news media, the proponent’s website or via an announcement from the proponent directly to regulatory agencies.</li> <li>The physical activity is under regulatory review (i.e., the application is in process). This can be known, for example, if information about the review or application is available on a government website, or an EA notice has been made public.</li> <li>The submission for regulatory review is imminent. This could be known if the collection of data has already commenced, regulatory authorities have been contacted about information requirements, or through an announcement from the proponent.</li> <li>The physical activity is identified in a publicly available development plan that is approved or for which approval is anticipated (e.g., a wastewater treatment plant in a city’s long term development plan).</li> <li>The physical activity supports – or is consistent with – the long-term economic or financial assumptions and engineering assumptions made for the project’s planning purposes.</li> <li>A physical activity is required in order for the project to proceed (e.g., rail or port transportation facilities, or a transmission line).</li> <li>The economic feasibility of the project is contingent upon the future development.</li> <li>The completion of the project would facilitate or enable the future development.</li> </ul> <p>The Gryphon deposit is an exploration phase property and is inherently captured as such in the cumulative effects assessment because the levels of disturbance from these activities to date are captured with the characterization of existing conditions. It would be inappropriate to consider mining of the Gryphon deposit within the cumulative effects assessment as a mining operation as Gryphon cannot be considered a reasonably foreseeable activity. As is widely understood, very few exploration phase projects become operating mines.</p> <p>We note that the press release and the prefeasibility study referenced in the IR were from 2018. The Wheeler River Project Provincial Technical Proposal and Federal Project Description used to initiate the provincial and federal EA processes was submitted in February 2019. This represents Denison’s most recent plans for development and the Project scope does not include underground mining of the Gryphon deposit. Denison acknowledges that, if development of the Gryphon deposit as an underground mine is proposed in the future, this would require additional regulatory review and approval.</p>	No EIS updates are anticipated to address this IR.
IR-35	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>	Please consider acrolein in the assessment or provide a rationale for its exclusion.	An analysis of acrolein risks is provided in Attachment IR-35.	The analysis provided in Attachment IR-35 will be appended in its entirety to Appendix 6-A in the final EIS.
IR-36	CNSC	Other	Section 6, Table 6.1-11 Baseline External Gamma Monitoring	<p><b>Context:</b> For one of the exposures in the summary table for baseline external gamma monitoring (Table 6.1-11), the cell states "Destroyed in Field".</p> <p><b>Rationale:</b> No rationale or indication as to why or how it was destroyed is provided.</p>	Please provide any additional info available as to how equipment was destroyed.	Gamma monitor 8 was destroyed in the field by wildlife.	Table 6.1-11 in the EIS will be updated to say "Destroyed in Field by Wildlife"
IR-37	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<p><b>Context:</b> "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."</p>	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.	As described in Section B.1 of Appendix 6-A, staff at the Saskatchewan Ministry of Environment (Air Quality Branch) were consulted on the selection of CALPUFF and developing the CALMET meteorological data set, beginning in 2019. The CALMET consultation included an initial discussion about the general approach, and once the CALMET run was completed, two technical memos were produced and reviewed by Ministry staff including: 1) a memo completed in March 2020 summarizing the general CALMET approach and results (e.g., wind roses, temperature data, precipitation data); and 2) a follow-up memo completed in May 2021, which answered specific questions posed by Ministry staff. Ministry staff also completed a review and provided feedback on the CALPUFF model setup in August 2021.	No EIS updates are anticipated to address this IR.



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				<p><b>Rationale:</b> Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry" OR "Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.</p> <p>Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).</p>			
IR-38	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.1, Potential Interactions Between the Project and Valued Component / Key Indicators	<p><b>Context:</b> In this section, the Proponent identifies primary interactions between Project activities and air quality valued components and their associated key indicators. These primary interactions may result in an adverse effect on the valued component. Among the primary interactions are the use of emergency generators in a backup role should there be an interruption of the provincial electrical grid. However, it is not evident what is the anticipated frequency and duration of interruption to grid power.</p> <p><b>Rationale:</b> The Proponent states in the conservative operation scenario that while the site will be powered from the provincial grid at the operations stage, the back-up power generators were assumed to be operating under emergency conditions as a worst-case scenario. ECCC acknowledges the positive impact of extending the electrical grid to the Project site with resultant reduction in generator emissions. The impact of an interruption in grid power would be greatest during the winter months when energy use would be greatest and surface-based temperature inversions, which vertically trap emissions, would be strongest.</p>	Provide an evaluation of a worst-case scenario of grid power interruptions (i.e., average aggregate length of power outages) during the winter months for this section of the electrical power grid.	<p>Denison expects an average of six outages per year based on information provided by SaskPower. An outage would be anticipated to last a few hours per event.</p> <p>The air quality assessment conservatively assumed that the generators would be in operation 24/7 to predict worst-case concentrations in all months of the year, including the winter months. Given the above, Denison can confirm it has evaluated an appropriately conservative worst-case scenario for use of the diesel generators in the air quality assessment.</p>	No EIS updates are anticipated to address this IR.
IR-39	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.2, Potential Project-Related Effects	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent's CALPUFF model runs indicated exceedances for 24-hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.	Additional information on diurnal and seasonal influences of the modelled exceedances is provided in Attachment IR-39 in this document.	No EIS updates are anticipated to address this IR.
IR-40	CNSC	Air Quality	Section 6.1.6.2.1, Air quality significance determination	<p><b>Context:</b> Significance determination was not conducted for air quality due to interconnectedness with other assessment endpoints.</p> <p><b>Rationale:</b> It is not clear where and how these air quality assessment endpoints were factored into the assessment.</p>	Please provide additional information to demonstrate where and how these air quality assessment endpoints were factored in.	Noted in Section 6.1.1.1 of the draft EIS, Air Quality was identified as an intermediate Valued Component (VC) (i.e., does not have an assessment endpoint). Air quality assessment endpoints and the significance of potential effects of Project-related changes to ambient air quality were considered in Section 9 (Terrestrial Environment), Section 10 (Human Health) and Section 11 (Land and Resource Use). For additional reference, Figure 6.1 2 of the draft EIS is a graphic representation of the main linkages among the Air Quality VC and other VCs, illustrating the flow of assessment information from the Air Quality VC. By way of example, the habitat alteration effects considered for avian and wildlife VC and Key Indicators (KIs) included dust deposition, which could change avian and wildlife use through an indirect effect.	No EIS updates are anticipated to address this IR.
IR-41	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<p><b>Context:</b> The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."</p> <p><b>Rationale:</b> If La Loche monitoring station is located near anthropogenic sources and the project is not, use of this data is not a conservative or realistic representation of background.</p> <p>For a realistic approach, background data considered should be upper 95th percentile (or max if n&lt;10) from an area representative of project location</p> <p>For a conservative approach, background data from an area located even further from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was</p>	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.	<p>The Saskatchewan Ministry of Environment requires that background concentration data be added to air model predictions and an accepted set of data is provided in the Saskatchewan Air Quality Modelling Guideline. Following Ministry requirements, the northern regional data set was selected, which is based on monitoring data from the La Loche station. Because the La Loche station is located near anthropogenic sources, the background values are likely higher than background in the Project Area. This means that the total air model predictions (modelled + background) are likely more conservative than would necessarily have been the case had a similar data set been available that was free of any anthropological influence.</p> <p>Further consideration of the use of the La Loche data set is provided in Appendix 6-A, Section 6.0 of the draft EIS.</p>	No EIS updates are anticipated to address this IR.

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				added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.			
IR-42	Health Canada (HC)	Physical stressors (noise and vibration)	Section 6.2.4.2.2, (p. 6-66)  Section 6, Section 6.2.9, (p. 6-72)	<p>Nighttime noise impacts are not adequately considered for human receptors.</p> <p><b>Context:</b> The EIS states in Section 6.2.9 that, “While the predicted sound levels were less than the guideline values, the increase from baseline was predicted to be noticeable” (p. 6-72). No information is provided on individual noise events occurring during the nighttime period.</p> <p><b>Rationale:</b> While the increase from baseline is predicted to be noticeable, it is important to also consider that changes to the characteristics of the sound from baseline (e.g., a change in frequency, changes in sound modulation, increased impulsiveness or tonality, or a shift in noise from the daytime to being more at night) may cause noise to be even more noticeable. Consult <a href="#">ANSI S12.9-2005/Part 4</a>, clause A.1.3 for further information.</p> <p>In particular, consideration should be given to potential impacts on sleep, where adverse impacts are reported to begin when sound levels inside bedrooms exceed 30 dBA for continuous noise sources and 45 dBA L<sub>A</sub>max for discrete noise events (<a href="#">WHO, 1999</a>).</p>	<p>1. Provide a description of the project- related nighttime noise sources that may impact human receptors as well as a qualitative discussion of the resulting potential impacts on perception considering not only changes in sound levels but also sound characteristics (e.g., tonality, impulsivity).</p> <p>2. Confirm whether individual nighttime noise events exceeding 45 dBA L<sub>A</sub>Max outdoors (or 30 dBA indoors) are expected to occur more than 15 times over the nighttime period at any nearby potentially noise-sensitive human receptor location(s). This may be of particular concern if some construction and/or operations activities occur during sleeping hours.</p>	<p>1. During Construction, the nighttime noise sources that are the highest contributors to sound levels at the nearest human receptor location are expected to be construction equipment (bulldozers, trucks, cement mixing and crusher). During Operation, the primary contributors are truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels per ANSI S12.9-2005 Part 4.</p> <p>2. For Construction, the crusher was modelled at its maximum sound output. The diesel-powered equipment (dozers, drill rigs) was adjusted for partial operation. When adjusted to provide maximum sound levels instead, the predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> during the nighttime hours for either Construction or Operation.</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>Section 6.2.4.2.2 will be clarified as follows: The nighttime sound levels were not predicted to exceed the PSL of 36 dBA at any of the identified receptors during Construction or Operation. As with the daytime sound levels, the maximum predicted nighttime sound levels were predicted at the property identified as 302586/Risk2. The predictions at this location were 35.9 dBA and 34.0 dBA for Construction and Operation, respectively, and were similarly primarily attributable to drilling activity in the wellfield, concrete batching (during Construction), and movement of trucks on the access road. During Construction, the nighttime noise sources that were the highest contributors to sound levels at the nearest human receptor location consisted of construction equipment (bulldozers, trucks, cement mixing and crusher operation). During Operation, the primary contributors at night were truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels. The crusher was modelled at its maximum sound output, while the diesel-powered equipment (e.g., dozers, drill rigs) were adjusted for partial operation over the respective daytime and nighttime periods. To account for potential issues resulting from equipment operating at maximum levels (as opposed to daytime and nighttime averages), the models were run with the partial operation adjustments removed, for comparison to the Health Canada recommended criteria value of 45 dBA L<sub>max</sub> at night. The predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> for either Construction or Operation."</p>
IR-43	HC	Physical stressors (noise and vibration)	Section 6.2.5, (p. 6-66)  Section 6.2.5, (p. 6-71)	<p>Mitigation measures for project-related noise were not identified for the Construction phase.</p> <p><b>Context:</b> The mitigation measures provided in Section 6.2.5, including a complaint management system is also to be implemented as part of the EMS, are only proposed for the operations phase.</p> <p>However, construction activities are predicted to last more than one year. Construction noise will involve the use of equipment operating at the site, construction of surface facilities, drilling, and partial operation of the freeze plant. It will also include regular truck trips and air traffic for personnel changes.</p> <p><b>Rationale:</b> It is unclear if listed mitigation measures also apply to the construction phase (or only to the operations phase).</p>	<p>1. Clarify whether mitigation measures and the proposed EMS apply to the Construction phase. If not, identify mitigation measures for noise impacts related to Construction phase activities, and consider applying the EMS to the Construction phase and implementing the community complaints and response procedure from the beginning of construction activities.</p> <p>2. Health Canada suggests that construction noise lasting longer than 1 year be assessed as operational noise, and that noise mitigation measures be applied also to the construction phase. Special consideration should be given to mitigation measures for construction noise that occurs at night, in order to minimize impacts on sleep (i.e., avoiding tonal or impulsive noise sources at night).</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of Appendix H of Health Canada (2017), which identifies additional construction noise mitigation measures that could also be considered to reduce project- related noise.</p>	<p>1. Mitigation measures and the proposed EMS apply to both Construction and Operation. As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison will collaborate with English River First Nation (ERFN) and Kineepik Metis Local (KML) on a community specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous communities of ERFN and KML will be sharing information in an agreed-upon fashion. If noise from construction activities form part of the interests for each of these Indigenous communities.</p> <p>2. See response to IR-42 regarding nighttime work and potential for sleep disturbance.</p> <p>The draft EIS will be updated to include the above clarifications.</p>	<p>The first paragraph of Section 6.2.5 will be revised to clarify the applicability of mitigation measures as follows: "Strategies to reduce the likelihood and magnitude of the predicted effects include source elimination and utilizing planning measures to counter the conditions that contributed to the predicted effects. Mitigation measures <b>to be applied during both Construction and Operation</b> include:..."</p> <p>The first paragraph of Section 6.2.8 will be revised to clarify the applicability of the EMS as follows: "An EMS will be implemented and include air quality and noise management and monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines that have been adopted for this assessment <b>during both Construction and Operation.</b>"</p>
IR-44	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p><b>Context:</b> Section 6.2.8 discusses Monitoring and Follow- up. The proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p><b>Rationale:</b> Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see <a href="#">Health Canada, 2017</a>).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per <a href="#">Health Canada (2017)</a>.</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>	<p>1. Denison is undertaking sequential EA and licensing processes with the CNSC. As such, a detailed management system based on the CNSC’s safety and control areas and focused on anticipated compliance verification criteria will be developed over the upcoming months to support licensing activities.</p> <p>Further to this, a framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section. Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing, and as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.</p> <p>As noted in Section 6.2.8 of the draft EIS, a commitment to have a community complaints and response procedure for noise has been made by Denison. Consistent with Denison’s approach to sequential EA and licensing and as highlighted above the specific details associated with this complaints and response procedure, consistent with provincial and federal guidelines, will be developed at that time. Nevertheless, further information concerning the framework / approach to the community complaints and response procedure is provided below for reference.</p>	No updates to the EIS in response to this IR.

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						<p>Denison is committed to designing the noise monitoring and follow-up plan and an associated procedure in accordance with provincial and federal guidelines and industry best practice.</p> <p>The plan will identify:</p> <ul style="list-style-type: none"><li>• Project-related noise sources and control measures;</li><li>• How complaints will be filed, acknowledged, investigated, and resolved, including general timeframes for each phase;</li><li>• How confidentiality of a complainant’s identity will be respected, if requested, how anonymous complaints can be filed and how assistance for those who may face barriers to the procedure can be accommodated;</li><li>• How those involved in executing the plan will receive training and be made aware of the plan;</li><li>• How potentially affected communities will be engaged;</li><li>• How complaints and their resolutions will be tracked and recorded;</li><li>• How the performance of the plan will be monitored and evaluated and how this information shall be communicated; and</li><li>• How the plan will be updated.</li></ul> <p>It is anticipated that the following procedure specific to noise complaints is expected to be applied:</p> <ul style="list-style-type: none"><li>• Each complaint would be logged/recorded and include the following information:<ul style="list-style-type: none"><li>○ the name, address and contact information of the complainant (if provided);</li><li>○ the time and date of the complaint;</li><li>○ the nature of the complaint; and</li><li>○ meteorological conditions at the time of complaint (i.e., wind direction).</li></ul></li><li>• Determine the specific cause(s) of the complaint and take short-term and immediate actions to resolve the cause of the complaint;</li><li>• Provide a prompt response to the complainant (within 24-hours) and follow-up as needed based on the required actions to resolve the complaint; and</li><li>• Prepare and retain on-site a written report that:<ul style="list-style-type: none"><li>○ identifies the cause of the complaint;</li><li>○ identifies the actions taken to appropriately deal with the cause of the complaint; and</li><li>○ identifies any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.</li></ul></li></ul> <p>2. Denison has committed to working with its Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local), to understand the issues and concerns they have relative to the Project, and resolution of some specific items of interest or concerns may be resolved through the negotiation process of private contractual arrangements or agreements. The noise complaint mechanism will be one area that will be raised specifically with the Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local).</p>	
IR-45	HC	Change to an environmental component due to hazardous contaminants	Section 6 Air Quality Technical Supporting Document Section 6.3.1	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p><b>Context:</b> Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: “concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel”. However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p><b>Rationale:</b> Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p><b>References:</b> [1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table. <sup>1</sup>	An evaluation of carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022) is provided in Attachment IR-45.	No updates to the EIS in response to this IR.



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				<p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>			
IR-46	HC	Physical stressors (noise and vibration)	Appendix 6-A Table A-1	<p>Low-frequency noise and associated potential human health effects were not assessed.</p> <p><b>Context:</b> Some equipment that may emit low-frequency noise (LFN) have been listed in Table A-1: Assessment Scenarios and Sound Level Data (Section 6 Appendix A); however, no information describing potential impacts of this type of sound on nearby human receptors are presented.</p> <p><b>Rationale:</b> Low frequency noise can be associated with the introduction of noticeable vibrations and rattles in nearby structures. Research indicates that annoyance related to noise is greater when low-frequency noise is present (ISO 1996-1:2003). As sound environments are usually characterized using A-weighted decibel levels (dBA) that reflect the frequencies most audible to the human ear, the impacts of low- frequency noise may need to be assessed separately.</p>	<p>1. Clarify whether any project-related activities (construction, operation and/or decommissioning) may produce LFN that could impact off-site human receptors. Evaluate LFN in the noise assessment, if and where applicable. See Appendix C of <a href="#">Health Canada (2017)</a> for a discussion of LFN.</p>	<p>Appendix C.2 of Health Canada (2017) identifies an approach to assessing LFN from ANSI, which states that the energy sum of the 16-63 Hz octave bands should be less than 70 dBZ to avoid rattles due to LFN. The energy sum of the 16-63 Hz octave bands at the nearest human receptors is expected to be well below 70 dBZ (predictions indicate the values are in the order of 44 dBZ at the nearest human receptor).</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>The following paragraph will be appended to the end of Section 5.1 of Appendix 6-E:</p> <p>"In addition to the Ldn and %HA assessment methods, Health Canada (2017) also recommends assessing the potential for low frequency noise (LFN) impacts such as noise-induced vibration or rattles in building structures. The recommended approach from ANSI is to combine the predicted receptor sound levels in the 16 to 63 Hz octave bands and compare the total to a criterion of 70 dBZ. The maximum prediction for this assessment was 44 dBZ, and, therefore, LFN is not predicted to be a concern for the Project."</p>
IR-47	ECCC	Air Quality	Appendix 6-A, A.1	<p><b>Context and Rationale:</b> Verification of the following calculation is required for assessing predicted emissions of dust from general construction. It appears the result of 0.70 ton/acre/month is incorrect and should instead be 0.314 ton/acre/month.</p> <p>Appendix 6-A, Appendix A, A.1 (p. A4) TSP Emission Factor for General Construction:</p> $EF\ (TSP) = 0.11\ \frac{\text{ton}}{\text{acre}} \times 1.2\ \frac{\text{ton}}{\text{acre}} \div 0.42\ \frac{\text{ton}}{\text{acre}} = 0.70\ \frac{\text{ton}}{\text{acre}}$	<p>Explain how the emission factor total suspended particulates (EF (TSP)) result was obtained or rectify if it is incorrect and update the draft EIS to reflect the correction.</p>	<p>The formula incorrectly displayed the wrong units. It is 0.314 ton/acre/month, which converts to 0.70 tonnes/hectare/month. Denison confirms that this was a typographical error, and the result of the calculation is unchanged.</p>	<p>In Appendix 6-A, the formula will be changed to:</p> $EF\ (TSP) = 0.11\ \frac{\text{ton}}{\text{acre}} \times 1.2\ \frac{\text{ton}}{\text{acre}} \div 0.42\ \frac{\text{ton}}{\text{acre}} = 0.314\ \frac{\text{ton}}{\text{acre}} = 0.70\ \frac{\text{tonnes}}{\text{ha}}$
IR-48	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p><b>Context:</b> Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p><b>Rationale:</b> The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	<p>1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.</p>	<p>A new figure will be added to Section 6.2 of the final EIS showing the Project Area, Local Study Area, the receptor locations, and nearby land leases (both traditional and recreational). A copy of this new figure has been included with this IR response.</p> <p>As noted in the context and rationale for this IR, Denison included the receptor locations on the contour maps with the predicted noise levels (Appendix 6-E, Figures 8 to 15); as such, no edits to the Appendix 6-E figures are proposed in response to this IR.</p>	<p>A new figure will be added to Section 6.2 and a copy of the figure has been included with this IR response in Attachment: IR-48. The new EIS Figure will be 6.2-4; figure numbering will shift and Figure 6.2.4 Baseline Monitoring Locations for Noise in the draft EIS will become Figure 6.2.5 in the final EIS.</p>
IR-49	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The Noise Source Characterization is incomplete.</p> <p><b>Context:</b> Section 3.0 of the Draft EIS Section 6 Appendix 6- E discusses Source Characterization. There is no detail regarding potential tonal or impulsive noise sources in Section 3.0.</p> <p><b>Rationale:</b> The draft EIS should include a description of sound source characteristics (e.g., tonal, impulsive, highly impulsive) in order to properly inform the quantitative noise assessment and which assumptions/adjustments need to be applied and to properly evaluate impacts of project noise on health of affected receptors.</p>	<p>1. Identify any tonal, regularly impulsive, highly impulsive, or high-energy impulsive noises likely to be produced during project activities that could be audible at noise sensitive receptors. Furthermore, describe the timing (e.g., hours of night-time activities), frequency and duration of noise events, and their sound characteristics, including frequency spectrum. See <a href="#">Health Canada (2017)</a> for details.</p>	<p>No tonal or impulse sources were identified for either assessment scenario. Construction activity was assumed to occur 24-hours per day as a conservative measure. The frequency spectrum data for each source is included in Table A.1 of Appendix 6-E.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rational for inapplicability to sources identified.</p>	<p>The following paragraph will be appended to the end of Section 3.0 of Appendix 6-E:</p> <p>"Upon establishing the source sound levels for inclusion in the predictive modelling, the list was reviewed to determine whether there were any sources with special sound characteristics such as tonality or impulse noise. Health Canada (2017) recommends the application of source adjustments in accordance with ISO 1996-1 for such sources as these are associated with increased annoyance. No tonal or impulsive noise sources were identified in the Construction or Operation scenarios."</p>
IR-50	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The description of noise modelling does not document or justify the use of sound level adjustments.</p> <p><b>Context:</b> ISO Standard 9613-2 has been used for the sound level modelling; however, it is unclear if all applicable adjustments have been considered as per ISO 1996-1:2016 (Table A.1).</p> <p><b>Rationale:</b> When modelling techniques are used to estimate present (baseline) or future (construction and operational) sound levels, these techniques and any accompanying assumptions, including the use of sound level adjustments, it is important to provide appropriate documentation and justification.</p> <p>Note that in situations where more than one source characteristic</p>	<p>1. Clarify whether ISO-1996-1:2016 has been considered in the modelling to account for any applicable sound level adjustments. Adjustments should be considered when calculating Ln (night- time sound level) and Ldn (day-night sound level). In addition, if applicable, adjustments can be applied depending on the noise characteristic (impulsive, highly impulsive, etc.), and because the project location is considered to be in a quiet rural area. See: ISO 1996-1:2016 and Health Canada (2017) for details.</p>	<p>No tonal or impulse sources were identified for the assessment scenario. As discussed in Section 6.2.1.2.1 of the draft EIS, the assessment did include the 10 dBA nighttime penalty inherent in the calculation of Ldn, and also included the HC recommended adjustment of +10 dBA to the Ldn levels to account for the Project location being in a quiet rural area.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rationale for inapplicability to sources identified. The noted time-of-day and rural adjustments are already discussed in the draft EIS and applied in the assessment.</p>	<p>Appendix 6-E will be updated, per the paragraph outlined in the response to IR-49, which is expected to resolve the comment about tonal and impulse noise.</p> <p>The comment regarding the adjustment to account for the Project being in a quiet rural area was already accounted for in the draft EIS as outlined in Section 6.2.1.2.1.</p>

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				adjustment is applicable (e.g., impulsive or tonal), only the higher of the adjustments is used. However, all time-of-day adjustments and the quiet rural area adjustment are to be added to the highest of the applicable source adjustments.			
IR-51	CNSC	Geology and Groundwater	Section 7, Figure 7.8-1  Appendix 7-C	<b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.  <b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?	Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).  Please clarify how the establishment of a continuous freeze wall will be monitored.	1: The information in the legend of Figure 7.8-1 will be updated to indicate that 2 well clusters target the Lower Sandstone Aquifer and the Intermediate Sandstone Aquitard. The target hydrostratigraphic units for the 4 well clusters are the Lower Sandstone Aquifer, the Intermediate Sandstone Aquitard, the Upper Sandstone Aquifer, and the overburden aquifer.  2: The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.	1: Figure 7-8.1 has been provided in Attachment IR-51 and will be updated in the final EIS to provide information in the legend on the hydrostratigraphic units being monitored in each well cluster.  2: The following text will appear in Section 2 (2.2.1.5 Monitoring Well Network) regarding monitoring to demonstrate a continuous freeze wall.  The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.
IR-52	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater  Appendix 7	<b>Context:</b> According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid, hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.  Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the centre surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long”.  As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.  <b>Rationale:</b> The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.	1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells was not presented.  2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.	Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the hydrogeologic assessment in the EA. The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and groundwater quality of the mining zone following remediation.  During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface or down gradient environment, and the assessment focuses on post removal of the freeze wall, once the groundwater flow returns to pre mining conditions.  The injection and recovery wells will be set up such that they are within the confines of the ore itself. Migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall are minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. If significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice and would be contained therein limiting any excursion outside of the mining horizon.  Additionally, continuous 3D modelling has been conducted for the purposes of mining operations beginning in 2019 through 2023, which has successfully demonstrated control of the mining solutions and recovered uranium bearing solution to the ore zone depth and not beyond the mining zone within the confines of the freeze wall. Furthermore, modelling had demonstrated that mining solutions will be maintained within the deposit area laterally and not contact the freeze wall, which is located at a 25 m stand-off distance.  For more information on how Denison’s extensive field testing and lab informed the design of the ISR mine and the mining zone remediation objectives please see the response to IR-6.	No updates to the EIS in response to this IR.
IR-53	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<b>Context:</b> The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.  However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper	Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).	The calibrated hydraulic conductivity values are consistent with observed data. The calibrated K value for the intermediate aquitard was 1x10 <sup>-8</sup> m/s, which is in the middle of the range of values reported from point testing within this unit (Range: 10 <sup>-10</sup> to 3.8x10 <sup>-6</sup> m/s), and similar to the geomean value (8.4 x10 <sup>-9</sup> m/s). Thus, the calibrated K value is within a factor of 1.2 of, and higher than, the geomean value. The hydraulic conductivity value for the Intermediate Aquitard is similar to that applied by AECL at Cigar Lake (5x10 <sup>-8</sup> m/s). Similarly, the K values applied for the Upper and Lower Sandstone Aquifer units are consistent with the field measured values, particularly for this fractured rock environment. The high end of the	No updates to the EIS in response to this IR.

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				<p>and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p><b>Rationale:</b> It is not clear how representative the calibrated K values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>		<p>packer tested range of K values varied by 2 orders of magnitude between the aquifer and aquitard units, which is consistent with the definition of aquifer / aquitard differentiation. The interpretation of an aquifer-aquitard-aquifer sequence is consistent with the AECL interpretation of the Athabasca Sandstone at the Cigar Lake mine.</p> <p>When packer testing in fractured rock, the hydraulic conductivity associated with any test depends on whether the packed zone contains a continuous fracture set. However, for the unit as a whole, it is important that the model represent the hydraulic conductivity (or transmissivity) representative of the interconnected fracture network. Thus, it is appropriate that the applied hydraulic conductivity values within the aquifers are consistent with the higher end of tested conductivity values within those units. Within aquitard units, having singular higher conductivity fracture values from packer tests that test local fractures only, does not necessarily indicate large-scale transmissivity.</p> <p>A fault feature is suspected along the western perimeter of the Lower Sandstone Aquifer near Kratchkowsky and Williams Lake, located 1.5 km west of the mine site (also as depicted on the Hydrogeological Conceptual Site Model). This feature was interpreted to exist based on the similarity in groundwater levels between deep and shallow aquifers in that particular area (c.f., water levels along the creek south of Williams Lake and within GWR-029, as well as water levels recorded in open boreholes near Kratchkowsky Lake), as well as geochemistry in GWR-029. The geochemistry and water levels show in the vicinity of GWR-029 are different, however, than conditions within the Lower Sandstone aquifer further east of this area, above and east of the Phoenix deposit.</p> <p>The effect of the fault feature along the western edge of the Lower Sandstone aquifer was incorporated within the numerical model both through enhanced hydraulic conductivity parameters, as required to match observed water levels, and boundary conditions applied to introduce as much inflowing water to the Lower Sandstone Aquifer as the water level data suggest is reasonable.</p>	
IR-54	CNSC	Geology and Groundwater	Section 7.3.1	<p><b>Context:</b> EIS states: “The most important associated topographic features in the region are the northwest to southeast trending drumlins and eskers....” This is not the trend shown on the provided maps, nor described elsewhere in the report, e.g., Section 7.3.2.1</p> <p><b>Rationale:</b> Inaccurate information in the EIS</p>	Please update the EIS where required to accurately describe the topographical features.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS.	<p>In Section 7.3.1. the text will be updated to say the following:</p> <p>“The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...”</p>
IR-55	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;  Appendix 7-C, section 2.8	<p><b>Context:</b> According to the proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p><b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated</p>	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.	<p>Denison acknowledges the IR from the review and based on feedback from the assessment team who conducted the hydrogeological modelling for the EA the following is provided in response.</p> <p>The viewpoint from the third-party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed. This higher hydraulic conductivity scenario allows more water to flow laterally through the Intermediate Sandstone unit. Specified head values applied at the model boundaries are employed, such that the amount of water entering / leaving the domain is only limited by the simulated transmissivity and hydraulic gradients. Under this revised calibration, the simulated flow to Whitefish Lake from the Lower Sandstone aquifer would be 0.57% (i.e., &lt; 1%, similar to the model presented in the draft EIS) of the discharge to Whitefish Lake, and the simulated travel time from the ore zone to Whitefish Lake is approximately 250 years. The results of this revised calibrated scenario, with a hydraulic conductivity of 1.E-07 within the Intermediate Sandstone unit, are very similar to those obtained in the base calibrated model. This is the case because the higher flow through the Intermediate Sandstone unit migrates laterally until it reaches the desilicified zone, where it merges with flow from the Lower Sandstone Aquifer travelling upward toward Whitefish Lake. The additional flow contribution through the ISS contemplated by the reviewer would enhance dilution within the desilicified zone and thereby reduce concentrations reaching Whitefish Lake.</p>	No updates to the EIS in response to this IR.



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				in the proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).			
IR-56	CNSC	Geology and Groundwater	Section 7.3.3.2	<p><b>Context:</b> It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p><b>Rationale:</b> It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?	<p>All historic exploration boreholes drilled to date containing a mineralized intersection, with grades higher than 1% U3O8, have been grouted a minimum 25 m above and below the mineralized intersection. The addition of grout to these depths is within the defined depths of the hydrogeologically modelled areas from operational mining scenarios conducted to date. The extent of the mining solution migration (i.e. the mining area) for the purpose on the EA extends 50 meters above the ore zone depth.</p> <p>During Operation, select exploration boreholes will be re-utilized for narrow diameter injection wells that will be developed with monitoring devices for the determination of excursions and water levels. Exploration boreholes not selected for the use of narrow injection wells will be grouted to surface to seal off any remaining conduit. Many of the exploration boreholes previously installed through the desilicified zone that overlies the deposit have collapsed, sealing the zone and acting akin to previous and natural state of the desilicified zone itself.</p> <p>The potential impact of the open, unplugged boreholes was evaluated as part of the numerical model sensitivity simulations performed and presented in Appendix 7-C. In general, while these open boreholes have the potential to create preferential flow paths, they were not found to create a meaningful differences in the groundwater flow paths, or mass transport conditions. This is partially because the simulated groundwater gradients are downward above the ore zone where the open coreholes are most prevalent. Further east, within the desilicified zone, unplugged coreholes are interpreted to have collapsed, such that they do not represent preferential transport pathways in the future</p>	No updates to the EIS in response to this IR.
IR-57	NRCan	Fish and fish habitat	Section 7.3.3.2  Appendix 7-A, sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).	Please see response in Attachment IR-57.	In the final EIS, Section 2.5.2 of Appendix 7-C will be updated to include information provided in Attachment IR-57.
IR-58	ECCC	Fish and fish habitat	Section 7.3.2.4, Ore Deposit	<p><b>Context:</b> The Proponent states that the Phoenix ore bodies are long and narrow (approximately 25 to 50 m wide) and are located within or near a graphitic pelite unit. Hydrothermal alteration associated with the ore zone is a discontinuous envelope of clay alteration and a sulphide-cemented rock zone that extends into the overlying sandstone and the underlying basement (Figure 7.3-3). This black, clay-rich zone is approximately 3 m thick on average and locally hydraulically isolates the ore zone from the overlying sandstones and underlying weathered basement rock.</p> <p><b>Rationale:</b> As indicated by the Proponent, a 3 m black clay rich zone isolates the ore zone from the overlying sandstones and underlying weathered basement rock. It is, however, unclear whether this discontinuous clay layer will prevent downward migration of uranium-bearing solution into the Paleo-weathered basement rock or horizontal flow along the unconformity surface to escape into the</p>	<p>1. Verify that there will be no downward migration of mining solution into the paleo- weathered basement rock or that there is no flow along the unconformity surface.</p> <p>2. If downward migration of the mining solution occurs, explain how it will be mitigated.</p>	<p>1. A portion of the paleoweathered zone is comprised of high grade mineralization of the deposit and will be subject to mining activities controlled by the inward hydraulic gradient induced by pumping. As is discussed in Section 4.1 of Appendix 7-C, potential exists for downward migration of the solubility enhancing fluids used during mining operation and the UBS because of the density and specific gravity of these fluids (greater than that of sea water). However, the downward migration will be limited by the competent unaltered basement rocks below the paleoweathered zone, which is characterized as having very low hydraulic conductivity (Section 2.3 of Appendix 7-C).</p> <p>2. As discussed above, some migration of mining fluids in the paleoweathered zone is expected and groundwater quality in this zone remediated post-mining. The entire thickness of the paleoweathered zone beneath the ore zone was included in the numerical model (Appendix 7-C) as having water quality represented by the "Restored Solution" (Figure 4-1 of Appendix 7-C). That assumption is inherent in the conservative source zone applied to all mass transport simulations. Further conservatism within the numerical model was exclusion of low permeability natural barrier zones (i.e., clays) identified in the geological model for the</p>	No updates to the EIS in response to this IR.

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				environment. Escape of uranium-bearing solution into the environment will have a negative effect on the receiving environment.		ore zone - meaning, it was not assumed that these zones would serve to mitigate against migration of mining fluids into the paleoweathered zone. If downward migration of the mining solution were to occur this would be under an upset condition where monitoring wells placed below the mining horizon would collect these solutions via installed groundwater pumps preventing further migration away from the mining horizon.	
IR-59	CNSC	Fish and fish habitat	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)	<b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.  <b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.	Acknowledged. Figure 7-4.2 in the EIS and Figure 2-18 of Appendix 7-C will be replaced for clarity.	The updated figure provided in Attachment IR-59 will replace Figure 7-4.2 in the final EIS and Figure 2-18 of Appendix 7-C.
IR-60	NRCan	Fish and fish habitat	Section 7.4.2.1  Appendix 7-C, section 5.2.1, Appendix B	<b>Context:</b> In the discussion of the limitations of the numerical groundwater flow model (Appendix 7-C, sec. 5.2.1), the proponent invokes the well known modeling principles of "Occam's razor" and "Parsimony" which guided the parametrization of hydraulic conductivity in model layers. The proponent states that hydrogeologic property values were applied uniformly for, among other units, the Lower Sandstone aquifer beyond the immediate area of desilicified materials. However, in the layer parametrization for the Lower Sandstone aquifer (Appendix 7-C, Appendix B, Figure B-5), NRCan notes a large zone of enhanced conductivity (1 E-05 m/s) extending south from Kratchkowsky Lake, which contrasts with the value (2 E-07 m/s) assigned elsewhere outside the desilicified zone. NRCan also notes the extremely detailed parametrization of hydraulic conductivity in the clay cap overlying the ore zone where borehole control is dense (Appendix 7-C, Appendix B, Figure B-6).  <b>Rationale:</b> In NRCan's opinion, these model features appear to violate the principle of "Parsimony" and require greater justification supported by field observations.	NRCan requests that the proponent provide justification based on field evidence for the multiple hydraulic conductivity zones assigned to the Lower Sandstone aquifer and the clay cap above the ore zone.	We reaffirm that the hydraulic conductivity zones applied are consistent with the principles of parsimony and Occam's Razor. The hydraulic conductivity along the western portion of the model area within the Lower Sandstone Aquifer reflects the identified fault zone discussed in IR-53. This zone was added to better represent observed water levels within that portion of the model area. Further, this high hydraulic conductivity zone permits additional water inflow into the Lower Sandstone Aquifer than would otherwise exist if a lower hydraulic conductivity zone were applied here, resulting in conservative modelling predictions of flow through the Lower Sandstone Aquifer (which is consistent with the requests in IR-55).  The high-resolution representation of the clay cap zones is consistent with other contemporaneous work within the ore zone completed by Petrotek (2020) and subsequently by Denison. This resolution of parameter values is consistent with the high data density contained at the Phoenix ore body. Extensive hydrogeologic core logging and permeameter sampling were conducted on over 3,000 mineralized and lower sandstone drill cores to demonstrate and identify the spatial distribution of the various hydrogeologic units contained within the ore zone itself, for purposes of optimizing mining scenarios and flow pathways for recovery. Each hydrogeological unit has specific hydraulic conductivity values based on this extensive test work in addition to various field packer and pump/injection test work.	No updates to the EIS in response to this IR.
IR-61	CNSC	Geology and Groundwater	Section 7.4.2	<b>Context:</b> There is no discussion of potential induced seismicity from mining processes.  <b>Rationale:</b> Induced seismicity may lead to a loss of process as identified for natural seismicity.	Please provide information on the potential mining-induced seismicity.	Natural seismic activity in Northern Saskatchewan is quite rare with no significant events in recorded history (refer to draft EIS Section 15.2 Seismic Events).  Compared to conventional mining techniques, the potential for mining-induced seismicity from ISR mining is quite low. Potential for mining-induced events for the Project could be postulated to occur as the result of a few sources: 1. collapse of cavity voids from leaching, 2. hydraulic fracturing, and, 3. use of permeability enhancement techniques, and each is discussed further below.  <ol style="list-style-type: none"><li><b>Collapse of cavity voids.</b> To clarify, the portion of the deposit being mined is never truly a void (as in a large empty underground cavern); rather, what remains will be a honeycomb textured environment with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses. In terms of void space creation and collapse of the overlying strata, modelling has demonstrated that only 0.05% by volume of desilicified material immediately overlies the ore zone and would be subject to collapse (RESPEC 2023; included here as Attachment IR-21). This low volume and percentage is determined to not be of significant seismic concern.</li><li><b>Hydraulic fracturing.</b> Draft EIS Section 2.2.1.4.2 Wellfield Operation provides a comparison of ISR mining pressures to conventional fracking pressures used in the oil and gas industry. Conventional fracking pressures used in the oil and gas industry can vary; however, common pressures to induce fracturing can range up to 15,000 psi and require injection of fracking fluids of up to 16,000 liter per minute over periods of three to four days. Fracking fluids are comprised of a slurry of water, proppant (generally silica sand), and chemical additives to support and maintain the open fracture system after fracking is conducted. Conversely, ISR mining for the Project is planned at nominal pressures of 100 psi, intermittent pressures of up to 250 psi, and average flow rates of 30 liters per minute within a recovery well. The ISR mining method proposed for the Project is markedly different than fracking. For example, looking at intermittent pressures alone, ISR pressures are anticipated to be 60 times lower than fracking pressures.</li><li><b>Permeability enhancement techniques.</b> Draft EIS Section 2.2.1.4.3 Permeability Enhancement outlines the three types of techniques being considered for the Project: mechanical, Propellant, and hydraulic options. Propellants are classified as a low hazard explosive (S.1 special-purpose explosives, low hazard explosives, per Explosive Regulations, section 36). Propellants technically do not explode (like classic mine explosives which detonate) but rather burn through a process called deflagration. Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds. Neither ISR mining or permeability enhancement is expected to produce mining-induced seismicity.</li></ol>	No updates to the EIS in response to this IR.



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IR-62	ECCC	Fish and fish habitat	Section 7.4.2, Potential Project-related Effects	<p><b>Context:</b> The Proponent indicates that the mining area includes:</p> <ul style="list-style-type: none"> <li>the ‘active mining area’, which is the target ore zone;</li> <li>a zone extending between 11 and 13 m above the active mining area that represents the maximum vertical height over which the injected mining fluids will migrate upwards from the ore zone during active mining; and</li> <li>a zone extending 50 m vertically upwards from the active mining area (that incorporates the active mining area and the 11 to 13 m zone defined in the previous bullet) that was selected to account for potential upset conditions.</li> </ul> <p><b>Rationale:</b> It is not clear to ECCC how the Proponent would be able to limit the mining solution migration within 11 &amp; 13 m above active mining as the maximum vertical height over which the injected mining fluid will migrate. As the mining fluid will be injected under pressure into zones with possible presence of fractures, the pressure may also cause additional fractures and given that the solution is warm/hot will possibly dissolve the other cementing material in the sandstone above, making it difficult to accurately predict where the solution will migrate to.</p>	<p>1. Explain plans to limit the upward migration of mining solution into the overlying layer to 11 and 13m above the ore zone.</p> <p>2. Explain what impacts will occur if the mining solution migrates beyond the predicted height.</p>	<p>1. More detail on engineered controls for containment of mining solution is provided in the draft EIS, Section 2.2.1.4.2 Wellfield Operation; see also the response to IR-08. Continuous monitoring of pump and injection wells will confirm containment of mining solutions to the lower 11 to 13 m above the ore zone during active operations.</p> <p>2. Additional monitoring wells located above this elevation will be installed to make sure this depth is achieved. These monitoring wells can be retrofitted to be pumping wells if needed to provide additional control of mining solutions. Denison has established a conservative mining area of 50 m above the ore zone in the EIS, which will be remediated to acceptable criteria post mining. Additionally, the freeze wall will be in place throughout Operations and will provide horizontal containment of solutions.</p>	No updates to the EIS in response to this IR.
IR-63	CNSC	Geology and groundwater	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning  Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.	See response in Attachment IR-63.	The information provided in Attachment IR-63 will be attached to Appendix 7-C in the final EIS.
IR-64	ECCC CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation  Appendix 7-A, Appendix K (p. 12)	<p><b>Context:</b> The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.</p> <p><b>Rationale:</b> ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.</p> <p>It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.</p>	<p>Explain:</p> <ul style="list-style-type: none"> <li>Will this be revisited with updated data based on extraction feasibility results?</li> <li>How will the surface expression of a subsidence will be limited to 7.5 cm and localized?</li> </ul> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.</p>	Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including subunits within the altered zone (RESPEC 2023; included as Attachment IR-21) and the surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm. Denison is not anticipating the need for remediation measures with the surface subsidence being negligible within the context of changes in terrain as it relates to decommissioning objectives.	No updates to the EIS in response to this IR.
IR-65	CNSC	Geology and Groundwater	Section 7.4.2.2	<p><b>Context:</b> It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?</p> <p><b>Rationale:</b> Surface facilities and wells may be impacted if there is unaccounted for subsidence.</p>	Please provide additional details for any dewatering/pumping induced subsidence.	<p>No pumping and/or dewatering subsidence is anticipated to occur as the fluid balance will remain relatively stable during Operation with no additional stresses placed on the mining horizon. Refer also to response to IR-07.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No updates to the EIS in response to this IR.

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						<p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface.</p> <p>Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p>	
IR-66	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<p><b>Context:</b> Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.</p> <p><b>Rationale:</b> Subsidence may impact wells and surface infrastructure.</p>	<p>Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.</p>	<p>Please see response to IR-64 for an updated analysis of surface subsidence (2.4 to 2.8 mm at surface; RESPEC 2023 included as Attachment IR-21). The predicted changes at surface related to subsidence is beyond the range of current Lidar technology with resolution at 10 cm. As such, Denison believes the level of risk for subsidence is negligible and that monitoring and contingency plans are commensurate with this low level of risk.</p> <p>Injection and recovery wells will be collared at surface and surveyed regularly to monitor for any changes in collar height over time. This monitoring will be added to Section 7 of final EIS for the Geology VC.</p>	<p>Update to Table 7.5-1 in Section 7 of the final EIS to note that subsidence estimates are in the mm range and mitigation measures are not required. Injection and recovery well collar height monitoring will also be added to Section 7 of the final EIS.</p>
IR-67	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<p><b>Context:</b> Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.</p> <p><b>Rationale:</b> The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).</p>	<p>1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.</p> <p>2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.</p> <p>3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-68	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7	<p><b>Context:</b> Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone.</p> <p><b>Rationale:</b> In NRCan's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCan notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCan's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.</p>	<p>NRCan requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.</p>	<p>Please see response in Attachment IR-68, IR-94, IR-97.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-69	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCan's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the</p>	<p>NRCan requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>

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				choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This Information is important when considering source terms in reactive transport modeling.			
IR-70	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p><b>Context:</b> The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p><b>Rationale:</b> A hydraulic conductivity (K) value of 5x10<sup>-6</sup> m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.	<p>Based on coreflood and column tests performed in the laboratory, a modest increase in the flow rate through the core was observed post-leaching. This is described in more detail in the response to IR-69. Based on the available information, the hydraulic conductivity in the ore zone was raised to be a uniform value of 2E-07 m/s to be represent the effective dissolution of any clay cap materials.</p> <p>However, the post-mining conductivity of the ore zone is not important to the fate and transport of the COPCs in the restored solution towards Whitefish Lake, as it represents a small portion of the flow path. Key parameters controlling transport rates to Whitefish Lake were the hydraulic conductivity of the lower sediments and the desilicified zone. Scenarios 5, 6, and 7 of the parameter uncertainty assessment presented in Section 4.7, Appendix 7-C, systematically explore the highest parameter values consistent with the observed data used for model calibration. As indicated by these scenarios, the geochemical assimilation capacity outweighs the uncertainty in hydraulic conductivity values.</p>	No updates to the EIS in response to this IR.
IR-71	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	<p><b>Context:</b> The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p> <p><b>Rationale:</b> It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.</p>	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.	<p>The experience of the Project team regarding studies of climate change and the impacts on groundwater at other sites generally shows a range of potential positive and offsetting negative impacts. While warmer temperatures will lead to extended periods of summer drought conditions extending into early fall, warmer winters are predicted as well, resulting in less snowpack accumulation, more frequent snowmelt events, and more frequent rainfall during periods when evapotranspiration is negligible. These warmer winter conditions are often simulated to produce enhanced groundwater recharge during late fall, winter, and early spring conditions. In particular, the lack of enhanced snowpack is simulated to result in less severe spring run-off conditions, indicating that more of the winter precipitation that falls will infiltrate. Overall, this is anticipated to result in enhanced groundwater recharge in the mid- to late-century periods.</p> <p>If, however, lower groundwater recharge was to result from climate change, it would reduce the groundwater driving force for mass transport of mining related fluids, and reduce mass loading to receiving water bodies such as Whitefish Lake. In other words, lower groundwater recharge resulting from higher evapotranspiration would result in slower mass transport to the receiving water bodies, reducing the risk of exposure.</p>	No updates to the EIS in response to this IR
IR-72	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<p><b>Context:</b> Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.</p> <p><b>Rationale:</b> It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?</p>	Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.	<p>Loss of freezing to the freeze wall is considered an accident and malfunction, and highly unlikely, although if it occurs, will be signaled earlier by operational monitoring than through monitoring of groundwater quality. Details of the monitoring of the integrity of the freeze wall are provided in IR-51 and include ground temperature monitoring achieved through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground and will provide early detection of any upset conditions can be identified and addressed.</p> <p>For more information on the freeze wall integrity see attached technical response IR-10</p> <p>The groundwater monitoring network and plan, as presented in the draft EIS, was designed primarily to detect excursions of mining fluids, but also considers upset conditions related to the freeze wall. The parameters being measured in groundwater include electrical conductivity (EC) and chloride, which is a key indicator of freeze wall brine (CaCl<sub>2</sub>), but is not expected to be a key indicator of migration of mining fluids. It is acknowledged that there was an oversight in the description of groundwater monitoring in Section 7.8.2 in not including chloride as a key performance indicator related to freeze wall upset conditions and brine migration; it has, however, been included in the Groundwater Monitoring Plan being developed for Licensing. Groundwater monitoring in wells and well clusters detailed in Figure 7-8.1 of the draft EIS (see IR-51 for updates to Figure 7-8.1) will include sampling for chloride and other key indicator parameters as well as continuous monitoring of EC (and pressure) at target hydrostratigraphic depths. The number of wells targeting the Lower Sandstone Aquifer is highest, with one monitoring well placed every 125 to 150 m distance along the freeze wall. The higher frequency of wells in this hydrostratigraphic unit reflects this as the unit where an upset condition with the freeze wall has the highest potential to allow migration of chemical constituents associated with the mining fluids laterally from the mining zone. Monitoring of</p>	<p>No updates to the EIS in response to this IR.</p> <p>The groundwater monitoring plan that will be submitted for licensing includes chloride and EC as key indicator parameters for demonstrating freeze wall integrity and, under upset conditions, delineating migration of brine in groundwater.</p>



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						these key parameters will also occur in wells in the overlying hydrostratigraphic units (Intermediate Sandstone Aquitard, Upper Sandstone Aquifer and Overburden Aquifer). The groundwater monitoring network serves as secondary means to demonstrate freeze wall integrity and, under upset conditions, delineate migration of brine in groundwater. In addition, changes in pressure and temperature will be monitored continuously in vibrating wire piezometers (VWPs) surrounding the freeze wall, again every 125 to 150 m along the freeze wall, and changes would be evaluated in terms of potential to signal a freeze wall upset condition.	
IR-73	CNSC	Geology and groundwater	Section 7.8.2.2, In Situ Recovery Mining Area  Appendix 7-A, Appendix C	<b>Context:</b> The EIS recommends that a follow-up study be carried out to supplement available data on hydraulic conductivity in the Desilicified Zone (DSZ).  <b>Rationale:</b> Appendix C (Summary of Hydraulic Testing Data and Conductivity Values) of Appendix 7A indicates that only n = 6 hydraulic conductivity values are available for the DSZ, one of which appears unreliable due to a problem with packer sealing. This is relatively few values compared to the Intermediate and Lower Sandstones. Additionally, limited hydraulic head data from boreholes screened in the DSZ is available (GWR-037, GWR-012 and GWR-014; See Figures 16/17 in Appendix 7-A) – most information appears to originate from open core holes. The information presented in its current form is insufficient considering the importance of this zone as a preferential pathway for contaminants following remediation activities, and the heterogeneity of the unit due to intense hydrothermal alteration and fracturing. Further information regarding hydrogeological properties and groundwater flow would aid greatly in validating and refining the numerical groundwater model.	As per the EIS recommendations, please provide additional information to supplement available data on hydraulic conductivity in the DSZ. Please provide the following information as part of the follow-up study: <ol style="list-style-type: none"><li>1. identification of the vertical conductivity (KV) as there is an upward flow component (isotropy was assumed in DSZ for numerical model, this assumption must be verified)</li><li>2. quantification of the horizontal and vertical flow gradients in the DSZ; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fracture/fault zones.</li></ol>	The specific information being asked for will be included in the final EIS. The detailed Groundwater Monitoring Plan will be provided to support licensing.  The need for additional data within the desilicified zone is recognized and Denison has committed to gathering that data during Construction. In the absence of such data, reasonable and conservative assumptions were made regarding the continuity, hydraulic conductivity, porosity and nature of the geochemically reactive solids of the desilicified zone. Conservatism on multiples levels provides confidence that conditions are likely more favourable than simulated within the draft EIS.	Section 7.8.2.2.1 of the final EIS will be updated to include these follow-up commitments related to the desilicified zone: <ol style="list-style-type: none"><li>1. identification of vertical conductivity;</li><li>2. quantification of horizontal and vertical flow gradients; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fractures/fault zones.</li></ol>
IR-74	CNSC	Geology and Groundwater	Section 7.8.2.3	<b>Context:</b> It is stated in Section 7.8.2.3 (p. 7-113, main EIS report) that, at the Post-Decommissioning Stage, “Excursion are signaled by a change in water quality that is outside of that bounded by modelling predictions”, and “The model predictions spatiotemporally bound COPC concentrations in the subsurface that do not pose a risk to the receiving environment. Water quality that is outside of this bounding is defined as representing a material increase over a meaningful period compared to the predicted values either in rate of change or magnitude of change of COPC concentrations.”  <b>Rationale:</b> It is not clear in which locations (e.g., is it in the mining area, or downstream of the mining area, or anywhere else?) the water quality is used to compare with the model predictions to determine if excursion occurs.	Please clarify in which locations the water quality data is used to compare with the model predictions to determine if excursion occurs.	These comparisons refer to conditions at the proposed monitoring well locations.	No updates to the EIS in response to this IR.
IR-75	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<b>Context:</b> The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.  <b>Rationale:</b> By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.	Additional conservative modelling scenarios were undertaken to address this (and other IRs). The modelling results show that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable (1.0 < factor of safety [FS] < 1.25), and no-failure conditions are apparent. The predicted surface displacement remains approximately 2.4 to 2.8 mm (RESPEC 2023; included here as Attachment IR-21).  For desilicified sandstone properties, failure conditions are predicted in 12.6% of the modeled desilicified sandstone volume, which is located within 20 to 35 m of the ore zone. Notable observations from modelling include that, based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone. The vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm, and quickly reduces to the range between 0 and 7 cm at a distance of 4 – 5 meters from the low-grade ore zone (RESPEC 2023).	No updates to the EIS in response to this IR.
IR-76	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<b>Context:</b> Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.  <b>Rationale:</b> Failure of steel casing may result in process loss or alter groundwater flow and quality.	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.	The well designs and operational monitoring of the wellfield will mitigate accidental release of mining solution or UBS in the sandstone above the mining area. Each well will have double containment: mining solution will travel inside an inner casing with the outer casing acting as secondary containment for the mining fluids. Wells will be continually monitored for operational parameters such as injection pressures, injection flow rates, and recovery flow rates. This data will be transmitted to the processing plant for remote monitoring through a master control system. Through the master control system, operators will be capable of controlling pumphouse production lines remotely. Wellfield monitoring will facilitate detection of any issues with the injection and recovery wells.  Specific to the steel casing for the injection and recovery wells, the conservative estimate of vertical strain in the steel casing passing through the altered sandstone provided in Appendix 7-A of the draft EIS is approaching the tensile and compressive yield limits; however, these estimates are likely an over-estimate of the actual casing strains because of the simplified, conservative assumptions used in the analysis. Altered sandstone within 25 m from the boundary of the mined excavation experiences tensile vertical strain greater than the yield limit (0.0018 strain) such that the vertical strain is relatively higher because of the presence	No updates to the EIS in response to this IR.

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						<p>of upper clay above the ore zone. The altered sandstone around the mined cavity similarly experiences compressive vertical strain greater than the yield limit (–0.0018 strain) for the radial span of 25 m. Where tensile strain exceeds the yield limit there is potential for well failure. These isolated areas that have been identified from the geomechanical study will need further assessment of well designs should a well be placed in these specific sub locations within the deposit area.</p> <p>A network of monitoring wells installed within the freeze wall area will be equipped with pressure instrumentation for the determination of the vertical strain/stresses placed on the formation to do mining zone space creation. This monitoring network is designed to detect if these strains may be approaching their acceptable levels prior to failure. The injection and recovery wells will also be equipped with devices for pressure and temperature that can detect a breach in the well casing if one were to occur. As a preventative measure, annual mechanical integrity testing is conducted on the wells to ensure their containment and compliancy.</p> <p>Active monitoring will allow for operational shutdown if a scenario is approaching a failure mode.</p>	
IR-77	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 1)	<p><b>Context:</b> It is reported in the appendix K report, within Appendix 7-A, that both phase I scoping analysis and phase II detailed strip model were investigated by numerical modelling. The analysis discussed influence on host rock stability as a result of incremental increase in volumetric extraction and graded conservative treatment of material properties.</p> <p><b>Rationale:</b> As critical components of a numerical geomechanical simulation, initial and boundary conditions are crucially important to the confidence and reliability of the modelling results. However, this information is absent from the current report. In-situ principal stresses largely affects the stability of the excavated host rock, and the vertical strain and surface subsidence. This information is also absent in current form.</p>	Please provide details on the boundary and initial conditions applied on stress loading and strain for the numerical analysis. In particular, the in-situ principal stresses, which are critical to correct understanding of the excavation disturbance to the host rock, should be provided and justified as appropriate.	<p>Several numerical models were conducted for material properties for altered sandstone. Presuming that the entire altered sandstone to be unconsolidated and desilicified.</p> <p>» For 0.0 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.1 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.5 MPa cohesion value, the numerical model reached equilibrium for friction angle of 20 degree.</p>	No updates to the EIS in response to this IR.
IR-78	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity  Appendix 7-C, Section 2.3.2.1, Porosity Values	<p><b>Context:</b> This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p><b>Rationale:</b> The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given the that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A, and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests, were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.</p>	<p>Effective porosity values applied in the numerical modelling are thoroughly discussed in section 2.3.2.1 and clearly presented in Table 2-4 of Appendix 7-C.</p> <p>Effective porosity values cannot be derived from packer tests, slug tests, or pumping tests. They can be inferred from core, although core is generally a very small sample of the subsurface and is generally limited to total porosity as opposed to the interconnected pore space. In fractured rock environments, the effective porosity is a combination of the fracture porosity and the portion of the total porosity interconnected with the fractures; thus, the effective porosity tends more toward the value of the fracture porosity. Effective porosity is rigorously determined using a successful tracer test; however, the success of a field based tracer test is not easily achieved as much of the tracer volume is often not intersected by downgradient wells. Consequently, most mass transport assessments use literature values for effective porosity (Anderson, Woessner and Hunt, 2015; pg 332). Further, the tracer test performed within a small portion (i.e., 10 m) of the ore zone, was not considered to be informative of the effective porosity values needed for the entire flow path between the ore zone and Whitefish Lake.</p> <p>For this study the effective porosity values applied in the Cigar Lake 3D model were used as a guide. Literature values suggested by Anderson, Woessner and Hunt (2015) would suggest higher values of effective porosity, which would be less conservative (i.e., result in slower groundwater velocities) than applied within this study.</p> <p>Reference: Anderson. M., W. Woessner, and R. Hunt. 2015. Applied Groundwater Modelling. Elsevier Inc.</p>	No update to the EIS in response to this IR.
IR-79	CNSC	Geology and groundwater	Appendix 7-A, Section 4, Groundwater Chemistry	<p><b>Context:</b> Table 4-1 in Section 4 of Appendix 7-A provides groundwater monitoring results from sampling activities carried out at 26 monitoring wells in 2019, 2020, and 2021. The majority of these wells were only sampled once (n = 8) or twice (n = 17). In some cases (Lower Sandstone Aquifer/Intermediate Sandstone Aquitard), the variability of results between sampling events is quite high. Data for the Paleoweathered Zone is sparse.</p> <p><b>Rationale:</b> Insufficient information is presented in the EIS and associated Appendices to concretely define baseline groundwater chemistry for the different hydrostratigraphic units. As defined in the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>: “Based on the scope of the project, the EIS will present sufficiently detailed baseline information to determine the effects the project could have on the VCs and analyze those effects”. This is particularly important given certain features of the study area (i.e., presence of zones of thermal alteration/desilicification, as well as hydraulically active fractures/faults), and the need to adequately characterize baseline</p>	Please provide the statistical basis (number of samples and variability) by which “baseline” is defined and the justification that the current information is sufficient to adequately characterize groundwater quality. In order to ensure sufficient baseline information is collected, further iterations of sample collection for groundwater monitoring wells in all defined hydrostratigraphic units may be required. In addition, groundwater quality downgradient from the proposed mining area should be further characterized to assess spatial influence of alteration and hydraulically active features,	<p>The statistical basis by which baseline groundwater data has been characterized, that is sample numbers included per hydrostratigraphic unit, median, maximum and minimum values, that describe the variability of the groundwater quality data were presented as Table 4-2 of Appendix 7A and Table 3-4 of Appendix 7C to the EIS. The primary purpose of the groundwater data collected as part of the baseline program is to provide a basis for evaluating the incremental change in groundwater quality with mining activities. The magnitude of any incremental changes in groundwater quality associated with the remediated groundwater, which was the focus of the modelling, was such that deviation in water quality from baseline conditions was possible to identify.</p> <p>Supplemental groundwater monitoring will be ongoing during all phases of the Project. Denison is committed to installing additional wells, with a focus on characterizing pre-mining conditions and monitoring through and post-mining immediately surrounding the freeze wall and downgradient of the mining zone, and will be re-initiating routine sampling that captures seasonal variability in 2024. A N288.7-compliant Groundwater Monitoring Plan is being developed to support permitting and licensing and will guide the aforementioned sampling.</p>	No updates to the EIS in response to this IR.

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				conditions in the Desilicified Zone downgradient from the proposed mining area. As an example, the US Nuclear Regulatory Commission (NRC) typically requires a minimum of four (4) quarterly samples from (i) surficial aquifers, (ii) production aquifers, (iii) overlying aquifers, and (iv) underlying aquifers to characterize preoperational groundwater quality (E. Striz, pers. comm.).			
IR-80	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model.</p> <p><b>Rationale:</b> The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO<sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO<sub>3</sub> or Ca-SO<sub>4</sub>/Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.</p>	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.	Please see response in Attachment IR-80.	Figure 26 of Appendix 7-A of the draft EIS will be separated into Figures 26 and 27, and the Figure numbering updated accordingly in that Appendix. Also, the text on pages 4.17-4.18 and 4.20 of Appendix 7-A of the draft EIS will be updated. These revised figures and text are outlined in Attachment IR-80.
IR-81	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p><b>Rationale:</b> Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., <sup>δ2</sup> H, <sup>δ18</sup> O) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.	Please see response in Attachment IR-81.	No updates to the EIS in response to this IR.
IR-82	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit  Appendix 7-C, Section 3.5	<p><b>Context:</b> A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p><b>Rationale:</b> A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p><b>Reference:</b></p>	<ol style="list-style-type: none"><li>1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2] below provide an example of simplified framework for characterizing redox conditions in aquifers.</li><li>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</li><li>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</li></ol> <p><b>Reference:</b> [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>	Please see response in Attachment IR-82.	No updates to the EIS in response to this IR.



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				[1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnvisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.			
IR-83	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p><b>Context:</b> Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p> <p><b>Rationale:</b> Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.</p>	Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.	Information requested here with respect to details of how the desilicified zone is considered in the geomechanical modelling is addressed in IR-75. Details linking the geochemical model with the geological model including core delineation of the desilicified zone above the mining zone is provided in RESPEC (2023), included here as Attachment IR-21.	No updates to the EIS in response to this IR.
IR-84	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.</p> <p><b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.</p>	1) Please clarify in Figure 2-10 where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. 2) Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.	1) As noted in Table 2-7 of Appendix 7-C of the EIS, under the heading "Surface Water Stations", the surface water stations used to evaluate baseflow to Whitefish Lake are stations SA-6 and SA-2. Both of these stations are demarked in Figure 2-10 of Appendix 7-C, illustrating the portion of Whitefish Lake that is monitored by these stations.  2) Stations SA-6 and SA-7 monitor upstream and downstream hydrologic conditions of the portion of Whitefish Lake adjacent to the Project. The difference in baseflow monitored between these stations is interpreted to be the contribution of groundwater to the portion of Whitefish Lake of interest. Within the report, the discharge between these stations has been referred to as "discharge to Whitefish Lake" although it is acknowledged that this refers strictly to the portion of Whitefish Lake adjacent to the Project.	No updates to the EIS in response to this IR.
IR-85	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C.</p> <p><b>Rationale:</b> It is not clear where Well A, Well B and Well C are located.</p>	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.	These three wells (referred within Appendix 7-C as "A", "B", and "C") are proposed wells to supply water to the mining operations. They are not yet constructed but are planned to be screened within the Upper Sandstone Aquifer. These wells were demarcated as "Freshwater wells" in Figure 2.2-1 of Section 2 of the EIS but were not labelled. Well A is located 200m northwest of the Phase 5 ISR injection area, Well B is located approximately 600 m south of the Phase 5 ISR injection area, while Well C is located 200 m northwest of the Phase 3 ISR injection area.	Figure 2.2-1 has been updated to label the “Freshwater wells” as “A”, “B”, and “C”. The updated figure is included in Attachment IR-85 and will replace the existing Figure 2.2-1 in the final EIS.
IR-86	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.</p> <p><b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.</p>	Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.	As stated in draft EIS Appendix 7-C, Section 2.7.2 (page 2.41) the calibrated, steady-state model was used as the basis for the transient model used to evaluate drawdown during operations. Only conditions immediately within the mining zone were altered within the transient model to reflect the proposed changes during mine operations. All boundary conditions that drive regional groundwater flow were unchanged for the transient model, and all hydrogeologic properties outside of the mining area were left unchanged. Changes made to the hydrogeologic properties were implemented transiently to represent the phased implementation of the freeze wall. Groundwater recharge was changed to reflect alterations to surficial land use and the implication of that land use change to groundwater recharge; transient pumping boundary conditions were incorporated to simulate the planned pumping demand for camp and ISR water requirements. The transient version of the model was used to evaluate changes to the groundwater discharge occurring at Whitefish Lake as documented in Appendix 7-C Section 2.7.	No updates to the EIS in response to this IR.
IR-87	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> In Section 2.8 (p. 2.45, Appendix 7-C) Parameter uncertainty assessment, only parameters for certain zones (part of each specific hydro-stratigraphic unit as shown in Figure 2-19, p. 2.46, Appendix 7-C) related to the pathway from the ore zone toward Whitefish Lake were allowed to vary in order to find combinations of parameter values that met statistical calibration criteria. If each hydro-stratigraphic units within the whole model domain were treated as parameter zones that can have varied hydraulic conductivity values, a different combination of parameter values could be obtained that</p>	It is recommended that the parameter zones in the Parameter uncertainty assessment include hydro-stratigraphic units in the whole model domain to investigate the possible combination of parameter values that could make the groundwater in the mined-out zone more active hydraulically.	As per the reviewer’s request, PEST++IES was applied to generate 50 calibrated realizations wherein all hydraulic conductivity parameter zones were allowed to vary. Of the 50 scenarios generated, the average contribution to Whitefish Lake from the Lower Sandstone Aquifer was 0.73%, with 48 of the 50 scenarios (96%) confirming the calibrated conceptualization. One of those scenarios is documented in the response to IR-55. It is noted that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, but as shown in the literature (Bradbury and Muldoon, 1990), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic	No updates to the EIS in response to this IR.

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				<p>meet statistical calibration criteria too.</p> <p><b>Rationale:</b> The parameter values for parameter zones between the mining area and Whitefish Lake is important in determining the hydraulic connection between the mining area and Whitefish Lake. Parameter values in other parameter zones could also be important. For example, if the K values for the intermediate sandstone aquitard are significantly larger than in the current calibration results, the interaction between the upper sandstone aquifer and the lower sandstone aquifer could be more active, and the mined-out zone could be more active hydraulically and groundwater in the minded-out zone could have a shorter residence time than in the current calibrated model.</p> <p>Additionally, it is noted that Figure 2.19 (p. 2.46, Appendix 7-C) illustrates the parameter zone for the intermediate sandstone aquitard. However, Figure 2.20 (p. 2.49, Appendix 7-C) did not include the intermediate sandstone aquitard in the results.</p>		<p>conductivities are best determined using long-term pumping tests, or a model and calibrating to observed water level trends.</p> <p>Please note that only parameter sets which are consistent with field observations (i.e., observed water level, baseflow, or geochemical observations) are considered relevant for prediction uncertainty analyses.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	
IR-88	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p> <p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in</p>	<p>It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active:</p> <ol style="list-style-type: none"><li>1. Determine the groundwater residence time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</li><li>2. Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</li><li>3. Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</li></ol>	<p>1) Denison believes that the best way to determine residence time as part of the EA is with the modelling approached used in the draft EIS. It is unclear how it would be possible to "determine the groundwater residence time within the Lower Sandstone Aquifer" other than by using a model. Available data (e.g., geochemistry) provide an indication of residence time, but not timing that can be compared to modelled results. The groundwater residence time within the Lower Sandstone Aquifer, downgradient of the ore zone, is simulated using the model to be 150 years or greater. Simulated residence time within the Lower Sandstone Aquifer upgradient of the ore zone is approximately 500 years.</p> <p>2) Particle tracking from the "mined-out" ore zone was incorporated within the EIS, as illustrated on Figure 4-4 of Appendix 7-C. The particle traces presented illustrate groundwater migration flow paths, path lengths, travel times, and velocities for water migrating from the mined-out ore zone. Reverse particle tracking indicates flow through the Lower Sandstone Aquifer flowing from upgradient areas flowing into the ore zone.</p> <p>3) The prediction uncertainty analysis (i.e., "sensitivity analysis") presented in Appendix 7-C included an evaluation of the change in the model prediction (i.e., plume migration) with respect to changes in the conductivity of materials along the flow path to the receptor, Whitefish Lake (i.e., Scenarios 4, 5, and 6) as well as regarding the hydraulic conductivity of the mined-out ore zone. As such we feel that the work requested by the reviewer has already been completed and reported upon within the draft EIS. In addition, the uncertainty of the Intermediate Sandstone Aquifer was evaluated (see IR55), where higher hydraulic conductivity within the Intermediate Sandstone Aquifer were found to reduce the proportion of water from the ore zone reaching Whitefish Lake, which would have the effect of further reducing (i.e., diluting) concentrations simulated and presented in the EIS documentation. As such, the conditions documented in the draft EIS are already conservative with respect to the uncertainty in these parameters.</p>	No updates to the EIS in response to this IR.



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				<p>the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be if the mined-out zones collapse.</p>			
IR-89	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p> <p><b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REDox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.</p> <p>See also related: IR-96.</p>	<p>1) Application of 5E-6 as the value for hydraulic conductivity within the desilicified zone is appropriate; the values of 5E-6 and 6E-6 are essentially the same number, particularly at the scale over which it is applied. We agree that the hydraulic conductivity of the desilicified zone is an important parameter to the fate and transport of dissolved minerals from the ore zone toward Whitefish Lake; that is why scenarios 4, 5, and 6 were designed to evaluate the prediction uncertainty related to the uncertainty of the desilicified zone, along with other hydraulic conductivity values along the transport migration pathway. Further, we recognize that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, and as shown in the literature (Bradbury and Muldoon, 2000), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic conductivities are best determined using a large-scale pumping test or a model calibrated to observed water levels, which is the approach we completed; the value of 5E-6 for the desilicified zone hydraulic conductivity provides an excellent match to observed water levels and baseflow discharge. In addition, packer tests in fractured rock tend to bias the hydraulic conductivity to be higher than is representative on the large scale, as testing is generally targeted on observed fracture zones. Given all this, we reaffirm that the applied hydraulic conductivity of 5E-6 is representative for the conductivity of the desilicified zone.</p> <p>2) Calibration-constrained uncertainty analyses were performed (i.e., the state of the practice) to evaluate the range of potential hydraulic conductivity values that could exist within the desilicified zone while still maintaining calibration. That analysis is presented in section 2.8 of Appendix 7-C. The most conservative of the parameter scenarios that are consistent with the field observational data were used for the prediction uncertainty analyses presented in Appendix 7-C, section 4.7. Scenarios 4, 5, and 6 explore higher hydraulic conductivity values which are supported by the observation data (i.e., calibration-constrained uncertainty analysis). The range of desilicified-zone hydraulic conductivity incorporated within those scenarios (Figure 2-21) is 1.6 to 3.2 m/d (i.e., 1.8E-5 to 3.7E-5 m/s); 3.2 m/d was the highest conductivity value for the desilicified zone (referred to as the Altered Zone within the Intermediate Aquitard on Figure 2-21) for all 50 calibrated realizations generated using PEST. As such, the EIS presented the prediction uncertainty with the highest hydraulic conductivity values supported by the observation data. It would not be appropriate to test scenarios with even higher values of hydraulic conductivity which would not be supported by the field observed groundwater levels. Thus, we do not feel it is appropriate to test scenarios where the hydraulic conductivity of the desilicified zone is orders of magnitude greater than suggested by field observations.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	No EIS updates are anticipated to address this IR.

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IR-90	ECCC	Fish and fish habitat	Appendix 7-C, Section 2.4 and 2.6	<p><b>Context:</b> Hydraulic conductivities and hydraulic gradients play an important role in groundwater flow, geochemical modeling, and contaminant transport for the PHREEQC and FEFLOW models. Although there is an important vertical component to the contaminant transport, there is no distinction made between lateral and vertical hydraulic conductivities of hydraulic gradients.</p> <p><b>Rationale:</b> According to the conceptual model, there is an important vertical aspect to the groundwater flow thus incorporating any vertical hydraulic gradient or hydraulic conductivity information into the calibration would increase confidence in the results.</p> <p>Providing a distinct value for vertical hydraulic conductivity will improve the accuracy of the model in regards to the transport of contaminants to Whitefish Lake through the Desilicified zone, which is important to understand potential impacts to aquatic life.</p>	<ol style="list-style-type: none"><li>1. Explain if the vertical and lateral hydraulic gradients and hydraulic conductivities are assumed to be equivalent.</li><li>2. Provide a rationale for not distinguishing between vertical and lateral hydraulic gradients.</li><li>3. Alternatively, provide both lateral and vertical hydraulic gradient estimates and the implications on contaminant transport.</li></ol>	<ol style="list-style-type: none"><li>1. Lateral and vertical hydraulic conductivity values are assigned for every model element within the numerical modelling domain. In most areas, the vertical hydraulic conductivity is assumed to be 1/10th of the lateral hydraulic conductivity due to variability in the depositional environment (i.e., intermittent periods of quiet water deposits, and higher-energy water deposits) and fracturing (typically bedding plane fractures are more prevalent than vertical joints).</li><li>2. In the case of the desilicified zone the thermal alteration was conservatively assumed to have resulted in equivalent hydraulic conductivity values in the lateral and vertical directions. This conservative assumption within the desilicified zone is designed to over-predict mass transport potential to surface receptors.</li><li>3. The gradients applied are considered reasonable and defensible. By calibrating to 3D point observations of groundwater levels, and using surface water levels for hydrogeologic boundary conditions, the model has been inherently calibrated to 3-dimensional hydraulic gradients. Thus, lateral and vertical hydraulic gradients are incorporated within the analysis presented.</li></ol>	No updates to the EIS in response to this IR.
IR-91	NRCan	Fish and fish habitat	Appendix 7-C, section 2.5.2	<p><b>Context:</b> The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p><b>Rationale:</b> As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.	<p>The scales on Figure 2-13 of Appendix 7 have been corrected and included in Attachment IR-91.</p> <p>From a regional perspective, the available groundwater levels are clustered around the Phoenix deposit. However, Denison advanced monitoring well clusters to support hydrogeologic (and hydrochemical) characterization upgradient, downgradient, and cross-gradient to the deposit. Data from all of these wells were used to calibrate the numerical model. It is acknowledged that the hydrogeologic conditions are extrapolated from the available data; this is consistent with the state of the practice.</p>	The corrected Figure 2-13, which will be included in the final EIS, is appended as Attachment IR-91.
IR-92	CNSC	Geology and groundwater	Appendix 7-C, Section 3.2.1, Mineralogical Composition	<p><b>Context:</b> Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p><b>Rationale:</b> Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported.</p> <p>The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>	<ol style="list-style-type: none"><li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li><li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. dichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).</li></ol>	Please see response in Attachment IR-92.	<p>The updated version of Table 3-2 (provided in Attachment IR-92) will be included in the final EIS Appendix 7-C.</p> <p>To reflect the discussion in Attachment IR-92 and updates to Table 3-2 of Appendix 7-C, the following text will be included on page 3.29-3.20 of Appendix 7-C in the final EIS:</p> <p>Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.</p>
IR-93	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-10: Properties of	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical</p>	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport	Please see response in Attachment IR-93.	The updates to Table 3-10 of Appendix 7-C are detailed in Attachment IR-93 and will be included in the final EIS.

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			Adsorbing Mineral Phases	<p>reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Geothite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m2/g, this equals to 1600/6E4 mol/m2, or 0.0266 mol/m2, 1.6e4 sites/nm2.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm2. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters.</p> <p>The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>	modelling should be re-run to update the contents presented in the EIS report.		
IR-94	CNSC	Geology and Groundwater	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H+ sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.</p>	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-95	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-11	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated.</p> <p><b>Rationale:</b> It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these Kd analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients.</p> <p>In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of Kd value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.	Please see response in Attachment IR-95.	The updated version of Table 3-11 (provided in Attachment IR-95) will be included in the final EIS Appendix 7-C.
IR-96	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, "Transport parameters were specified for diffusion (1x10-9 m2/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)". The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the</p>	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89.</p>	Please see response in Attachment IR-96.	No updates to the EIS in response to this IR.



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				model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.  Further guidance on solute transport modelling can be found in BC MOE (2012) [1].  <b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.			
IR-97	ECCC	Fish and fish habitat	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b	<b>Context:</b> Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.  It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.  <b>Rationale:</b> The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.	1. Explain and clarify if mining operations will mobilize contaminants beyond operations?  2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?  3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-98	CNSC	Change to an environmental component due to hazardous contaminants	Section 8, Aquatic Environment	<b>Context:</b> It states in EIS in Section 8.3.7.1 (p. 8-151) that "Cameco's Key Lake Operation will overlap spatially and temporally with the Project".  <b>Rationale:</b> It is not clear whether there is the possibility that planned Denison discharges would eventually flow into and influence a background reference lake used by Key Lake operation.	Please provide supporting information to demonstrate whether discharges from the proposed operation will not eventually flow into a reference lake used by another existing operation.	Denison understands that Alpha Lake and McGowan Lake are used as reference lakes for a Cameco operation within the area of Denison's proposed project. Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.  Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan Lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.	No EIS updates are anticipated to address this IR.
IR-99	CNSC	Aquatic environment	Section 8, Water Quality, Table 8.2-13	<b>Context:</b> Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.  <b>Rationale:</b> It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.	The values provided in Table 8.2-13 for radiological COPCs are presented as Bq/L and the units provided in the sub-title (mg/L) are not consistent with the data provided. Table 8.2-13 is consistent with the data provided in Appendix 10-A (Environmental Risk Assessment), which specifies the concentrations as having been measured in Bq/L. Subsequent updates of the EIS will correct this inconsistency. Denison will review the final EIS to ensure this error is not repeated in other tables.	Table 8.2-13 will be revised to ensure the units for radiological parameters are expressed in Bq/L. The revised table is provided in Attachment IR-99.
IR-100	HC	Indigenous Peoples' health / Socio-economic conditions	Section 8, (p. 8-195)  Section 8.5.3, Table 8.5-2, (p. 8-226)	Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.  <b>Context:</b> Section 8 states "Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.  However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment" (p. 8-195).  Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.  In Section 8.5.3, fish tissue concentrations are compared to Health Canada's human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.  <b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.  Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day ( <a href="#">Health Canada, 2007</a> ) is a more	1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.  2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada's pTDI for methylmercury ( <a href="#">Health Canada, 2007</a> ).  3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.  See also related Advice to the Proponent: AD-31.	1. The intent is not to include mercury (and methylmercury) as a COPC for the assessment. As indicated in EIS Section 8.4.6.1, Residual Effects Characterization, mercury is not associated with the local geology and is not expected to be released in the effluent at measurable levels and was therefore not identified as a COPC. Denison notes that there is potential for increased methylmercury production in the receiving environment under a certain combination of factors to which the Project may contribute, such as increased nutrient levels in the environment; however, prediction of methylmercury production is not practical. Denison commits to monitoring mercury and methylmercury in the aquatic environment over the life of the Project to determine the potential changes in mercury concentrations in fish tissue over time. 2. As the Project advances and operational monitoring is underway, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight. This is a human health risk-based maximum permissible concentration. 3. Mercury data presented throughout the draft EIS represents total mercury. Denison agrees to included methylmercury as part of the constituents monitored in fish throughout all project phases.	A commitment will be added to Section 8 of the final EIS that as the Project advances, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight.  It will be clarified in the final EIS that mercury data presented is total mercury.

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				<p>appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing foetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>			
IR-101	ECCC	Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>Responses are numbered as listed in the IR. Figures associated with this IR are provided in Attachment IR-101.</p> <p>1) Below indicates the information that is presented in the draft EIS regarding wetland characteristics. This information was housed within the terrestrial environment component and potential impacts to wetlands as a valued component is further assessed under Section 9.2 of the draft EIS, and specifically Section 9.2.6.4. The following list indicates what information was provided in the draft EIS specific to information request #1. As such, repackaging the available information in Section 8 would be redundant and therefore in Denison’s view unnecessary.</p> <p>a) <i>Locations of Wetlands</i> <b>Section 9, Figure 9.2-8</b> on page 9-83 of the draft EIS presents a map of the RSA and LSA detailing the locations of various wetland features including bogs and fens.</p> <p>b) <i>Wetland Types</i> <b>Section 9, Figure 9.2-8</b> on page 9-83, and <b>Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS provides the geographical distribution and listing of the following wetland types within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – Black spruce treed bog</li><li>ii. BS18 – Labrador tea shrubby bog</li><li>iii. BS19 – Graminoid bog</li><li>iv. BS19/24 – Graminoid bog/Graminoid fen</li><li>v. BS20 – Open bog</li><li>vi. BS21 – Tamarack treed fen</li><li>vii. BS23 – Willow shrubby rich fen</li><li>viii. BS24 – Graminoid fen</li><li>ix. BS25 – Open fen</li><li>x. BS27 – Sedge rocky shore (shallow open water)</li></ul> <p>c) <i>Wetland Size</i> <b>Section 9, Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS lists the following wetland types and the cumulative area they encompass within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – 18.2 ha</li><li>ii. BS18 – 23.3 ha</li><li>iii. BS19 – 2.8 ha</li><li>iv. BS19/24 – 0.8 ha</li><li>v. BS20 – 0.6 ha</li><li>vi. BS21 – 1.9 ha</li><li>vii. BS23 – 0.6 ha</li><li>viii. BS25 – 0.4 ha</li><li>ix. BS27 – 4.2 ha</li></ul> <p>d) <i>Wetland Water Surface Elevation</i> Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 <b>Figure 1 Elevations of wetland features in the LSA.</b></p> <ul style="list-style-type: none"><li>• Wetlands 1.5 km west of the SSA range from 526-524 masl</li><li>• Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl</li><li>• Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl</li><li>• Wetlands north of the SSA and in the vicinity of the proposed air strip range from 514-508 masl.</li><li>• Wetlands situated further north of the SSA in the LSA were at an elevation of approximately 526 masl</li><li>• Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl</li><li>• Most wetland evaluated south of the SSA had elevations ranging from 491-488 masl</li></ul> <p>e) <i>Wetland Depth</i> – information associated with wetland depth for those in the LSA is not available.</p>	No EIS updates are required for this response.

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						<p>f) <i>Wetland Flow Pathways</i> - Nearly all wetlands are connected or adjacent to rivers and tributaries, and thus flow pathways are discernable in <b>Figure 9.2-8</b> of the draft EIS.</p> <p>g) <i>Presence of Fish and Fish Habitat</i> For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA.</p> <p>2) As noted in other parts of this IR response, the wetlands within the Project footprint are limited to two areas (i.e., stream crossings along the access road to the airstrip and powerline connection SE of Highway 914 [See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution in Attachment IR-101]) and these wetland areas can be avoided through design and construction mitigations. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>In regard to baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint:</p> <p>a) <i>Surface water quality in wetlands</i> – surface water quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, surface water quality was sampled and assessed at stream and lake stations situated upstream and downstream of wetland areas. These stations were selected for sampling as they were identified as providing repeatability (i.e., relative water depth) and informative with respect to desired segments of the system. For example, water quality was sampled at SA-4, SA-5, LA-6, SA-6 and LA-5 following the flow path from upstream to downstream, respectively. The water quality at these nodes was inclusive of upstream wetland influences. For further reference to surface water sampling station during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>b) <i>Sediment quality in wetlands</i> - sediment quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, sediment quality was sampled and assessed at depositional lake stations situated upstream and downstream of wetland areas. The sediment quality at these nodes would be inclusive of upstream wetland surface water and sediment influences. For further reference to sediment sampling stations during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>3) For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA</p> <p>However, when further scrutinizing the potential overprinting of wetland features as a result of the Project it is evident that even this loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and powerline connections are proposed (<b>See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution (Attachment IR-101)</b>).</p> <p>Wetlands associated with stream crossings have been identified to have mitigative designs (clear-span) to ensure no impacts to fish and fish habitat. The hydro-line as shown in Figure 1 will be constructed to avoid direct impacts to fish and fish habitat following best installation practices. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>As discussed in Section 8.1.6.1 of the EIS, water levels in the ponds and lakes in the vicinity of the of the Project are expected to experience negligible effects, with magnitudes of changes in water levels predicted to be in the sub-centimeter range. As natural fluctuations in lake water levels were approximately 0.4 m from 2011 to 2019, Project-related changes are not expected to be of a magnitude to compromise the Surface Water Quantity VC. It can then be considered a reasonable assumption that any changes to wetland features will have similar sub-centimeter impacts to water levels due to changes in surface flow and/or groundwater and therefore do not pose an indirect effect to water quantity or fish and fish habitat associated with these wetland features.</p> <p>4) As no impact is expected due to overprinting or due to draw down effects by the ISR, additional mitigation measures are not warranted. Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project. However, such changes are expected to be less than measurable.</p>	
IR-102	ECCC	Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including	<b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data	1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.	Please note: Figures and tables associated with this IR response as noted below are provided in Attachment IR-102. See also response IR-236.	Wording errors in Appendix 8-C, Appendix II, Table 1 will be updated in the final EIS as follows: - SA-2 extension method = Unit Area Runoff with Scaling and Offset



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			Appendix II, Table 1 (p. 2)	<p>from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>	<p>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</p> <p>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</p>	<p>1. As mentioned by ECCC and discussed in the draft EIS, baseline hydrometric datasets are available for the Project at various nodes throughout the watershed and these datasets are extended to cover a broader period of record to the Wheeler River station (06DA005) operated by Water Survey Canada. Datasets for local stations measured at the Project cover a range from 2010 to 2019, though the date records are not continuous over this period. There is value in the hydrometric data collected at the Project site and these data should inform the long-term estimates of flow at Project nodes. As such, relationships are established to link 06DA005 first to SA-1 via correlation, than SA-1 to the other stations at the Project via correlation, unit area runoff relationships and unit area runoff relationships with scaled and/or offset influences.</p> <p>The use of 06DA005 solely to extend the record at the Project is reasonable given that it is a direct receiver from the Project watersheds and has a watershed area approximately one order of magnitude larger the SA-1 which is the largest watershed monitored at the Project. Further, trends in the datasets for coincident dates are generally similar and correlated are sufficiently in agreement. 06DA005 is not a perfect proxy for long-term record extension; in particular a flow event in October 2016 results in proportionally greater flow rates than were observed at 06DA005. That said, it is the best available station and incorporates locally and regionally measured data which is standard practice.</p> <p>A wording error in Table 1 of Appendix II of Appendix 8-C indicates that for Assessment Nodes SA-2 and SA-3 the extension method is listed as Unit Area Runoff with Offset. Rather, SA-2 should be listed as Unit Area Runoff with Scaling and Offset and SA-3 should be listed as Unit Area Runoff with Scaling. Also, the source station for SA-5 should be noted as SA-6. These corrections will be made in the final EIS.</p> <p>All record extension methods follow the same equation format (presented below) where the variable Q represents discharge. Correlations may have influence over all five variables while Unit Area Runoff methods may only use one or two. The variable A through E are adjusted to define the fit of the extension method. The fit of the extension method is determined as the summation of the differences between the observed and estimated daily average discharge (or instantaneous measured discharge if the station did not have an installed datalogger) for coincident days in the datasets. Variables A through E are adjusted through a solver algorithm such that the summation of the differences is as near to zero as possible.</p> $Q_{Assessment\ Node} = A \cdot [B + C \cdot (Q_{Source\ Station} + D)^E]$ <p>Table 1 in Attachment IR-102 presents the variable used for each assessment node and indicates the source station for the calculation. In Attachment IR-102 following Table 1, figures 1 to 7 are presented for each assessment node show the estimated hydrograph for the station as well as measured discharges and reported hydrographs as daily average discharge. Figures are not presented for nodes LA-1 and LA-5 as there are no measured discharges immediately at the outlet of those lakes.</p> <p>2. Simple unit runoff relationships from larger watersheds are a reasonable approach when no other data are available for use at a Project. In this approach larger watersheds tend to have attenuation which impacts the timing and magnitude of runoff events When local data are available it is a better approach to understand the relationship of local flow rates within the broader context. As an example, at SA-3 if the unit area relationship is used from 06DA005 direct to that watershed it results in a dramatic under prediction; the measured data indicate that that watershed is capable of generating larger flow rates than would be expected simply based on a unit runoff.</p> <p>Regarding the comment on the use of constructing records based on constructed records, the same methodology is incorporated into developing hydrographs at the Project as is used to estimate flows at 06DA005. The long-term extension of the Project data simply relates the datasets in a manner which is acceptable to the Proponent’s technical experts.</p> <p>Using the record extension methodologies presented in Table 1 of Attachment IR1-2, ensures the data provide a better fit ultimately to 06DA005 as understood within the regional context.</p> <p>3. The proponent is of the professional opinion that the baseline water quantity metrics do not need to be revised and the information presented in the draft EIS and supporting documents is suitable for the intended purpose. As noted in the draft EIS, Section 8.1.6.2, “The confidence in the assessment of predicted effects on hydrology is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that water withdrawal and discharge scenarios presented herein represent the bounding case and hydrogeological modelling projections are not changed.”</p>	<p>- SA-3 extension method = Unit Area Runoff with Scaling - Source station for SA-5 = SA-6</p>
IR-103	ECCC	Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<p><b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.</p> <p>The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.</p> <p><b>Rationale:</b> IDF trends exhibit random behavior at some locations and</p>	<p>Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>ECCC correctly notes that the tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations. The closest gauged location to the Project is located 35 km_south southwest at the Key Lake Mine (KLM) and the IDF values at KLM for historical and future scenarios (Tables 1 and 2 below) are substantially lower than those predicted for the Project. The IDF-CC Tool estimated 1:100-year, 24-hour return period events of 79.9 and 88.6 mm during the current and predicted future values, respectively. As per Tables 1 and 2 those values are substantially larger, and more conservative than, the coincident values of 56.4 and 62.0 mm for KLM.</p> <p>The predicted values for the Project are likely strongly influenced by Cree Lake (4061861; 85 km west southwest) and Collins Bay SK (4061620; 130 km northeast). The interpolation may also be influenced by Stony Rapids A (4067PR5; 196 km north). The Cree Lake, Collins Bay SK and Stony Rapids A stations are all substantially higher than KLM; however, the</p>	No EIS updates are anticipated to address this IR.

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				correlated behavior at other locations. The choice of gauged locations will infer the statistics for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.		<p>geography, and likely the climate of KLM, is more similar to those of the Project than from the more distant stations.</p> <p>Despite the potential for the IDF_CC Tool to use weighting factors, the estimates provided by the tool for the purposes of assessing impacts of the project on the surface water hydrology are robust and conservative including in consideration of flooding or extreme weather events.</p> <p><u>IR-103 Table 1: Key Lake (4063753) – Historical IDF</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.39</td><td>6.66</td><td>7.11</td><td>7.37</td><td>7.43</td><td>7.56</td><td>7.65</td></tr><tr><td>10 min</td><td>7.46</td><td>10.11</td><td>11.40</td><td>12.39</td><td>12.66</td><td>13.37</td><td>13.94</td></tr><tr><td>15 min</td><td>9.22</td><td>12.44</td><td>13.97</td><td>15.12</td><td>15.42</td><td>16.23</td><td>16.86</td></tr><tr><td>30 min</td><td>11.50</td><td>16.59</td><td>19.20</td><td>21.24</td><td>21.81</td><td>23.36</td><td>24.63</td></tr><tr><td>1 h</td><td>13.72</td><td>18.91</td><td>21.28</td><td>23.00</td><td>23.45</td><td>24.61</td><td>25.49</td></tr><tr><td>2 h</td><td>15.71</td><td>22.25</td><td>26.04</td><td>29.31</td><td>30.29</td><td>33.09</td><td>35.61</td></tr><tr><td>6 h</td><td>21.93</td><td>27.85</td><td>30.92</td><td>33.36</td><td>34.05</td><td>35.92</td><td>37.48</td></tr><tr><td>12 h</td><td>26.57</td><td>33.31</td><td>36.50</td><td>38.87</td><td>39.50</td><td>41.17</td><td>42.46</td></tr><tr><td>24 h</td><td>35.57</td><td>44.63</td><td>48.82</td><td>51.86</td><td>52.67</td><td>54.76</td><td>56.35</td></tr></table> <p><u>IR-103 Table 2: Key Lake (4063753) – 2020 – 2050 Predicted IDF using CMIP6 Raw GCMs and SSP5.85</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.80</td><td>7.21</td><td>7.72</td><td>8.03</td><td>8.10</td><td>8.29</td><td>8.41</td></tr><tr><td>10 min</td><td>8.06</td><td>10.96</td><td>12.42</td><td>13.45</td><td>13.78</td><td>14.70</td><td>15.55</td></tr><tr><td>15 min</td><td>9.95</td><td>13.49</td><td>15.21</td><td>16.43</td><td>16.80</td><td>18.04</td><td>18.82</td></tr><tr><td>30 min</td><td>12.47</td><td>17.99</td><td>20.90</td><td>23.10</td><td>23.78</td><td>26.00</td><td>27.69</td></tr><tr><td>1 h</td><td>14.88</td><td>20.51</td><td>23.16</td><td>25.08</td><td>25.68</td><td>27.36</td><td>28.61</td></tr><tr><td>2 h</td><td>16.85</td><td>24.13</td><td>28.27</td><td>31.65</td><td>32.77</td><td>36.06</td><td>39.23</td></tr><tr><td>6 h</td><td>23.50</td><td>30.23</td><td>33.64</td><td>36.05</td><td>36.88</td><td>39.24</td><td>41.27</td></tr><tr><td>12 h</td><td>28.59</td><td>36.18</td><td>39.67</td><td>42.08</td><td>42.85</td><td>44.99</td><td>46.74</td></tr><tr><td>24 h</td><td>38.26</td><td>48.47</td><td>53.03</td><td>56.20</td><td>57.14</td><td>59.86</td><td>62.03</td></tr></table>	T (years)	2	5	10	20	25	50	100	5 min	5.39	6.66	7.11	7.37	7.43	7.56	7.65	10 min	7.46	10.11	11.40	12.39	12.66	13.37	13.94	15 min	9.22	12.44	13.97	15.12	15.42	16.23	16.86	30 min	11.50	16.59	19.20	21.24	21.81	23.36	24.63	1 h	13.72	18.91	21.28	23.00	23.45	24.61	25.49	2 h	15.71	22.25	26.04	29.31	30.29	33.09	35.61	6 h	21.93	27.85	30.92	33.36	34.05	35.92	37.48	12 h	26.57	33.31	36.50	38.87	39.50	41.17	42.46	24 h	35.57	44.63	48.82	51.86	52.67	54.76	56.35	T (years)	2	5	10	20	25	50	100	5 min	5.80	7.21	7.72	8.03	8.10	8.29	8.41	10 min	8.06	10.96	12.42	13.45	13.78	14.70	15.55	15 min	9.95	13.49	15.21	16.43	16.80	18.04	18.82	30 min	12.47	17.99	20.90	23.10	23.78	26.00	27.69	1 h	14.88	20.51	23.16	25.08	25.68	27.36	28.61	2 h	16.85	24.13	28.27	31.65	32.77	36.06	39.23	6 h	23.50	30.23	33.64	36.05	36.88	39.24	41.27	12 h	28.59	36.18	39.67	42.08	42.85	44.99	46.74	24 h	38.26	48.47	53.03	56.20	57.14	59.86	62.03	
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IR-104	ECCC	Fish and fish habitat	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>Please see response to IR-15, IR-236 and AD-15. Although there are a variety of methods available to derive a PMP, Denison’s selected PMP for engineering design (i.e., 493 mm; see response to IR-15; based on Canadian Climate Program [1994]) is over 5 times higher than observed and predicted 24 hour precipitation events (both 1 in 100 year, 24 hour return precipitation events and 24-hour maximum precipitation events; see response to AD-15), and as such, Denison is confident that the Project water management infrastructure will be appropriately designed. The PMP included in Section 8 of the draft EIS was 489.3 mm from a more recent publication (Atmospheric Environment Branch [1999]). Denison retained the higher of the two PMP values (i.e., 493 mm) for design purposes.</p> <p>The proponent will address the information requirements in reverse order of the way they are presented.</p> <p>2. The World Meteorological Organization (WMO) issued Manual on Estimation of Probable Maximum Precipitation (PMP) in 2009 (WMO-No. 1045), the third edition of this manual. This document presents several methodologies for estimation of PMP and is preceded by the similar second edition 1986 document titled “Manual for Estimation of Probable Maximum Precipitation (WMO No. 332)”. The 1986 document served as part of the foundation for analyses presented by Atmospheric Environment Branch (1999). WMO indicates that the 2009 document “keeps a majority of the content from the second edition” and newly added content since 1986 is for “directly estimating PMP for the requirements of a given project in a design watershed on probable maximum flood (PMF) in China, the United States of America, Australia and India.” As such, the proponent believes the Atmospheric Environment Branch (1999) analysis remains current within the context of the Project.</p> <p>Atmospheric Environmental Branch (1999) builds upon a similar document produced in 1994 (Canadian Climate Program, 1994). The 1994 text discusses methodology and results of analyses for northern Saskatchewan. Though the author is confident in their assessment, the author does indicate that values estimated through northern Saskatchewan may be “spurious” due to the scarcity of climatological data in the region. The use of the term “spurious” seems to be in reference to predicted PMP values which are substantially higher than those where data are available.</p> <p>Additional analyses would be possible for this assessment; however, climatological data remain scarce in northern Saskatchewan. Though there is uncertainty as to the result of</p>	No changes to the EIS are required.																																																																																																																																																																



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						<p>reassessment of PMP values in the vicinity of the Project, others have completed their own reassessment of PMP values based on locally monitored data which yielded a much smaller result for the PMP. In that situation the proponent opted to stay with a value of 489.3 mm as estimated by Atmospheric Environment Branch (1999) even though it was substantially larger than their reassessed value (NexGen Energy Ltd., 2022).</p> <p>1. Though it is presumed that methodologies have not changed appreciably to justify a reassessment of the PMP, the data scarcity component would also influence the potential for accurate estimation of the design storm. No new stations have been added in northern Saskatchewan with sufficient data record to improve regional observations which play a role in Hopkinson's analyses.</p> <p>Anecdotaly speaking, the estimates of 489.3 mm across the northern Saskatchewan region are considered very high by other practitioners in the industry. This seems to be supported by additional analyses completed for NexGen Energy Ltd. (2022). The acceptance of 489.3 mm or 493 mm as the PMP for the Project falls in line with magnitudes used by existing operators in the area and is likely a conservative estimate.</p> <p>References:</p> <p>Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p> <p>Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.</p> <p>NexGen Energy Ltd. 2022. Rook I Draft Environmental Impact Statement. June 2022.</p>	
IR-105	Directorate of Fisheries and Oceans (DFO)	Fish and fish habitat	<p>Section 8.1.4.1, Potential interactions between project and valued component/key indicators Surface Water Quantity</p> <p>Section 8.1.4.2.2, Surface Water Taking</p> <p>8.3.4.1, Potential interactions between project and valued component/key indicators</p>	<p><b>Context:</b> Table 8.1-8 and Table 8.3-6 in the EIS indicates a potential for freeze wall operation to influence groundwater interactions and surface water quantity and as a result, impact fish and fish habitat. Section 8.1.4.2.2 references Section 7 Geology and Groundwater for details on potential impacts. In addition, IR-63 notes the groundwater model does not describe the pathway in which groundwater would pass around the freeze wall during operation and any resulting potential effects on groundwater discharge to Whitefish Lake.</p> <p><b>Rationale:</b> As per IR-63, the groundwater model analysis is insufficient to make conclusions on the potential effects of the freeze wall on groundwater discharge into Whitefish Lake. DFO requires this information to fully understand if altered groundwater regimes will result in changes to Whitefish Lake water levels and any potential impacts to fish and fish habitat as a result of changing water levels.</p>	<p>1. Provide a more fulsome analysis of the potential impact of freeze wall operations on local and semi-regional groundwater regimes, and subsequently to fish and fish habitat within Whitefish Lake. The analysis should provide a rationale of how the scope of the groundwater model is relevant to and able to detect changes at the scale of fish and fish habitat.</p> <p>2. If impacts to fish and fish habitat in Whitefish Lake are predicted to occur due to changes in the groundwater regime, describe any mitigation measures that could be used to avoid these impacts.</p> <p>3. If impacts are predicted that cannot be avoided, characterize residual effects on fish and fish habitat.</p>	<p>Please refer to the disposition for IR-63 for a fulsome explanation of the minor impact that the freeze wall will have on the area and regional groundwater flows. It was concluded that the freeze-walled area is a relatively small disruption to the regional groundwater flow system.</p> <p>Potential indirect impact to the surface water hydrology at Whitefish Lake as a result of project induced changes to the hydrogeology of the area was considered as part of Section 8.1 and discussed in Appendix 8-C. The project impacts were inclusive of changes in groundwater contributions to LA-5 as listed in Table 4-1 of Appendix 8-C. The analysis included the most up to date information during the preparation of the EIS and which indicated a potential loss in contribution of 4-6 L/s of groundwater reporting to LA-5 through the operation and decommissioning phase. This input is anticipated to return to pre-disturbance conditions for Post-Decommissioning. More recent calculations of the potential loss of groundwater contribution to Whitefish Lake as 9.9 L/s. This change is within the same magnitude of that previously modelled and therefore is not likely to constitute a change in the assessment of significant effects for the aquatic environment.</p> <p>Recent modelling using a loss of 9.9 L/S indicates that the majority of this change is due to dewatering of the ISR area and not due to the freeze wall itself. As indicated in Attachment IR-63, the groundwater flow contours will locally deviate from their original paths due to the installation of the freeze wall and the pumping, yet this will not impact the larger spatial migration of groundwater to the lake. Furthermore, groundwater discharge distribution (i.e., seeps and upwellings) will continue to occur in a similar pattern during pumping as to pre-pumping. This indicates that while the overall groundwater discharge rate is reduced, the areas of primary groundwater discharge will remain unchanged. As such, fish which utilize LA-5 for critical life-history periods (namely Northern Pike) will not be impacted due to changes in groundwater interactions directly, or indirectly due to reductions in surface water levels or flow. As such, additional mitigation measures outside that currently proposed in the draft EIS are not suggested.</p>	Based on the response no revisions to the EIS are needed.
IR-106	CNSC	Change to an environmental component due to hazardous contaminants	Section 8.1.4.2.3, Surface Water Discharge	<p><b>Context:</b> It is stated in this section under construction that all site contact water will be held in the Clean Waste Rock Pond.</p> <p><b>Rationale:</b> It is unclear from this section what will happen to the contact water held in the Clean Waste Rock Pond, and whether it will be removed from site or released at a later time. What is the contingency plan if more contact water is produced during construction than the Clean Waste Rock Pond has capacity for.</p>	<p>Please indicate what will happen to the contact water stored in the Clean Waste Rock Pond during construction activities, will it be released after the wastewater treatment plant is installed? Further, please describe the contingency plan if contact water produced exceeds estimates and will exceed the volume of the clean waste rock pond?</p>	<p>During Construction, no effluent is expected to be released to the aquatic environment. Contact water stored in the Clean Waste Rock Pond during Construction will be held onsite until the Industrial Wastewater Treatment Plant (IWWTP) is commissioned. At that time the water from the pond would be conveyed to the IWWTP, treated, and released to Whitefish Lake per permit / license requirements.</p> <p>The sequence for Construction activities will occur in a logical manner based on Project execution plans. For example, construction of the wellfield runoff pond will be prioritized during the early part of Construction and it will able to hold 38,200 m<sup>3</sup> of water. This will provide contingency and additional water storage capacity if contact water produced exceeds estimates or the volume available in the Clean Waste Rock Pond.</p> <p>Other secondary contingency measures are also available should the volume of water requiring management exceed site infrastructure storage volume. This could include use a hydrovac for offsite disposal.</p>	No changes to the EIS are required.
IR-107	CNSC ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality</p>	<p>Please clarify what data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p>	<p>Surface water quality was sampled through 2016, 2018, and 2019 on a monthly basis which is generally consistent with federal requirements for assessing potential impacts through EA. Hydrological assessment has occurred from 2011 to 2019. Mean Annual Discharge (MAD) (m<sup>3</sup>/s) as measured at the Water Survey Canada (WSC) Wheeler River Watershed Station (06DA005) during 2016, 2018 and 2019 was 17.07, 17.34 and 19.23, respectively, all of which were slightly above the 43 year (1977 to 2019) average of 16.82. The MAD in 2016 and 2018 can be considered near average, with 2019 being considered an average-high flow year, but well below the maximum observed for the timeseries (27.62 m<sup>3</sup>/s). Since this period, there</p>	No changes to the EIS are required.

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				<p>characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”</p> <p>In addition, the “applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”</p>	<b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline	<p>have been no land use changes within the area that would constitute a major change in water quality.</p> <p>Baseline water quality samples were collected during years of average to average-high flows in the Wheeler River system and therefore representative of background conditions for assessment of potential impacts in the EIS. Additional conservatism was included in the impact assessment by using the 95<sup>th</sup> percentile values for baseline parameter concentrations when modelling potential effluent effects. As such, the surface water quality data collected are suitable for the intended purpose of assessing potential impacts and the additional conservativisms that were included as part of the assessment were precautionary.</p> <p>Given the above, Denison feels strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>Denison commits to the collection of additional surface water quality baseline data prior to project development starting to ensure updated baseline information is available for identification of any changes that might influence estimates of Project impacts. These data will be used to support permitting and licensing through updates to the ERA.</p>	
IR-108	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>	Please see Attachment IR-108.	Tables 8.2-2 and 8.2-3 will be updated in the final EIS, per Attachment IR-108.
IR-109	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. from the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.	Section 2 Project Description, Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds of the draft EIS outlines Denison's commitment to test effluent prior to discharge to Whitefish Lake, to ensure it meets federal and provincial discharge limits. Any pond not meeting the criteria will be recycled back to the Industrial Wastewater Treatment Plant via the process water pond.	No EIS updates are anticipated to address this IR.
IR-110	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment  Appendix 8-E, Section 2.1	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0 of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p>	<p>Provide confirmation of the diffuser depth and location.</p> <p>ECCC requests the opportunity to review the finalized diffuser design once it is available.</p>	The diffuser will be placed at a depth between 2.5 and 3 m. The mapping provided in the draft EIS and Appendix 8-E is based on coarse bathymetric information, which will be supplemented with more robust bathymetric surveys to support final siting and design associated with permitting and licensing.	No EIS updates are anticipated to address this IR.

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IR-111	CNSC	Fish and fish habitat	Section 8.2.4.2.2, Controlled Discharge	<p><b>Context:</b> This section of the EIS indicated that the scenario was assessed using a conservative assumption of a continuous freshwater withdrawal rate of 40.5 m3/hr, and a continuous effluent discharge rate of 81.0 m3/hr.</p> <p><b>Rationale:</b> The withdrawal rate assessed is half of the effluent rate, it is unclear from the text where the other half of the volume of effluent is coming from, if not drawn from the lake.</p>	Please clarify where the other half of the total volume of effluent discharged is from in the water balance between water intake and effluent.	Process water will be drawn from both groundwater and surface water (when required). The 81.0 m³/hr discharge rate conservatively assumes withdrawal from both sources at the maximum proposed rates. Please refer to Section 2.2.3 and specifically Figures 2.2-14, 2.2-15 and 2.2-16 of the draft EIS which depict the water balance for the Project for each of Construction, Operation and Decommissioning phases.	No EIS updates are anticipated to address this IR.																																																																																																												
IR-112	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.2, Aquatic Environment  Appendix 8-E, Section 1.2.1  Appendix 10-A (ERA), Section 3.1	<p><b>Context:</b> This section of the EIS states that, “for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of 81.0 m³/hr.” (p. 8-21)</p> <p>However, several sentences later it is stated that, “The approach to assessing Project-related effects on the Surface Water Quality VC was conservative for the following reasons: The assessment was based on a continuous (year-round) discharge rate at an expected average effluent discharge of 0.0101 m3/s (or 36.5 m3/hr) throughout Construction, Operation, and Decommissioning...”</p> <p>This is a continuous theme throughout Section 8, Aquatic Environment, where the discharge rate for the surface water quality assessment changes between 36.5 m3/hr and 81.0 m3/hr. However, in Appendix 10-A (ERA) the 36.5 m3/hr discharge rate is the only value used for the near and far-field modelling.</p> <p>It should be made clear in the main body of the draft EIS that the average effluent discharge rate of 36.5 m3/hr has been used as the input for the near- and far-field modelling for effluent, surface water and sediment quality predictions. The maximum upper bound discharge rate is 81 m3/hr; however, modelling for effluent, surface water and sediment quality was not completed for this discharge rate.</p> <p><b>Rationale:</b> It remains unclear throughout the draft EIS that all predictions of COPC concentrations in effluent, and receiving environment surface water and sediment are based upon the effluent discharge rate of 36.5 m3/hr, and not the maximum upper bound discharge rate of 81 m3/hr. All conclusions about risk to the environment and aquatic and terrestrial biota must make this clear. If the Proponent wishes to make conclusions based on the maximum upper bound discharge rate of 81 m3/hr, modelling needs to be conducted using this rate of discharge.</p>	<p>1. Confirm that the surface water quantity, quality, and aquatic biota risk assessments and modelling, were conducted using the discharge rate for 36.5 m3/hr within the draft EIS.</p> <p>2. Revise any statements or conclusions in the draft EIS to improve clarity about the usage of the maximum upper bound discharge rate of 81 m3/hr. Remove statements regarding use of the discharge rate of 81 m3/hr during modelling and risk assessments to the receiving environment as needed.</p>	<p>1. Denison confirms that the surface water quantity, quality, and aquatic biota risk assessments presented in the draft EIS and ERA (Appendix 10A) were conducted using the discharge rate for 36.5 m³/hr.</p> <p>2. Denison provides the following summary to clarify effluent discharge rates and identify updates to the final EIS:</p> <ul style="list-style-type: none"><li>Section 8.2.4.2.2 of the EIS will be modified (see details in EIS Updates column).</li><li>Appendix 8-E used an effluent discharge rate of 36.5 m³/hr, which is correct. No changes required.</li><li>Appendix 10-A used an effluent discharge rate of 36.5 m³/hr in the modelling and ERA results; however, in Section 6.2 of the ERA in Appendix 10-A, a sensitivity analysis was conducted to assess the effects on surface water and sediment when the effluent discharge rate is increased to the upper bound discharge rate of 81 m³/hr. No changes required.</li></ul>	<p>The sentence in Section 8.2.4.2.2 will be updated in the final EIS as follows:</p> <p>Denison does not intend to include constant freshwater withdrawal or effluent discharge throughout Operation; however, for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of <del>81.0</del> <b>36.5</b> m³/hr.</p>																																																																																																												
IR-113	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>Section 8.1.3.4 (and Appendix 8-C) provides a quantitative assessment of the potential changes in surface water quantity due to climate change. The 1:100 year, 24-hour return period rainfall events for the baseline and climate change influenced IDF curves are 79.9 mm and 88.6 mm, respectively. The PMP for the Project is estimated to be 493 mm (refer to IR-15 and AD-15) which is well above both 24-hour maximum precipitation and 1:100, 24 hour return precipitation events. The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change). The potential impacts of climate change to precipitation and therefore flows was summarized in Appendix 6-C, Table 10 with the total annual precipitation and the maximum 1-day events being variable over the next four decades (Table 1). Regardless, the climate change scenario indicates a potential increase in event based assimilative capacity in the receiving environment.</p> <p>TABLE 1- Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)</p> <table><tr><th>Year</th><th colspan="4">Total Annual (mm)</th><th colspan="4">Maximum 1-day (mm)</th></tr><tr><td></td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td></tr><tr><td>2011-2020</td><td>455</td><td>518</td><td>509</td><td>508</td><td>48</td><td>29</td><td>27</td><td>27</td></tr><tr><td>2030</td><td></td><td>528</td><td>503</td><td>537</td><td></td><td>27</td><td>24</td><td>26</td></tr><tr><td>2040</td><td></td><td>487</td><td>498</td><td>514</td><td></td><td>28</td><td>29</td><td>24</td></tr><tr><td>2050</td><td></td><td>504</td><td>524</td><td>520</td><td></td><td>26</td><td>29</td><td>33</td></tr><tr><td>2060</td><td></td><td>513</td><td>515</td><td>523</td><td></td><td>26</td><td>33</td><td>26</td></tr><tr><td>2070</td><td></td><td>527</td><td>534</td><td>568</td><td></td><td>29</td><td>31</td><td>28</td></tr><tr><td>2080</td><td></td><td>539</td><td>551</td><td>547</td><td></td><td>30</td><td>33</td><td>28</td></tr><tr><td>2090</td><td></td><td>543</td><td>545</td><td>548</td><td></td><td>31</td><td>32</td><td>35</td></tr><tr><td>2100</td><td></td><td>546</td><td>535</td><td>559</td><td></td><td>23</td><td>25</td><td>28</td></tr><tr><td colspan="2">Overall Increase:</td><td>28</td><td>26</td><td>51</td><td></td><td>-6</td><td>-2</td><td>1</td></tr></table> <p>To mitigate the potential for unplanned release of deleterious substances into the surface water environment even during the next 40 years of climate change, the PMP of 493 mm was</p>	Year	Total Annual (mm)				Maximum 1-day (mm)					Measure d	RCP 2.6	RCP 4.5	RCP 8.5	Measure d	RCP 2.6	RCP 4.5	RCP 8.5	2011-2020	455	518	509	508	48	29	27	27	2030		528	503	537		27	24	26	2040		487	498	514		28	29	24	2050		504	524	520		26	29	33	2060		513	515	523		26	33	26	2070		527	534	568		29	31	28	2080		539	551	547		30	33	28	2090		543	545	548		31	32	35	2100		546	535	559		23	25	28	Overall Increase:		28	26	51		-6	-2	1	No EIS updates are anticipated to address this IR.
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						used for water management engineering designs. During a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m <sup>3</sup> (excluding a freeboard of 1 meter). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.” As such, the project has been designed to manage water during PMP and greater, and therefore mitigation of potential impacts to water quality due to climate change has been initially included as part of the EIS. As a result, it is Denison's opinion that a quantitative assessment of potential impacts to surface water quality is not warranted as it is likely to indicate improved results from the conservative assessment of potential water quality changes during operation and decommissioning phases. Continued monitoring of background, effluent and receiver water quality will be undertaken and provide the ability for adaptive management throughout the life of the mine in association with potential climatic changes to the local and regional area.	
IR-114	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>	<ol style="list-style-type: none"><li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li><li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li><li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li></ol>	See response in Attachment IR-114.	Tables 8.2-9, 8.2-10, and 8.2-13 will be updated in the final EIS. The updated tables are provided in Attachment IR-114.
IR-115	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p><b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be</p>	<ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li><li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li></ol>	<ol style="list-style-type: none"><li>1. Table 8.2-8 has been updated and provided in Attachment IR-115</li><li>2. Denison believes that the water quality thresholds used in the assessment (Section 8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) were appropriate and reflect levels that are protective of aquatic life. The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is a reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.</li></ol>	Table 8.2-8 of the draft EIS will be replaced per the IR response as indicated.

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				derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.		<p>3. Denison has selected the Saskatchewan specific guideline for molybdenum of 31 mg/L to be the most appropriate for the Project. It was derived from recent data following the CCME (2007) protocol. The molybdenum water quality objective based on the 5th percentile (HC5) of the species sensitivity distribution (SSD) according to the CCME protocol; 18 data points for 12 different species were used, mainly EC10 data (WSA, 2017). The CCME guideline is identified as an interim guideline and was based on multiplying the lowest chronic toxicity value, the 28-d LC50 of 0.73 mg/L for rainbow trout (O. mykiss), by a safety factor of 0.1. This original study by Birge (1978) has not been reproducible, either using the original methods or using standard methods (Davies et al. 2005). No changes to the EIS are proposed in this regard.</p> <p><u>References:</u>            Birge, W.J. 1978. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. Special Collections, USDA National Agricultural Library. Accessed February 16, 2023, <a href="https://www.nal.usda.gov/exhibits/speccoll/items/show/5224">https://www.nal.usda.gov/exhibits/speccoll/items/show/5224</a>.</p> <p>CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life.</p> <p>Davies, T.D., J. Pickard and K.J. Hall. 2005. Acute molybdenum toxicity to rainbow trout and other fish. Journal of Environmental Engineering &amp; Science 4: 481-485.</p> <p>WSA (Saskatchewan Water Security Agency). 2017. Saskatchewan Water Quality Objective for the Protection of Aquatic Life – Molybdenum. Fact Sheet. Report No. WSA 514.</p>	
IR-116	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3	<p><b>Context:</b> Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p><b>Rationale:</b> It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>	<p>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</p> <p>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</p>	See response in Attachment IR-116.	The EIS will be updated with the information provided in Attachment IR-116. Specifically, Table 8.2-14 and Table 8.4.9 of the EIS will be replaced by Table 1 of Attachment IR-116 and Table 8.5.5 will be replaced by Table 2 of Attachment IR-116..
IR-117	CNSC	Human health with respect to hazardous contaminants	Section 8.2.4, Table 8.2-9	<p><b>Context:</b> CNSC staff note that some of the effluent quality predictions in the EIS are quite high for a uranium mine and mill facility compared to the existing facilities.</p> <p>For example, the upper bound effluent quality of molybdenum is 2.5 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.213 mg/L.</p> <p>Also, the upper bound effluent quality of copper is 0.022 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.002 mg/L.</p> <p><b>Rationale:</b> Surface water quality models should be based on the anticipated effluent quality. From discussions with Denison, it appears that the effluent quality predictions may change based on the results of more bench scale tests that are still being conducted and continued optimization of the design of the water treatment plant.</p>	<p>Please provide the anticipated effluent quality of the constituents of potential concern during normal operations.</p> <p>Once Denison has refined the effluent quality predictions, Denison is expected to update the inputs into the surface water quality model.</p>	<p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the draft EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in the middle part of Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three." The derived effluent quality based on not exceeding a water and sediment quality guideline was only used for a handful of constituents. The ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. In addition, Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project. The effluent quality predictions provided in the EIS will continue to bound the assessment and provide a conservative representation of risk to human health and the environment. No changes to the EIS are proposed in this regard. See also responses to IR-16 and IR-18.</p>	<p>Revisions to the draft EIS and ERA (Appendix 10-A) will be made per the IR response as indicated below.</p> <p>Section 10.1.4.2.2 of the EIS and Section 3.1.1.2 of the ERA (Appendix 10-A) will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab results. The text in both sections will read "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium."</p>
IR-118	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.6.1, Section 8.4.6.1 and Section 8.5.6.1, Aquatic Environment	<p><b>Context:</b> It is unclear if Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. No information regarding the future centuries scenario has been provided in the rationale summary for ratings.</p> <p><b>Rationale:</b> Groundwater seepage of COPCs may have future impacts to surface water quality, sediment quality and aquatic receptors; however, the extent of residual effects is unclear without further information.</p>	Provide further information regarding how groundwater seep. of COPCs may have future impacts to surface water quality, sediment quality, and aquatic receptors, and any residual effects that may persist.	It can be confirmed that Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 did take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. Ground water contributions to surface water as a result of excursions or migration from the shallow groundwater aquifer to Whitefish Lake was well documented in Section 7 and Appendix 7-C. For the COPCs identified in the effluent, the predicted mass flux from groundwater into Whitefish Lake Middle starting 200 years after the Project phases, during the future centuries, was input to the IMPACT model to predict the water and sediment concentrations over time at the exposed locations. The COPCs in groundwater will be released to Whitefish Lake Middle at a predicted mass flux as shown in Table 3-4 (Appendix 7-C) The results of the predictive modelling were then used to support	No EIS updates are anticipated to address this IR.

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						the environmental risk assessment to assess potential impacts and risks to surface water, sediment and aquatic biota. The IMPACT model scenario for the future centuries was undertaken specifically to investigate the potential for groundwater migration to Whitefish Lake in future centuries to impact the aquatic environment of Whitefish Lake. For each medium or receptor (i.e., surface water, sediment or aquatic biota) no risk was identified during the future centuries period (Appendix 10-A). Additional information concerning potential impacts of groundwater interactions with Whitefish Lake are provided in IR-116.	
IR-119	CNSC	Fish and fish habitat	Section 8.3.1.2, Table 8.3-1, Sediment quality	<p><b>Context:</b> Sediment quality isn't considered a key indicator for fish and fish habitat, but the accumulation of contaminants in sediment porewater without habitat alteration is similar to the key indicator 'change in surface water quality from baseline conditions' that is considered.</p> <p><b>Rationale:</b> It is not clear whether sediment was just considered for physical disturbance, and why chemical changes are missing from key indicator list for fish and fish habitat.</p>	Please provide the rationale for exclusion of sediment quality from the key indicator list for fish and fish habitat.	<p>Sediment quality was not included as an indicator for the Fish and Fish Habitat VC, rather Sediment Quality and Benthic Invertebrates were elevated to VCs within the EIS (Section 8.4). In the draft EIS Section 8.4.1.1, Sediment Quality VC was identified as having interrelations or linkages to Benthic Invertebrates (VC) as their medium of support to life-cycles as well as the Fish and Fish Health VC. Specifically, the sediment that benthic invertebrates inhabit as the medium responsible for their ability to carry out their life processes. Benthic invertebrates provide an important forage base for fish species. Aquatic sediments and benthic invertebrates (food supply) are inferred as part of the definition of fish habitat under subsection 2(1) of the Fisheries Act, 1985 (Government of Canada 2019).</p> <p>Alterations to Sediment Quality in an aquatic environment can directly affect Fish and Fish Habitat and this was taken into consideration both with respect to physical and chemical changes. Under Section 8.4.1.2 and Table 8.4.1, key indicators and measurable parameters for sediment quality were provided and included:</p> <ul style="list-style-type: none"><li>- Sediment quantity and physical quality (particle size) from baseline conditions</li><li>- Change in sediment quality (chemical) from baseline concentrations</li></ul> <p>The results of the assessment of potential effects and significance of those effects for sediment quality as a VC are directly translatable to Fish and Fish Habitat as identified in Sections 8.3.1.1 and 8.4.1.1. As such, providing the same assessment within both sections is considered redundant.</p>	No EIS updates are anticipated to address this IR.
IR-120	CNSC	Aquatic species	Section 8.3.3 and 8.5, Aquatic Environment	<p><b>Context:</b> Although downstream impacts are not predicted by Denison it is important from an ecosystem perspective to establish baseline locations to monitor for potential cumulative effects to the aquatic environment due to the Key Lake and Wheeler River Operations to ensure the aquatic environment is being protected from cumulative impacts.</p> <p>Denison should consider adding a far-field exposure location and collecting baseline aquatic ecosystem baseline data in Russell Lake including:</p> <ul style="list-style-type: none"><li>• Water quality/chemistry</li><li>• Sediment chemistry/quality</li><li>• Benthic invertebrate chemistry /community</li><li>• Large-bodied fish tissue/chemistry</li></ul> <p><b>Rationale:</b> Russell Lake is identified as part of the RSA for the aquatic environment, but it appears that no detailed aquatic baseline data was completed in far-field location in Russell Lake. In addition, several Indigenous Nations and communities and local resource users have indicated that Russell Lake is an important body of water both culturally for traditional use and was once used as commercial fishery.</p>	<p>If Denison has not collected baseline aquatic studies in the far-field downstream receiving environment of Russell Lake, please provide a rationale for why.</p> <p>If a far-field Russell Lake location was sampled as part of baseline data collection, more information about the process and results with regards to sampling at Russell Lake should be included in the EIS. This information would be valuable to help determine potential cumulative effects downstream in the Russell Lake drainage system (due to the Key Lake Operation) which has been identified as a key concern and area of interest by several Indigenous Nations and communities.</p>	<p>Aquatic baseline surveys were conducted at two stations (LAB-1 and LAB-2) in Russell Lake and were considered 'far-field' stations in relation to the proposed mining plan for the Wheeler River Project. Data collection methods and results are presented in the draft EIS throughout the applicable subsections of <b>Section 8</b>.</p> <ul style="list-style-type: none"><li>• <b>Section 8.2</b> details the Surface Water Quality methods and results,</li><li>• <b>Sections 8.3</b> and <b>8.5</b> detail fish habitat, community, and health methods and results; and</li><li>• <b>Section 8.4</b> details sediment quality and benthic invertebrate community and chemistry methods and results.</li></ul> <p>A breakdown of where specific processes and results are located for each of these components is presented below:</p> <p><b><u>Surface Water Quality/Chemistry:</u></b> Surface Water Quality was sampled in Russell Lake. Methods and metrics are presented in <b>Section 8.2.3.1</b>. Water was sampled in Russell Lake and presented in <b>Table 8.2-2</b> (Pages 8-60 to 8-62) of <b>Section 8.2.3.3</b> of the EIS report, and summarized in <b>Table 8.2-4</b>. Surface Water predicted maximum Constituents of Potential Concern for the Russell Lake Inlet (LAB-1) are presented in <b>Table 8.2-13</b> of <b>Section 8.2.4.2.4</b>. Cumulative effects are also assessed in <b>Section 8.2.7</b>. Detailed baseline summary data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-3</b>.</p> <p><b><u>Sediment Quality/Chemistry:</u></b> Sediment was sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Sediment grain size results are summarized in <b>Table 8.4-2</b> in <b>Section 8.4.3.2.1</b>, and full data is presented in <b>Appendix 8-D, Table 3-4</b>. Sediment chemistry was summarized in <b>Table 8.4-3</b>, and full data is in <b>Appendix 8-D, Table 3-5</b>.</p> <p><b><u>Fish Habitat, Tissue Chemistry, and Community:</u></b> Russell lake is not clearly indicated in the initial list of sample areas presented in <b>Section 8.3.3</b> or <b>Section 8.5.3</b>; however, habitat information is presented in the Fish Habitat table (<b>Table 8.3-4</b>) of <b>Section 8.3.3.2</b>, and both Russell Lake sample locations (LAB-1 and LAB-2) and their associated fish community data are presented in the fish community map (<b>Figure 8.3-6</b>). Fish community and information is also presented in <b>Table 8.3-4</b>. Baseline fish community information is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-9</b>. Fish chemistry summary data (Mean, Max, Min) for Northern Pike and White Sucker bone and tissue samples is presented in <b>Table 8.5-2</b> of <b>Section 8.5.3</b> of the Draft EIS. Detailed fish tissue data summary is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-10</b>.</p> <p><b><u>Benthic Invertebrate Chemistry and Community:</u></b> Benthic invertebrates were sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Benthic invertebrate endpoints are summarized in <b>Table 8.4-4</b> of <b>Section 8.4.3.2.4</b>, and benthic invertebrate chemistry is summarized in <b>Table 8.4-5</b>. Detailed baseline benthic invertebrate community and chemistry data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-8</b>, and community data in <b>Tables 3-7A to 3-7D</b>.</p> <p>Also, refer to Cumulative Effects sections (Section 8.X.7) within each part of the Aquatic Environment assessment in the draft EIS for a discussion of potential cumulative effects in Russell Lake. (i.e., Section 8.2.7 for surface water quality; Section 8.3.7 for fish and fish habitat, 8.4.7 for sediment quality and benthic invertebrates, and 8.5.7 for fish health).</p>	No updates to the draft EIS are needed based on this IR response.
IR-121	CNSC	Fish and fish habitat	Section 8.3.3.1, Methodology and Metrics	<p><b>Context:</b> In the description of methodology for fish communities and spawning surveys, there's no mention that could be found for an any evaluation of fish condition, other than sexual condition.</p>	Please provide reference to where fish condition is considered or provide a justification for its exclusion.	Field work was conducted by aquatic biologists that are familiar with the identification of fish condition and abnormalities as it pertains to fish sampling protocols and the MDMER EEM guidance and protocols. As such, the lack of record of such gross abnormalities is reflective of fish populations of good condition. Any supplemental baseline surveys or future	No updates to the draft EIS are needed based on this IR response.



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				<b>Rationale:</b> Exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.		environmental effects monitoring will include documentation of fish condition and abnormalities.	
IR-122	CNSC	Fish and fish habitat	Section 8.3.8, Monitoring and Follow-up	<b>Context:</b> Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development."  <b>Rationale:</b> Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.	Please include reference lakes, and if it is provided, please reference where in the EIS these are discussed. If there are no reference lakes, these should be included in the monitoring program.	The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed prior to the commencement of ISR operations that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.	No updates to the draft EIS are needed based on this IR response.
IR-123	ECCC	Change to an environmental component due to radiological contaminants	Section 8.4.3.2.3, Aquatic Environment  Appendix 8-D, Table 3-5	<b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.  <b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.	1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.  2. Provide data on baseline concentrations of mercury in sediment.  3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.	1) Please see Attachment IR-123, Table 1, for a summary of baseline sediment concentrations and their respective screening criteria. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.  2) Mercury was not analyzed specific to sediments within the LSA during the initial baseline data collection period. Analysis of mercury at a low-level in sediment was not considered necessary for two reasons: 1. mercury is not associated with the uranium mining and milling process and 2. water quality sampling within the LSA indicated levels of mercury below detection at an acceptable level of detection (i.e., 0.00001 to 0.0000001 mg/L). Denison will collect background information pertaining to sediment total and methyl mercury from LSA lakes and streams prior to site development.  3) Please see Table 1 of Attachment IR-123 for a summary of baseline sediment concentrations and their respective screening criteria. One sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equaled to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria.  References:  Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.  Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.	No updates to the draft EIS are needed based on this IR response.
IR-124	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment	<b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated: <ol style="list-style-type: none"><li>COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</li><li>COPCs that exceed water quality guidelines in effluent, and,</li><li>COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</li></ol> <b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.	1. Provide the information on baseline exceedances of COPCs in sediment.  2. Provide an assessment of risk for any COPCs that have baseline exceedances of sediment quality thresholds in the receiving environment.  3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.	1) The information on the baseline exceedance of COPCs in sediment are provided as part of Attachment IR-123. The table indicates that only the maximum concentration of cadmium exceeded the CCME ISQG on one occasion when assessing all sediment samples over the course of baseline surveys in the LSA.  2) Only one sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6 within the RSA. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equals to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria. Cadmium was included as one of the constituents identified as a COPC under the non-radiological Ecological Risk Assessment (Appendix 10-A). No significant adverse effect on either aquatic or terrestrial populations or communities, as a result of releases from the Project, are predicted during the Project phases or during the future centuries. All estimated total HQs for all COPCs (arsenic, cadmium, chromium, cobalt, copper, molybdenum, selenium, uranium, zinc, chloride, and sulphate) for all ecological receptors are predicted to remain below the HQ benchmark of 1.  3) Denison has provided an analysis of the parameters that are identified under MDMER Schedule 4 and therefore have specified effluent discharge criteria. Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.	Changes suggested for Table 8.2-13 as consistent with IR-114.
IR-125	CNSC	Fish and fish habitat	Section 8.5, Aquatic Environment and Fish health	<b>Context:</b> Indigenous Knowledge studies and information collected in relation to the Project clearly identified the importance of water quality and fish health to local Indigenous peoples and is discussed throughout the Draft EIS. For example: <ul style="list-style-type: none"><li>“Russell is one lake where I commercially fish. How will this effluent impact the water quality, fish health? Will I be able to sell fish from here? If there is going to water” pollution, I just want to know” (19-LK-ERFNTrip-134.255) ”</li><li>“How are you going to protect the water quality? We are concerned about mercury in fish, other animals, etc. Is there mercury or arsenic in the uranium solution?” (p. 8-53)</li></ul>	One of the many mitigation measures mentioned throughout the aquatic environment section states:  “Denison will work with the associated communities to develop and implement the Project-specific monitoring programs and a framework to share the results for the purpose of assessing the performance of the water management system.” (p.10-32)  Has Denison considered the collection of additional baseline fish tissue species that are of importance to Indigenous Nations and communities and local cabin owners from	Fish tissue chemistry (bone and muscle) was collected for Northern Pike and White Sucker and presented in Table 8.5-2 of Section 8.5.3. Tissue was not collected for Walleye or Lake Whitefish, however, the tissue analysis of Northern Pike and White Sucker would be key indicators for the fish community in Russel Lake. Northern Pike is a piscivorous top predator much like Walleye, which would address concerns of bioaccumulation of mercury and other metals of concern. White Sucker is a generalist bottom feeding species that is often used to assess metal concentrations at a lower trophic level of the food chain. This information provides an initial baseline understanding of the tissue metal concentrations for the fish of Russell Lake.  The outcomes of the impact assessment demonstrated there will be no expected impact to Russell Lake with respect to water quality, sediment quality or fish and fish habitat. As	No updates to the draft EIS are needed based on this IR response.



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				<b>Rationale:</b> Several Indigenous Nations and communities and local resources users have indicated Russell Lake is an important body of water both culturally for traditional use and was used as commercial fishery in the past and from an aquatic ecosystem perspective.	Russell Lake? Assuming the species would be walleye (commercially and recreationally) and lake white whitefish that is traditionally an important species consumed.  Please provide more information on the engagement to date on the development of the Surface Water Management Program and Monitoring program that Denison is developing and engagement to date with interested Indigenous Nations and communities in the region on fish and fish health.	discussed in the response to IR-120 and this IR, historic information from Russell Lake is available, but may require supplementation prior to project development to monitor potential changes to the aquatic environment in the lake. Engagement on licensing requirements, such as the development of the environmental monitoring program and the associated surface water quality and monitoring regime will occur in later in 2023 and 2024.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on monitoring regimes, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.							
IR-126	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	Denison is aware of the ECCC Federal Environmental Quality Guideline for selenium in fish. The ECCC FEQG is for fish tissue egg-ovary and whole-body. Denison selected the US EPA guideline over the ECCC guideline since US EPA provides guidelines for fish tissue muscle as well. The fish assessed in the ERA were large-bodied fish including northern pike and white sucker. A fish tissue muscle TRV is appropriate for assessment of large-bodied fish; therefore, the US EPA selenium fish tissue muscle benchmark was preferred over the whole body value from ECCC.	No updates to the draft EIS are needed based on this IR response.						
IR-127	CNSC	Aquatic environment	Appendix 8-E, Section 1.2.1, Hydrological Inputs	<b>Context:</b> Within this section it states that the 7Q10 low flow rate used in the mixing assessment “was provided verbally to Ecometrix by NewFields Canada during a project meeting on 26 April 2022”  <b>Rationale:</b> The statement that this value was provided verbally is not an infallible method of communicating data, as the value could have been misheard, misremembered, or recorded improperly.	Please verify that the 7Q10 value used in the assessment is the correct value determined by NewFields.	The value used in the assessment (0.616 m³/s) is the correct value determined by NewFields. The value was calculated by NewFields as the inflow from SA-6 to Whitefish Lake and therefore considered representative of the flow in the northern basin of LA-5. This value will be specifically updated in Appendix 8-C (Table 3-3: 7Q10 Estimated Discharge) and Appendix 8-E (Section 1.2.1 to be changed to reference Appendix 8-C, Table 3-3) for clarity.	Appendix 8-C Table 3-3:7Q10 Estimated Discharge will be updated as shown below.  <b>TABLE 3-3: 7Q10 ESTIMATED DISCHARGE</b> <table><tr><th>Assessment Node</th><th>7Q10 Flow Rate (m³/s)</th></tr><tr><td>LA-1</td><td>0.874</td></tr><tr><td>LA-5</td><td>0.616</td></tr></table> <p>Note: m³/s = cubic meters per second</p>	Assessment Node	7Q10 Flow Rate (m³/s)	LA-1	0.874	LA-5	0.616
Assessment Node	7Q10 Flow Rate (m³/s)												
LA-1	0.874												
LA-5	0.616												
IR-128	CNSC	Current use of lands and resources for traditional purposes	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use Section 12 Section 14	<b>Context:</b> The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting with Indigenous Nations and communities and are presented in the EIS.  <b>Rationale:</b> The increased traffic and therefore dispersal of game (moose, woodland caribou) due to increased traffic has been raised as a concern with respect to increased mortality on wildlife and decreased ability to practice traditional rights.	How have the potential residual impacts with respect to increased traffic and noise (due to current and future operations) been communicated to Indigenous Nations and communities who use the road #914 for cultural and traditional activities (such as moose harvesting, berry picking and small game and birds)?  Please provide any additional information on the engagement that has taken place to date with Indigenous Nations and communities with respect to concerns and potential impacts on current use of lands and resources due to increased road traffic, and any mitigation measures proposed by Indigenous Nations and communities to minimize the potential impacts.	The potential residual impacts with respect to increased traffic and noise were communicated to ERFN and KML during engagment and through pre review of the EIS and have documented their regular use of the road. Proposed mitigation measures in relation to vehicle traffic were also communicated. Please see draft EIS, Section 4 record of consultation (ROC) 618, 619 and 620.  The findings in relation to the potential for residual impacts as a result of change in traffic will be shared again in future engagement activities, expected in late September and early October 2023. Any additional input will be integrated into the final EIS, as part of the commitment made under IR-28.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has collaborated with ERFN and KML to develop additional mitigation measures specific to these Communities. These include: 1) Assisting ERFN to provide clear highway identification for the location for the Mawdsley Reserve, where many cultural camp activities occur 2) The same is offered to KML; however, the current km 67 Culture Camp for KML was burned in the May 2023 forest fires, and so this will be executed in the future at such time as KML selects a new location. 3) The commitment by Denison to slow truck traffic down for a minimum of 2.5 km on either side of the culture camp(s) to 40 km/hr, during the months of September and October. 4) To communicate this new slowing protocol to Denison's contractors and other operators in the area, to inspire best practice for other operators in the area.	The EIS will be updated to reflect the additional mitigations to which Denison has committed, per the IR response. Specifically, the following will be added to the text of Section 11.1.5.3 and 12.3.5 within the context of traffic mitigation  <u>Traffic</u> <ul style="list-style-type: none"><li>Assist ERFN to provide clear highway identification for the location for the Mawdsley Reserve.</li><li>If requested, assist KML to provide clear highway identification at the km 67 Culture Camp or other selected location.</li><li>Require Denison truck traffic to slow to 40km/hr for a minimum of 2.5 km on either side of the culture camp(s), during the months of September and October.</li><li>Communicate the slowing protocol to Denison's contractors and other operators in the area, to encourage best practice for other operators in the area.</li></ul>						
IR-129	CNSC	Current use of lands and resources for traditional purposes	Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<b>Context:</b> ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).  Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)  <b>Rationale:</b> The <a href="#">Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012</a> notes: “The views of affected Aboriginal groups on mitigation be considered and included in the EIS. This could assist in ensuring that the environmental effects on the current use of land and resources for traditional purposes are at an acceptable level for the community.”  Sources for indirect moose mortality (e.g., increased hunter access, changes to health due to sensory disturbances, changes to predator-prey dynamics) may result in mortality outside the Wildlife LSA. The	Please provide additional information on the discussions Denison has had with Indigenous Nations and communities on how to mitigate any residual project impacts on their traditional harvesting activities of large game such as moose.  More information is required to determine if Denison has engaged directly with ERFN/KML and other Indigenous Nations who utilize the area to harvest moose to determine current baseline harvest numbers that provide subsistence, continued cultural identity and community well-being, as well as discussions on how the project could potentially impact moose populations and the harvesting of moose for traditional practices.	Potential project related changes to moose are detailed in Section 9 of the EIS, and include potential changes associated with vegetation removal and/or ground disturbance (i.e., loss of habitat), sensory disturbances, and vehicular collisions. Mitigations to minimize these potential effects include minimizing the extent of the Project area and associated disturbances to the extent practicable, standard mitigation measures to minimize air emissions, dust, light and noise, exclusion fencing around waste pads and ponds, and measure to minimize direct mortality through vehicular collisions through driver training and safety practices.  Baseline harvest information was shared by the Indigenous Communities of Interest through Indigenous and traditional knowledge studies which were considered by all discipline leads in the assessment process. Information on moose is specifically documented in: <ul style="list-style-type: none"><li>Wheeler River Project - Summary of Traditional Knowledge Study Results (ERFN and SVS 2022b)</li><li>English River First Nation Country Foods Study Final Report (CanNorth 2017a)</li><li>Land use and occupancy maps shared with Denison by the Kineepik Metis local</li><li>Kineepik Valued Ecosystem Components – KML Pre-statement for Denison (KML 2022)</li></ul> Although Denison understands these documents are not representative of the complete extent of Indigenous moose harvest, recorded harvests proximal to the Project are document	No updates to the draft EIS are needed based on this IR response.						

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				<p>residual effect of change in moose mortality is likely to occur. Although mitigation measures are expected to reduce, but not fully eliminate, the residual effect on moose.</p> <p>The potential residual impact on the moose and other large game populations in the broader regional study area may potentially impact Indigenous treaty rights, culture, and community well-being if the harvesting of moose and large game declines due to increased traffic, noise, and vehicle mortality or increased outside hunting pressure.</p>		<p>in Section 11.1.4.3.1 of the EIS, and further harvest in the local and regional study areas are noted in each. Moose is central to the traditional diets of these communities, and as noted in the English River First Nation Country Foods Study Final Report (CanNorth 2017) were the most commonly consumed species by ERFN citizens. Interest and concerns about the Project’s potential interactions with moose populations are also noted in the engagement record, for example the engagement record notes that, for ERFN, moose is a [hunting and food] mainstay and there is concern for how moose would be impacted.</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e., moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring programing, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.</p>	
JSIR-130	CNSC	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>	<p>Vibration is a sensory disturbance that may affect some species and is inherently accounted for in the effects assessment by way of consideration of the sensory disturbance buffers that are recognized as areas of altered habitat (i.e., zone of influence) that may not be used as a result of the Project.</p> <p>Consideration of Project-related vibrations are considered in the responses to IR-46 within the context of vibrations generated by Low Frequency Noise (LFN). Unlike a conventional mining operation, vibration derived from LFN by the proposed operation is not expected. By extension, vibration related sensory disturbance outside the sensory disturbance buffer for habitat alteration already considered in the assessment would not be expected. Nevertheless, in response to the IR, specific mention of vibration will be added in the EIS where sensory disturbance is defined to provide further context to the assessment.</p> <p>Reptiles were not identified as a VC as part of the initial community consultations when the VCs were selected, and their ranges do not typically extend into northern Saskatchewan, and therefore, were not included in the effects assessment. Also, the potential for occurrence of reptiles within the Project footprint is expected to be low.</p>	<p>In the final EIS, discussion of habitat alteration in Sections 9.3 and 9.4 will be updated to include consideration of vibrations.</p> <p>For example: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, <b>vibrations</b>, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA.”</p>
IR-131	CNSC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): <i>The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</i></p> <p>As per the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> pursuant to the Canadian Environmental Assessment Act, 2012: <i>“The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan”.</i></p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>	<p>Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.</p>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to the IR further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-132	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> ECCC has identified that three species at risk arthropods (yellow banded bumble bee, transverse lady beetle, and nine-spotted lady beetle) have ranges overlapping the Project area and these were not mentioned in the draft EIS.</p>	<p>1. Conduct an effects assessment for arthropod species at risk.</p> <p>2. Explain what mitigation measures will be used to minimize potential effects.</p>	<p>Consideration of the three arthropod species at risk are included in Attachment IR-131.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-133	ECCC		Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> There is potential for some species at risk (e.g., myotis species, barn or bank swallows, common nighthawk) to be attracted to and use mine infrastructure (buildings, roads etc.) once constructed for nesting, roosting, or foraging.</p> <p>Details on mitigation measures and adaptive management with respect to attraction to Project components should be identified to assess residual and cumulative impacts to species at risk.</p>	<p>For all Project phases, describe the mitigation measures and adaptive management to prevent and minimize effects on species at risk that may utilize mine infrastructure.</p>	<p>Specific exclusion measures will be added to the mitigation measures in Sections 9.3.5 and 9.4.5 of the EIS. These measures will be designed and appropriately applied to prevent or reduce access to Project infrastructure for roosting, nesting, and foraging, and are expected to address adverse Project-related effects on myotis species, barn and bank swallows, and common nighthawk.</p> <p>If bird nests (or tree cavities) should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>The results of mitigation measures implemented, and any associated wildlife observations will be considered in an adaptive management process to determine if/when/where additional mitigation measures may be required.</p>	<p>The below exclusion measures will be added to Sections 9.3.5.2.5 and 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>



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IR-134	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The draft EIS states in multiple places that vegetation clearing may occur year-round.</p> <p>In order to correspond with the timing of emergence from hibernation, tree clearing should not be conducted during the bat roosting period. If maternity roost trees are removed after pregnant females have established a roost area, there is a higher likelihood of abortion than there would be otherwise.</p> <p>Species-specific mitigations are required to protect bat SAR.</p>	Provide important roosting dates for bat species at risk in the Project area.	<p>Maternity roosts are used by pregnant females in late spring (April/May) either alone or in small groups. Females and their offspring roost in groups in nursery colonies in late summer/early fall prior to hibernation. Denison will adjust the activity timing windows to include the April/May maternity roosting period and the July/August nursery roosting period, to the extent practicable. Pre-construction surveys will identify all sensitive wildlife habitat features, including potential roosting trees (e.g., hollow trees, trees with defects, trees with cavities, and tree stumps). Should potential roosting trees be detected, consultations with the regulators will be initiated, and appropriate mitigation measures will be designed and implemented.</p> <p>This information above is provided in Attachment IR-131. This new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS.</p>	A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-135	ECCC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The mitigation measures for birds and wildlife presented in the draft EIS are very general. Additional detail is required for a complete assessment of residual and cumulative Project effects to birds and wildlife.</p> <p>The Proponent has committed to providing a number of plans including, a Decommissioning Plan, a Spill Response Plan, a Waste Management Plan, a Surface Water Monitoring Plan, a Remediation and Closure Plan, a Radiation Protection Plan, a Soil and Vegetation Monitoring Plan, a Wildlife Monitoring Plan, and a Woodland Caribou Management Plan. In order to assess potential affects to migratory birds and wildlife from Project related activities, ECCC requires details on species-specific mitigation measures, and monitoring plans.</p>	<p>The following information should be included in the various plans and should be provided for review during the environmental assessment:</p> <ol style="list-style-type: none"> <li>For all Project phases, describe the species-specific mitigation measures and responses to prevent and minimize effects on migratory birds or species at risk (SAR) birds and mammals that may utilize mine infrastructure.</li> <li>Explain how light pollution will be managed and what specific mitigation measures will be used to minimize effects to migratory birds and SAR birds and mammals.</li> <li>Provide details on what methods will be used for erosion control and how they will prevent sediment from entering waters frequented by migratory birds or SAR. Explain what actions will be taken if the erosion control measures are not successful.</li> <li>Provide details on noise and other sensory disturbance monitoring and mitigations if noise levels surpass thresholds.</li> <li>Describe time windows and species- specific mitigations related to maintenance activities such as vegetation management, road or building repair and stream crossing replacements.</li> </ol>	<p>As noted in the draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through a sequential EA and licensing process. The IR refers to “plans” and that these plans should be provided in the environmental assessment for review. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed to, it is Denison’s opinion that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response to the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed and provided during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes that this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p> <ol style="list-style-type: none"> <li>The mitigation measures referenced to in Part 1 of the IR are considered in the response to IR-133 and the reviewer is referred there for additional information. Specific exclusion measures will be added to Sections 9.3.5 and 9.4.5 to prevent or reduce access to Project infrastructure, as noted in the response to IR-133 (and in the adjacent column).</li> <li>Means to manage light pollution and specific mitigation measures to minimize the potential for adverse effects on migratory birds and SAR birds and mammals will be added to Section 9.4.5.2.5 of the EIS as noted in the adjacent column.</li> <li>Erosion control measures have been identified in Section 8, Aquatic Environment, of the draft EIS. These same proven mitigation measures will be effective at mitigating adverse effects on waters frequented by migratory birds or SAR. For completeness, the erosion control measures from Section 8, Aquatic Environment, of the draft EIS will be added to Sections 9.3.5 and 9.4.5 of the draft EIS, as highlighted in the adjacent column.</li> <li>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the draft EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat, and include the following: <ul style="list-style-type: none"> <li>not using the concrete batching plant and crusher during nighttime hours, where possible;</li> <li>locating the concrete batching operation as far away from sensitive wildlife features as possible;</li> <li>directing the generator discharge openings away from sensitive features;</li> <li>making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings); and</li> <li>collecting sound level measurements from the identified sources once they are operating and determining whether the actual effect is lower than that which was modelled.</li> </ul> </li> </ol> <p>Regarding monitoring, as outlined in Section 6.2.8 of the draft EIS, an EMS will be implemented and include noise monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines. Sound levels will be monitored on a continuous basis using calibrated Class 1 sound level meters and data loggers, calibrated to a National Institute of Standards and Technology traceable standard within one year of its use in the program, and field calibrated using a Class 1 acoustic calibrator. Where possible, the sound level meters will utilize the same monitoring locations as were used in the baseline program to allow direct comparison and may be expanded to include the location of the nearest sensitive receptor where access is granted. Should monitoring show noise levels surpass modelled sound levels, Denison will implement corrective action to identify noise sources and reduce sound levels. Details of noise monitoring and an adaptive management process for the Project will be developed to support Project permitting and licensing.</p> <p>5. Information related to timing windows and species as it concerns Project activities has been provided in response to IR-134. As noted in the response to IR-134, Denison will schedule Project activity timing windows to appropriately consider all Valued Components and SAR requirements/sensitivities. For reference, additional information that will be added to the final EIS is described in the response to IR-134.</p>	<p>EIS updates in response to IR-135, part 1 are outlined in EIS Updates for IR-133.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 2 as follows:</p> <p>Proposed mitigation measures related to light pollution will be added to Section 9.4.5.2.5. This includes using low lighting and/or task lighting (e.g., downturned shaded fixtures to prevent sky-lighting or bird disorientation), putting building lighting on sensors or timers, and potentially using a higher lumen/watt ratio on all new buildings or building expansions.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 3 as follows:</p> <p>Erosion control measures that are designed to prevent sediment from entering waters frequented by migratory birds or SAR include (but not limited to) the installation of silt fence, straw wattles, and/or erosion control blankets to prevent erosion and limit sediment transport. Additionally, vegetated barriers will be maintained between Project components and wetland features, as much as practical. Further information on erosion and sediment control measures will be provided in the applicable management plans which will be developed to support Project permitting and licensing. Routine inspections and management would be completed to document the effectiveness of the erosion control measures, and any required /replacement of these structures would be completed as required.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 4 as follows:</p> <p>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat.</p> <p>The proposed monitoring related to noise and sensory disturbance outlines in Section 6.2.8 of the EIS are considered to be adequate and appropriate to monitor changes in sound levels.</p> <p>EIS updates in response to IR-135, part 5 are outlined in EIS Updates for IR-134.</p>
IR-136	CNSC	Soil Salvage Monitoring	Section 9.1.8.2	<p><b>Context:</b> The proponent plans to salvage and stockpile soil and organic matter/peat in order to use it in reclamation activities during decommissioning. Periodic monitoring of the stockpiles is proposed to be conducted to verify that soil and organic matter/peat are delineated, stripped, handled, and stockpiled as recommended, and to evaluate the stability of salvaged soil, e.g., in relation to potential erosion and/or degradation. It is unclear whether monitoring includes soil quality in terms of concentrations of COPCs.</p>	Please clarify if COPC concentrations monitoring is planned to be performed for stockpiled soil and organic matter/peat.	Per the Residual Effects Characterization: "Predicted changes in concentrations of COPCs (i.e., soil quality) associated with open-source dust, process-source dust and process emissions are expected to be within acceptable health and safety guidelines; no threshold exceedances are predicted." Monitoring of COPCs in soil stockpiles during the life of the Project is not presently being considered, but the need for such monitoring could be revisited within the context of monitoring of sources that could contribute to COPCs to stockpiled soil and organic matter/peat. For example, if source monitoring data exceed predictions	No updates to the draft EIS are needed based on this IR response.

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				<p><b>Rationale:</b> It is expected that project-related activities (road and airport traffic, drilling) can result in open-source (i.e., fugitive) dust and process-source dust (incl. radionuclides), which can accumulate and result in changes in soil quality of the stockpiled soil and organic matter/peat as described in Sections 9.1.4.2.2 and 9.1.4.2.3).</p>		<p>presented in the EA that may provide rationale for sampling and analysis of COCPs in stockpiled materials.</p> <p>A soil salvage monitoring program/protocol (or equivalent) is expected to verify soil salvage volumes and reclamation suitability. Denison is proposing to support reclamation trials/research at the Project to inform and refine the revegetation strategy. It is understood that reclamation trials/research will include investigations into soil conditions, preparation techniques and amendment strategies (to the standard of the day). These ancillary investigations may include analysis of COCPs, although this is not expected at this time, but as highlighted above would be considered as may be warranted.</p>	
IR-137	ECCC	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA:</u> The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects. For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p> <p><u>RSA:</u> The Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul>	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"><li>• Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>• Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>• Re-do the assessment with the RSA at the scale of the range</li></ul> <p>See also related IRs: IR-154 and IR-156.</p>	<p>The Project Area was delineated to capture all direct, and most indirect, likely adverse effects on caribou; as this is the zone of influence most likely to affect caribou in the vicinity of the Project (i.e., in the vicinity of human activity, equipment use and vehicle use). The Project Area (169.6 ha) is the direct footprint of proposed Project infrastructure (74.8 ha) with a buffer applied, thereby representing the area of maximum physical disturbance. The Project Area is not VC-specific, but consistent throughout the EIS.</p> <p>The Wildlife LSA was designed to capture the majority of the Project effects. The LSA extends beyond Project Area of the site to include a reasonable estimation of where sensory disturbance from Project-related activities would extend and where effects on wildlife including caribou are most likely to occur. That is the primary rationale for selection of the spatial extent of the LSA – Denison believes this is an appropriate spatial scale that applies broadly to the wildlife VCs as a whole given the perceived mechanism of VC-Project interaction.</p> <p>Importantly, as noted in draft EIS Section 9.3.6.4, in the caribou assessment, the Project Area had a 500 m buffer applied to account for indirect effects/habitat alteration; this area is within the wildlife LSA (refer to Figure 9.3-14 for a map showing the spatial areas). The 500 m buffer for habitat alteration for caribou was selected in accordance with ECCC’s (2020) assessment of disturbed areas, which buffered (500 m) anthropogenic disturbances to evaluate woodland caribou habitat. The alteration of available woodland caribou habitat is quantified in this EIS by applying a buffer of 500 m around the Project Area in which Project effects in the form of sensory disturbance are likely to affect available woodland caribou habitat and make it functionally unavailable for use.</p> <p>Boreal caribou occur as one continuous population across the SK1 range, including within the Terrestrial RSA. It was decided to not use the entire SK1 range as an assessment area (e.g., due to the dilution factor) and instead use the Terrestrial RSA to appropriately and adequately assess residual and cumulative effects in proportion to the Project. It was deemed to be not feasible to use a large area like the SK1 range to assess residual Project effects because this would provide inappropriate context or "dilute" the adverse effects of the Project on the caribou that have a home range that overlaps with the RSA.</p> <p>The cumulative effect assessment of the draft EIS compares the Project-specific habitat effects (i.e., the Project Area plus a 500 m buffer to account for sensory disturbance) at the scale of the SK1 range (as the applicable management unit for portion of the woodland caribou population that uses the Terrestrial RSA). The result showed that the Project is expected to add 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (Section 9.3.7.3.3 of the EIS).</p> <p>References: Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p>	No updates to the draft EIS are needed based on this IR response.



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				<p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada.</p> <p><b>Reference:</b> [1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011).</p>			
IR-138	CNSC	COPC in Lichen	Section 9.2.4.2.2  Appendix 10-A (ERA)	<p><b>Context:</b> A quantitative assessment using modelling dispersion and uptake of COPCs in the environment was completed for the Project as part of the ERA, to support conclusions drawn in the EIS. In Appendix 10-A (ERA), COPCs in plant tissue was estimated for lichen. Table 5-5 of the ERA (p. 5.24) named “Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model” lists the exposure pathway for lichen as direct contact on soil.</p> <p><b>Rationale:</b> Airborne COPC can deposition on lichen and subsequently enter the food chain; therefore, the “contact with air” pathway should be considered. In fact, lichen species are frequently used to monitor the deposition and accumulation of airborne contaminants (e.g., dust, metals). It is also noted that based on sampling results of the 2017 baseline studies, lichen frequently contain higher concentrations of COPC than blueberry (compare Table 9.2-6 and Table 9.2-7 in the EIS), especially at sampling sites with elevated concentrations (e.g., RSV9 and RSV10).</p>	<p>Please include the exposure pathway of direct deposition (dry and wet) of airborne contaminants on lichen in the quantitative ERA, or justify why this exposure pathway was not considered.</p> <p>See also related: IR-189.</p>	<p>Denison agrees that the air to lichen pathway is the primary exposure route for lichen. The ERA (Appendix 10-A) modelled the deposition of air to lichen as an exposure pathway and considered the uptake from soil to lichen as negligible. This will be clarified in Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model. In the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>	<p>Minor change. In Table 5-5 of Appendix 10-A, the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>
IR-139	ECCC	Change to an environmental component due to hazardous contaminants	Section 9.2.5.2.7, Waste and Hazardous Materials Management	<p><b>Context:</b> In this section, the Proponent outlines various measures to mitigate air emissions, including implementation of the air quality programs within the Environmental Management System, regular maintenance and inspection of equipment, and elimination of unnecessary idling of equipment. However, the intention to use industry-standard emission control systems has not been substantiated.</p> <p><b>Rationale:</b> For the protection of air quality, it is important to specify the emission standards that equipment will have (e.g., Tier 3 or Tier 4 engines). Vehicles and equipment with Tier 4 engines have much lower emissions of contaminants than those with Tier 3 engines. If non-Tier 4 engines are used, ECCC recommends that best management practices are followed, including proper maintenance of the engine and anti-idling measures.</p>	<p>Confirm if vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>Denison confirms that vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-140	CNSC	Change in the Areal Extent of Wetlands	Section 9.2.6.4	<p><b>Context:</b> Predicted residual effects on the areal extent of wetlands include the direct effect of loss of wetlands and several indirect effects of alteration of wetlands. As stated in the EIS, wetlands can exhibit low resilience and high susceptibility to disturbance. At the same time, wetlands tend to support a high species diversity, and are considered to have a moderate to high potential to support listed plant species. Lastly, wetlands are rare on the landscape compared to terrestrial ecosites (see Table 9.2-5).</p> <p><b>Rationale:</b> Several wetland ecosites (BS19/24, BS25, BS27) occur only in small areas (&lt; 30 ha) in the RSA but are predicted to experience disturbance of 6-64%, most notably the ecosite BS19/24 where 0.8 of 1.2 ha are predicted to be disturbed. It is noted that wetlands are scattered throughout the landscape as shown in Figure 9.2-8. More information is requested regarding the ecological impact of this disturbance.</p>	<p>1. Please provide a discussion on the ecological impact of disturbance to rare wetland ecosites.</p> <p>2. Please provide information on whether adequate other habitat is available for species impacted in these disturbed sites in close proximity, taking into account the home ranges of susceptible species.</p> <p>3. Please provide additional information on whether wetland connectivity is maintained through the landscape within the LSA/RSA.</p> <p>See also related: IR-141.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison conduct monitoring of species present in wetlands before and after disturbance, with a focus on listed plant species.</p>	<p>1. As described in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not a unique ecosystem and is instead an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. No direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (further described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No listed plant species have historically been observed to be associated with ecosites BS19/24 (graminoid bog/fen), BS25 (open fen), or BS27 (sedge rocky shore). As described in Table 2.4.4 of Appendix 9-B of the EIS, populations of the listed plant Alaskan clubmoss were observed to be associated with open Jack pine stands and transitional areas between upland and wetland/riparian areas. As stated in Section 2.2.2 of Appendix 9-B of the EIS the listed plants angle-leaved sundew and neat spike-rush were not observed in ecosites BS19/24, BS25 or BS27 either (see also the response to IR-175). With regard to wildlife, ecosites BS19/24, BS25, and BS27 are not limiting habitats for ungulates, furbearers, woodland caribou, raptors, or migratory breeding birds (as described in Sections 9.3 and 9.4 of the EIS) in the Terrestrial RSA. In fact, these ecosites were observed to exhibit low species richness and species diversity for breeding and migratory songbirds (Section 9.4.3.2.3). For bird species at risk, ecosites BS19/24 and BS25 are considered to provide suitable habitat for Short-eared Owl, Yellow Rail, and Rusty Blackbird; however, these ecosites are not anticipated to be limiting. Up to 2.9% of available Short-eared Owl habitat and up to 2.4% of Yellow Rail and Rusty</p>	<p>1. Section 9.2.6.4.1 will be updated to include the following: As noted in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not considered a unique ecosystem and is instead an artifact of mapping uncertainty, as it was not possible to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas during the wetland mapping process due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. However, no direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance associated with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to</p>

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						<p>Blackbird habitat within the Terrestrial RSA may be altered or lost as a result of the Project during all Project phases (Section 9.4.6.4.1).</p> <p>3. Surface drainage continuity and hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity. This post-construction surface water management monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change.</p>	<p>cause an adverse effect, and thus maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No updates to EIS required.</p> <p>3. Section 9.2.5.2.3 will be updated to include the following: Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction surface monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. The monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity.</p>
IR-141	ECCC	Wetlands	Section 9.2.6.4.1	<p><b>Context and Rationale:</b> The Proponent states that: “Direct loss of wetlands has been mitigated by reducing the size of the Project Area to the extent practicable during Project design.</p> <p>However, up to 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA are anticipated to be removed from the Project Area during Construction (Table 9.2-16).”</p> <p>Information is not provided on whether wetlands in the terrestrial RSA are considered ecologically, economically or socially important to the region. Information on the regional importance of the wetlands that will be lost is needed in order to assess effects, including a wetland compensation plan if the wetlands are considered regionally important.</p>	<p>1. Provide information that accounts for whether wetlands are considered ecologically, economically and socially important to the region.</p> <p>2. If the above is affirmative provide a wetland compensation plan to offset the loss. Consistent with the Operational Framework For Use of Conservation Allowance [1] a minimum ratio of 2:1 should be the starting point when determining the amount to be offset.</p> <p>[1] Available at : <a href="https://publications.gc.ca/site/eng/9.696852/publication.html">https://publications.gc.ca/site/eng/9.696852/publication.html</a></p> <p>See also related: IR-138.</p>	<p>During engagement activities, no specific comments or concerns were raised that would suggest wetlands near the Project are considered to be particularly ecologically, economically, and socially important to the region. Drainage in the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion is very weakly developed, and with numerous poorly drained wetland areas in lower landscape positions (Acton et al. 1998). This pattern is reflected in the Terrestrial RSA, where wetlands and water bodies are commonly scattered, comprising 16.6% of all mapped ecosystems (Section 9.2.3.3; Figure 9.2-8 of the draft EIS). Wetlands in this region provide ecological, economic, and social functions and values, and Denison has appropriately considered this during Project planning (i.e., avoidance to the extent practical). The Project Area has been reduced to the extent practicable, and the Project footprint has been sited to avoid wetlands to the extent feasible (Figure 9.2-8). Where wetland avoidance was not feasible, mitigation measures have been designed to reduce disturbance and maintain surface water connectivity (Section 9.2.5; see also response to IR-140 and IR-101). A small area of direct wetland disturbance is anticipated (0.5 ha; less than 0.1% of all wetlands within the Terrestrial RSA), predominantly associated with access road development. This area includes 0.4 ha of BS17 (black spruce treed bog), &lt;0.1 ha of BS18 (Labrador tea shrubby bog), and &lt;0.1 ha of BS23 (willow shrubby rich fen). These areas of direct wetland disturbance are small and located adjacent to existing access routes, and mitigation measures to maintain surface water connectivity across access roads will be implemented and monitored (see response to IR-140). The re-establishment of appropriate hydrologic conditions during Decommissioning is expected to lead to the re-establishment of wetland ecosystems within these directly disturbed areas. As such, it is Denison's opinion that a wetland compensation plan is not warranted.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-142	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.3.2.1 Scientific Literature Review – Wolverine Section 9.3.5 Mitigation Measures Section 9.3.6 Residual Effects Evaluation	<p><b>Context:</b> The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens.</p> <p>In Section 9.3.3.2.1, the Proponent states: “Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success. ”</p> <p>In Section 9.3.6, the Proponent states: “In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction.”</p> <p>The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost</p>	<p>1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges.</p> <p>2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project.</p> <p>3. Assess the need for pre- construction/pre-clearing surveys to identify any wolverine denning sites.</p> <p>4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.</p>	<p>1. While wolverine were not observed during baseline studies for the Project, it is assumed that the Project (Project Area, LSA) may overlap with wolverine home ranges. As described in the EIS, wolverine occur in low densities across all forest stand and vegetation types but are generally absent from areas of human development and activities.</p> <p>2. No wolverine dens were identified during any of the baseline studies. It is not anticipated that wolverine denning sites will be lost and/or altered because there are no specific landscape features typically used by wolverine as potential denning sites located in the Project footprint. Further, much of the proposed Project footprint will be developed within previously disturbed areas, including roads and cutlines.</p> <p>3. Pre-construction surveys will be completed to identify all sensitive wildlife habitat features, including wolverine denning sites.</p> <p>4. Most of the Project footprint is already disturbed through previous exploration activities. The total expected direct habitat loss of 169.6 ha includes the already disturbed areas. In the Terrestrial RSA, 8.2% of available wolverine habitat may be altered or lost; this includes 0.5% that will be cleared within the Project Area during Construction, and an additional 7.7% that may be altered through indirect effects (sensory disturbance). The magnitude of this effect was characterized as being "moderate" and the residual effect is not expected to result in a</p>	<p>1. No updates to the draft EIS are needed based on this IR response.</p> <p>2. No updates to the draft EIS are needed based on this IR response.</p> <p>3. Section 9.3.5.2.4 Work Timing Windows (third bullet will be updated to include): Pre-construction wildlife clearance surveys will be conducted within the Project Area in accordance with a wildlife monitoring plan and the draft Caribou Mitigation Plan. This would include surveying for important wildlife features that would include wolverine den sites.</p> <p>4. No updates to the draft EIS are needed based on this IR response.</p>



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				(Table 9.3-20).  <b>Rationale:</b> As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens.  Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features.		change that will alter wolverine habitat integrity to the point where it would not be able to sustain the regional populations of wolverine. This considers that no wolverine were observed during the baseline investigations, the small Project footprint, and the typically large size of a wolverine home range.	
IR-143	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.  Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.	Provide details on the baseline caribou data including: <ul style="list-style-type: none"><li>Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>Description of seasonal use of the LSA, RSA and caribou range.</li><li>Description of Project areas used by caribou.</li><li>Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul> Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).  See also related: IR-152.	The baseline data collection program was not specifically designed to collect seasonal caribou habitat use but to document caribou presence in the Project Area, Wildlife LSA and Terrestrial RSA. Based on this information, the EIS assumed caribou to be present in the study areas throughout all seasons and life stages. It should be noted that discrete calving areas have not been documented for the SK1 range. As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from IK was included in the EIS, including potential calving areas in the Terrestrial RSA.  Additional wildlife camera data have been obtained and analyzed to further describe seasonal use of the Project study areas. Updated Figure 9.3-8 (included in Attachment IR-143) provides the caribou sightings from baseline studies and updated to reflect seasonality of all sightings, where such data are available. There is insufficient information to provide further explanation on how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering)); however, the EA appropriately addressed direct and indirect effects on caribou and their habitat.  Denison’s intent is to develop the specific details related to environmental monitoring in general, and Caribou specifically, as part of licensing. A conceptual framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section (see Section 9.3.9 for terrestrial wildlife). Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.  At this time no aerial surveys are planned. Denison approached the Province with proposals for aerial surveying for the purpose of the baseline program in 2016/2017 but the Province would not provide Denison with permits for aerial surveys. Based on recent discussion with the Province this position has not changed, nor is it Denison’s understanding that it is likely to.	Applicable sections of Section 9.3.3.3 will be updated in the final EIS to include a description of seasonal use of the RSA. This would include:  Wildlife Camera Study Wildlife camera locations were spread across three categories of linear features in mature and regenerating forest types: road (a maintained or seasonally accessible road supporting traffic), trail/rough road (a cleared disturbance over 2 m in width), and hand-cut line (a cleared disturbance under 2 m in width) (Appendix 9-B). Trails/rough roads and roads had the highest frequency of wildlife detection, with woodland caribou being the second most commonly photographed species (after snowshoe hare).  Of the 34 caribou observations that were recorded, most were documented in the winter, with one observation from the spring and one in the summer. Seven data points had no date associated with the observations. Of the winter observations that were documented, seven occurrences were located in the northern portion of the RSA and the remainder located in the eastern portion of the RSA (Figure 9.3-8).  Figure 9.3-8 included in Attachment IR-143 has been updated to include additional camera data on caribou presence and seasonal use and will replace Figure 9.3-8 in the draft EIS  The Conceptual Caribou Mitigation Plan is included with the IR response package (Attachment IR-149). This Plan includes description of ongoing studies to assess linear feature use by caribou and will be included in the final EIS as new Appendix 9-E.
IR-144	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i>  <i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i>	Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.	Refer to the Attachment IR-143 for the updated version of Figure 9.3-8.  Denison acquired data from the Province of Saskatchewan which has been included in Attachment IR-145. As shown in the figure, the data is not available in a format that can be imported for analysis and incorporated into a spatial map. The data does not specify seasonality of the observations. Regardless, this data relates to the information provided by McLoughlin (2019 and 2021) and confirms caribou have been previously documented within the RSA, particularly in the eastern portion.  References:  McLoughlin, P. D. 2021. Associate Professor, University of Saskatchewan, Saskatoon, SK. Personal Communication. January 2021.  McLoughlin, P. D., C. Superbie, K. Stewart, P. Tomchuk, B. Neufeld, D. Barks, T. Perry, R. Greuel, C. Regan, A. Truchon-Savard, S. Hart, J. Henkelman, and J. F. Johnstone. 2019. Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. Final Report. Department of Biology, University of Saskatchewan, Saskatoon. 238 pp.	No updates to the draft EIS are needed based on this IR response.
IR-145	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Woodland Caribou	<b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).  The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.	1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada: <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul>	Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and	The map included in Attachment IR-145 along with supporting text will be added to Section 9.3.3.3 of the final EIS.



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				<p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>	<p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.</p>	<p>species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>The EIS uses "available caribou habitat" as a basis to assess the Project effects. Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.</p> <p>Subsequent to filing of the draft EIS and as committed to ECCC during an April 20, 2023 meeting between Denison and ECCC, Figure 9.3-8 has been updated (included in Attachment IR-143) to address seasonal use by caribou within the terrestrial study areas.</p> <p>In May 2023, Denison received caribou data from the Province of Saskatchewan that included both incidental observations and telemetry point data within the terrestrial study areas. These data were provided to Denison as a figure, and this figure has been included herein as Attachment IR-145. The information made available to Denison by the Province was not broken down to reflect the timing (seasonality) of the reported data and therefore does not specifically contribute to the description of seasonal use of the Project study areas by caribou.</p> <p>For reference, and based on the data that have been made available, the conservative assessment approach utilized in the draft EIS of assuming caribou presence in the terrestrial study areas throughout all seasons will not be changed.</p>	
IR-146	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3.1, Woodland Caribou, Scientific Literature Review - Predation	<p><b>Context and Rationale:</b> The information on impacts of predation and apparent competition for caribou in relation to the proposed Project are insufficient.</p> <p>In the section on caribou predators (9.3.3.3.1), the Proponent provided details on densities of wolves and their overlap with caribou and speaks of apparent competition. The Proponent did not examine other predators, such as black bear.</p> <p>The analysis on impacts of predation and apparent competition is insufficient since known predators have been omitted without explanation from the assessment of effects. ECCC is not able to verify the Proponent’s effects assessment since important species have not been considered in the assessment.</p>	<p>Provide further information and analyses on all potential predators of caribou, including impacts from apparent competition.</p>	<p>Effects from predation as a factor contributing to indirect mortality are discussed and qualitatively assessed in the EIS. Section 9.3.3.3 describes current knowledge of caribou mortality in or around the Project study areas (i.e., the existing studies describe wolf predation and hunting). It is acknowledged that black bear may also prey on caribou; however, this would be expected to follow the same effect pathways and is included in the qualitative indirect mortality assessment. Effects of apparent competition are included in the EIS and are part of the qualitative indirect mortality assessment.</p>	<p>In the final EIS, 9.3.3.3.1 Scientific Literature Review Denison will replace Predation section with the following:</p> <p>Predation McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season; however, mortality could not be confirmed for most of the caribou, with only the fate of 1 of 94 collared caribou confirmed in the four years of the study (which had been harvested by a hunter).</p> <p>Relatively low predator (e.g., wolf and black bear) densities in their study area were documented by McLoughlin et al. (2019), with other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>). While the effect on adult caribou survival by black bear is anticipated to be marginal compared to that by wolves, they may still be a predator of caribou calves and potentially a limiting factor to recruitment (McLoughlin et al. 2019).</p> <p>McLoughlin et al. 2019 noted that there was spatial separation between caribou and wolves as well as black bear, although this was found to be variable amongst individuals. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected</p>

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							<p>for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Black bears also used mixed-wood forests but particularly in the summer and fall they selected for jack pine stands &lt;40 years. (McLoughlin et al. 2019).</p> <p>While predation is believed to be the limiting factor for woodland caribou, Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.</p>
IR-147	ECCC	SAR - Boreal Caribou	<p>Section 9.3.4.2.1, Alteration and/or Loss of Habitat</p> <p>In Section 9.3.4.2.1 the Proponent states that: “Following decommissioning and reclamation, wildlife habitat is expected to recover to baseline conditions.”</p> <p>A more thorough explanation regarding post-decommissioning landscape is required to assess Project impacts.</p>	<p><b>Context and Rationale:</b> The process of in-situ recovery mining will likely create changes to the surface topography and potential ground subsidence as well as changes to groundwater elevations. These changes can affect the plant communities and ecosite types.</p>	<p>1. Provide further rationale and/or analysis regarding the return of wildlife habitat to baseline conditions post-decommissioning. Incorporate other environmental impacts including:</p> <ul style="list-style-type: none"><li>Ground subsidence and impacts on wildlife habitat</li><li>Changes to aquifers and impacts on wildlife habitat</li></ul> <p>2. Describe reclamation activities/measures, including temporal information that will be implemented to help in the recovery to baseline conditions.</p>	<p>1. The risk of ground subsidence has been assessed as part of the draft EIS (see Appendix K to Appendix 7-C). Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21). Overall, the analysis shows there is negligible risk of subsidence and the magnitude of subsidence, if it were to occur, is in the range of millimeters at surface. Further, this potential subsidence would be limited to the footprint directly above the deposit.</p> <p>In consideration of the above, with specific reference to the expected level of ground subsidence, no effects on wildlife habitat nor aquifers that support wildlife habitat are expected. Moreover, Denison does not foresee that ground subsidence would be a risk to the success of wildlife habitat restoration / reclamation during Post-Decommissioning, within the context (potential for adverse effects on wildlife habitat and/or changes to aquifers that may adversely affect wildlife habitat) raised by the IR.</p> <p>As outlined in Section 2.3.3 of the draft EIS, as part of the Conceptual Decommissioning Plan (CDP), reclamation activities, including replanting, will take place once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled. Notwithstanding the execution of major decommissioning activities, Denison will look for opportunities to proactively reclaim inactive areas of the Project site as is possible in a timely manner and without delay. Progressive reclamation is considered in more detail below.</p> <p>Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on the results of these discussions, roads associated with the Project site that are no longer needed will be graded and scarified to promote natural revegetation. Access roads or trails required for post-closure monitoring or deemed useful by Interested Parties may be left to facilitate continued access. Access to the site may be restricted by gates and/or berms for safety. Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during reclamation. Lessons learned from progressive decommissioning and any site-specific reclamation studies will be incorporated into the detailed reclamation design. Additionally, information from other northern Saskatchewan mine sites will be examined to help Denison select the reclamation tools, including revegetation options, that will contribute towards decommissioning success.</p> <p>2. Specific details concerning reclamation activities / measures, including detailed temporal information for restoration will be developed as part of future updates to the decommissioning plan. The CDP included in the draft EIS contains information related to site restoration; see also the Conceptual Caribou Mitigation Plan provided in Attachment IR-149. The CDP contains the appropriate level of detail for this stage of the Project. Briefly, the three main physical decommissioning activities include:</p> <ul style="list-style-type: none"><li>mining area remediation;</li><li>asset removal; and</li><li>decontamination, demolition, and disposal.</li></ul> <p>Physical decommissioning activities are followed by reclamation. The expected duration for decommissioning is 5 years (from year 18 to 23 of the Project).</p> <p>Importantly, during physical decommissioning, the majority of Project components are scheduled to be removed from site which is expected to facilitate reclamation activities. Also, because of the selected mining method, there are no large site aspects, such as waste rock</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>

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						<p>piles or tailings management facilities, for which large scale and potentially complex reclamation strategies are needed.</p> <p>Denison has committed to progressively reclaim areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Reclamation of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed annually. Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native vegetation species and in accordance with the Reclamation and Closure Plan.</p> <p>As described in Section 2.3.3 and outlined above, the details of the decommissioning plan, including site restoration, will evolve and become more specific as the Project advances. The subsequent iteration of the decommissioning plan will be the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning, including site restoration. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan, including site restoration, will evolve over time and the plan will become more refined as the Project advances.</p>	
IR-148	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus</i> caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>1. Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>2. Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>• an account (and GIS file if available) of existing habitat affected, using the following formula: (Project footprint + 500m buffer) - overlapping (permanent alteration(s) + 500m buffer)</li></ul></li><li>3. A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</li><li>4. Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and provide a rationale for the conclusion.</li></ol> <p>See also related: IR-154.</p>	<p>1., 2., and 3.: This calculation (for Project Area + 500 m buffer) is provided for the Project at the SK1 range level in the Cumulative Effects Assessment (see Section 9.3.7.3.3). Project-specific values are provided as they add to the known existing reported anthropogenic disturbance in the SK1 range and the result shows that the Project would be adding 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (refer to response to IR-137). Existing anthropogenic disturbance was mapped at the scale of the Terrestrial RSA (i.e., the assessment area - see Figure 9.3-15); the mapping was not extended to the entire SK1 range because: (1) this was not determined to be the assessment area (explained in response to IR-137) and (2) shapefiles are not publicly available for all developments in the SK1 range.</p> <p>4. The Project is not expected to compromise the ability of the range (i.e., SK1 range) to be restored to the undisturbed habitat threshold. This opinion is based on the small amount of disturbance (i.e., 0.001%) of anthropogenic disturbance and Denison’s commitment to progressive reclamation as well as final reclamation as part of the Decommissioning phase. Also considered was the ecology of the boreal forest which is influenced, primarily by forest fires that continue to “reset” the seral stage of forest, typically at a much larger scale than that of the Project Area. The reclamation efforts will be monitored, and deficiencies noted and addressed appropriately in a timely manner, so that lands are returned to comparable land use capability and habitat (i.e., regenerating forest), that existed prior to the Project. The Project is not expected to adversely affect the habitat within the SK1 range to the extent that the range/habitat is unable to support caribou.</p>	No updates to the draft EIS are needed based on this IR response.
IR-149	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li><li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li></ol>	<p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities</p>	The Conceptual Caribou Mitigation Plan, provided in Attachment IR-149, will be included in the final EIS as a new appendix (Appendix 9-E) to Section 9.



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					<p>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</p> <p>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>	<p>directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>Denison met with ECCC representatives on April 20, 2023, and agreed to provide a conceptual caribou mitigation plan as part of the IR response package, and also include the conceptual plan in the final EIS. As such, the Project’s Conceptual Caribou Mitigation Plan is provided as Attachment IR-149 and will be included in the final EIS.</p> <p>The framework for the Conceptual Caribou Mitigation Plan (the Plan) was developed during discussions between Denison and Saskatchewan Ministry of Environment (ENV) in May and June 2023. The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and ENV. Since the boreal caribou range plan for SK-1 is under development, it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan at this time is in part due to the absence of range plan priorities and reflects Denison’s commitment to continue to work with ENV to meet the management objectives and management strategies for the SK1 range. This approach acknowledges that the responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p>	
IR-150	ECCC	Wildlife and Wildlife habitat	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.	The report titled <i>Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results</i> is included as attachment IR-150.	No EIS updates in response to this IR.
IR-151	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<p><b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.</p>	<p>1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.</p> <p>2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.</p>	<p>To appropriately focus the EA, using an accepted/proven methodology, the EIS considers two effects: (1) alteration and/or loss of habitat and (2) change in mortality.</p> <p>Effects on movement corridors were not assessed specifically as this is not an infrastructure project that is expected to affect movement patterns across the landscape (i.e., landscape connectivity is not expected to be affected). This also considers the life stages and biology of woodland caribou, including their movement patterns. A “wildlife corridor” ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022) was identified by IK that was appropriately considered in the assessment, as this feature overlaps with the Terrestrial RSA. However, this feature was not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects. Further, the effect of habitat alteration does consider changes in species' habitat use, including movement. This approach was appropriate considering the small Project Footprint, the progressive reclamation, the baseline data, the available Indigenous Knowledge and the biology of caribou (e.g., no large-scale movement patterns) potentially using portions of the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response.
IR-152	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4, Appendix 9-B	<p><b>Context:</b> Baseline studies for Woodland caribou include:</p> <ul style="list-style-type: none"><li>Winter Track Count Survey to assess presence, abundance, feeding activity, and ecosite affiliation;</li><li>Pellet Group/Browse Availability Survey to detect presence and abundance of caribou, and frequency of occurrence and abundance of lichen;</li></ul>	<p>Please provide a summary of available baseline data on habitat use during all seasons and life stages, in particular sensitive stages such as calving, and how habitat use during all seasons and life stages was considered in the residual effect analysis.</p> <p>See also IR-145 and IR-143.</p>	Refer to the responses to IR 143 and IR 145.	No updates to the draft EIS are needed based on this IR response.

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				<ul style="list-style-type: none"><li>Covert Camera Survey to determine presence and use of linear features (roads, trails, and hand-cut lines).</li></ul> <p>The Saskatchewan Conservation Strategy for Boreal Woodland caribou [1] states that caribou are very susceptible to predation during the calf-rearing period, and populations are extremely sensitive to even minor changes in mortality rates.</p> <p><b>Rationale:</b> It is unclear if, or how, any data on seasonal and spatial use of habitat was considered in the residual effect analysis, for example summer/winter home ranges, sensitive life stages including calving (e.g., location of calving sites). It should be noted that the English River First Nation have identified caribou calving areas in the vicinity of the project footprint.</p> <p><b>Reference:</b> [1] Saskatchewan Ministry of Environment. 2013. Conservation Strategy For Boreal Woodland Caribou (Rangifer tarandus caribou) in Saskatchewan. Saskatchewan Ministry of Environment. Fish and Wildlife Technical Report 2014.</p>			
IR-153	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4.1	<p><b>Context:</b> According to ECCC (2020), forest fires can directly alter habitat, making it unsuitable for boreal caribou (e.g., through loss of mature conifer stands, loss of lichens and other forage plants, barriers to movement). Boreal caribou generally do not return to burned areas for several decades until the forest is old enough to support lichens and other food sources, although they may make limited use of burned areas to feed on new growth.</p> <p>The residual effects evaluation of alteration and/or habitat loss lists ecosites BS3 and BS7 (regenerating forest types) as available habitat in Table 9.3-22, which represent 43.5% of the Regional Study Area.</p> <p><b>Rationale:</b> It is unclear whether the ecosites BS3 and BS7 (regenerating forest types) represent suitable habitat for Woodland caribou year-round. More information is required on the habitat quality (e.g., time since last forest fire) and suitability for different life stages of caribou.</p> <p>For conservatism, it is recommended to perform a second residual effect analysis not including regenerating forest ecosites.</p>	<p>1. Please provide further information on the suitability of ecosites BS3 and BS7 for Woodland caribou in different life stages.</p> <p>2. Please provide the results of a residual effect analysis not including ecosites BS3 and BS7 for conservatism.</p> <p>3. If 2 leads to habitat fragmentation, consider connectivity of habitat patches in the residual effect analysis.</p>	<p>1. Caribou were observed within these regenerating ecosites (BS3 and BS7) during baseline studies and therefore, to be inclusive of all life stages, they were included in the "available habitat" for woodland caribou.</p> <p>2. The EIS followed a conservative approach by including these ecosites in the available year-round habitat to appropriately inform the effects assessment. No additional analysis related to connectivity of habitat patches is considered to be warranted for the Project, considering the baseline data, available Indigenous Knowledge and the biology of the caribou potentially using portions of the Terrestrial RSA</p> <p>3. Effect on habitat connectivity and fragmentation were considered in the habitat-based effects assessment within the context of habitat loss/alteration. The effects assessment considered that the project footprint had been previously disturbed/fragmented and connectivity altered. The assessment appropriately considered effects on wildlife habitat at the LSA and RSA levels</p>	No updates to the draft EIS are needed based on this IR response.
IR-154	CNSC	Woodland Caribou Alteration and/or Loss of Habitat	Section 9.3.6.4.1	<p><b>Context:</b> Lichen, the primary food source for Woodland caribou (up to 70% of the year-round diet), can be exposed to airborne contaminants and dust deposition at distances of 1–40 km (e.g., increased metal concentrations or dust were detected in lichen at distances of 1–40 km from a mine site [1, 2]).</p> <p><b>Rationale:</b> Further information is requested on how the potential for contamination of the food source “lichen” is reflected in the applied buffers of direct and indirect disturbance for woodland caribou.</p> <p><b>References:</b> [1] Watkinson et al. (2021). Effects of dust deposition from diamond mining on subarctic plant communities and barren-ground caribou forage. Journal of Environmental Quality 50(4): 990-1003. doi: 10.1002/jeq2.20251. [2] Chen et al. (2017). Does dust from arctic mines affect caribou forage? Journal of Environmental Protection 8(3): 258-276. doi: 10.4236/jep.2017.83020.</p>	<p>1. Please provide additional justification for how the potential for contamination of the food source “lichen” is reflected in the applied buffers for sensory disturbance.</p> <p>See also related IRs: IR-137, IR-148 and IR-156.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>COPC in Lichen monitoring is recommended in transects from the Project site to assess COPC concentrations and confirm whether the chosen buffer is conservative.</li></ul>	<p>Potential effects on caribou as the result of exposure to COPCs, including dietary pathways inclusive of lichen, were assessed as part of the Ecological Risk Assessment (ERA) (see draft EIS, Appendix 10-A). Hazard Quotients (HQs) associated with the exposure pathways analyses were below the benchmark of 1 for all COPCs.</p> <p>The reviewer is referred to Appendix 10-A, as well as the responses to IRs 138 and 189 for additional information.</p>	No updates to the draft EIS are needed based on this IR response.
IR-155	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou Habitat in the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine available habitat based on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>	<p>Available woodland caribou habitat was identified in the draft EIS to comprise the ecosites with observations of caribou and caribou sign during the baseline studies. This was done without seasonal differentiation because it was assumed that caribou may use these ecosites during all seasons and life stages. Section 9.3.6.4.1 of the draft EIS describes these habitat types. A reference to Appendix H of the 2020 Amended Recovery Strategy and important biophysical features will be added to Section 9.3.6.4.1. in the final EIS.</p> <p>Please see the response to IR-145 related to the acquisition of data received from the Province of Saskatchewan.</p>	Per the IR response, Section 9.3.6.4.1 in the final EIS will be updated to add: “To be conservative, the environmental assessment assumed caribou use of all habitat types during all seasons, as appropriate. This is expected to appropriately address all of the biophysical features outlined in Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020.”
IR-156	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>	<p>The EA appropriately assessed the residual effects and the cumulative effects within the RSA, as per standard, accepted EA methodology.</p> <p>As described in Section 9.3.7.3.3 of the draft EIS, ECCC identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in that range should not exceed 5% with</p>	No updates to the draft EIS are needed based on this IR response.

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				<p>significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p> <p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p> <p>The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.</p>		<p>55% being attributed to natural disturbance. In 2020, approximately 58% of the SK1 Boreal Shield range were affected by past forest fires and 3% of the range were affected by anthropogenic disturbances (i.e., 61% of the range were disturbed mostly due to fires).</p> <p>As described in the Cumulative Effects Assessment (Section 9.3.7.3.3 of the draft EIS), the Project-related (i.e., anthropogenic) disturbance was predicted to add 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. Refer to the response to IR-137 for a rationale of the assessment area for the effects assessment (i.e., the Terrestrial RSA).</p> <p>Please also refer to IR-149 and the attached Conceptual Caribou Mitigation Plan (the Plan), specifically Section 5.1 of the Plan. A mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020). Based on the analysis in Section 5.1 of the Plan using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.</p>	
IR-157	ECCC	Wildlife and Wildlife habitat	Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets.</p> <p>ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary</p>	Refer to response to IR-145.	No updates to the draft EIS are needed based on this IR response.



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					approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.		
IR-158	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p>ECCC advises the Proponent to identify additional focal species that have the ability to represent anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects (e.g., species at elevated risk of collision with vehicle traffic).</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	<p>The habitat-based assessment presented in the draft EIS appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA.</p> <p>Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds were considered as species guilds themselves, and appropriately identified as Key Indicators of the Migratory Breeding Birds Valued Component and were adequately assessed separately (i.e., at the Key Indicator level) for each Project effect and only rolled up to the Valued Component level for the significance determination. This approach was identified as the appropriate assessment method to identify Project effects on migratory breeding birds and to focus the assessment. The potential effects were identified and described for those species (within the Key Indicator group) that are most affected, and was then applied to all Key Indicator species, including those that may be less affected (e.g., risk of vehicle collisions, risk of entrapment) using a conservative, inclusive approach that considered the baseline data and the habitat. Further selection of focal species within each of these species guilds is not anticipated to affect the outcome of the assessment results or the conclusions</p>	No updates to the draft EIS are needed based on this IR response
IR-159	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	<p>The baseline data presented in the draft EIS are sufficient for the intended purpose – that is the data are sufficient, in conjunction with regionally available data, to identify potential project effects. The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site.</p> <p>As described in the EIS, pre-construction surveys will be conducted prior to the commencement of any vegetation clearing or soil disturbance. Avian species will also be routinely monitored throughout the life of the Project. Results from the surveys and monitoring activities are expected to inform the adaptive management process to update Project design and identify the need for additional mitigation measures, if required. Note: Section 9.4.3.3 of the draft EIS includes all available information from the HABISask database at the time of the assessment. While recent surveys from Environment and Climate Change Canada and the Saskatchewan Breeding Bird Atlas have expanded surveys into the northern boreal forest, these data are not yet publicly available or published to make inferences on population trends for migratory songbirds that could use the available habitat in the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response
IR-160	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p>Results from baseline studies as well as other supplemental information as per IR-159 should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>	<p>The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment.</p> <p>The EIS provides a discussion and subsequent quantitative assessment of the habitat types lost and/or altered based on the Valued Components and Key Indicator species. Species richness and diversity (as evaluated in the baseline report) were included as part of the selection of "available habitat" (e.g., for migratory songbirds, ecosites with low richness and diversity were excluded; refer to the response to IR-169 for a description of these ecosites). This approach provided an appropriate assessment of the Project effects on available habitat as it relates to the direct and indirect effects on the avian community.</p>	No updates to the draft EIS are needed based on this IR response
IR-161	CNSC	Bird Species at Risk	Section 9.4.3.3  Appendix 10-A (ERA)	<p><b>Context:</b> For the assessment of effects on Bird Species at Risk (SAR), in the EIS it was decided to use representative species for certain SAR birds:</p> <ul style="list-style-type: none"><li>Olive-sided Flycatcher and Common Nighthawk were selected to represent Barn Swallow.</li><li>Yellow Rail and Rusty Blackbird were selected as substitutes for Horned Grebe.</li></ul> <p>No further rationale is provided to demonstrate that the identified surrogate species are representative of the Barn Swallow and Horned Grebe in the EIS. For example, do they share a common diet?</p> <p>Moreover, in the residual effects assessment, limited discussion is provided on the conservatism of chosen suitable habitat types for both surrogate and represented species, in the calculation of habitat loss and alteration, as well as change in mortality. For example, how does habitat for Common Nighthawk and Barn Swallow overlap (do they use identical habitat types?) and how does this affect the calculation of habitat loss and alteration used to evaluate the magnitude of residual effect?</p> <p>Finally, in the ERA, Lesser Scaup is the surrogate for Horned Grebe. Yellow Rail is also represented by Lesser Scaup but Rusty Blackbird is represented by Olive-sided Flycatcher.</p> <p><b>Rationale:</b> It is unclear what criteria were applied to select surrogate species for Barn Swallow and Horned Grebe, and how the chosen</p>	<p>1. Please provide additional information to justify the selection of surrogate species for Barn Swallow and Horned Grebe in the EIS. This should include a description of the similarity of SAR and associated surrogate species and any relevant uncertainties.</p> <p>2. Please provide conservative estimates of habitat loss and alteration for the represented and not directly assessed species (Barn Swallow, Horned Grebe).</p> <p>3. Please provide clarity as to why different surrogate species are used for Horned Grebe between the EIS and ERA.</p> <p>See also related IRs: IR-160 and IR-162.</p>	<p>1.a. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment. As described in the EIS, the Common Nighthawk (similar to the Barn Swallow) is an aerial insectivore that uses a variety of habitats, including anthropogenically disturbed and cleared areas (Section 9.4.3.3.1). As such, effects on these anthropogenically disturbed areas were appropriately assessed in the habitat-based EA methodology. Since Barn Swallows nest almost exclusively on human-made structures, specific Barn Swallow exclusion methods will be added as mitigation measures to the EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities would be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>1.b. To focus the effects assessment on key species, it was decided to use the provincially listed Yellow Rail (and Rusty Blackbird) as surrogates for Horned Grebe. Horned Grebe use similar wetland habitat types for nesting, foraging and protective cover as Yellow Rail. As such, potential effects on these habitat types were assessed appropriately.</p> <p>2. The habitat-based approach for the assessment supports the use of surrogates that are known to utilize the same habitat types. Habitat loss and alteration were assessed for the Key Indicator species included in this Valued Component. A conservative approach of identifying available habitat for these species was chosen to include habitat for those species not directly assessed (i.e., Barn Swallow through Common Nighthawk habitat and Horned Grebe through Yellow Rail and Rusty Blackbird habitat).</p> <p>Please refer to the response to IR-131. A new species at risk appendix has been included with the IR response package and will become Appendix 9-D to the final EIS. This new final EIS appendix lists all avian species at risk (under Schedule 1 of the <i>Species at Risk Act</i>), their conservation status in Saskatchewan, and references to species-specific mitigation measures.</p>	<p>The below barn swallow exclusion methods will be added to Section 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>



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				surrogates relate to Barn Swallow and Horned Grebe in terms of habitat type and range, nesting, and feeding requirements etc.  There is also inconsistency with respect to the use of surrogate species for the Horned Grebe between the EIS and ERA supporting document.		3. The rationale for the use of the surrogates in the ERA was provided in the draft EIS Appendix 10-A, Section 5.1.1 Receptor Selection. The summary of species at risk and associated surrogates was provided in the draft EIS Appendix 10-A, Table 5-2. In the ERA, Lesser Scaup was selected as the surrogate for other omnivore ducks and gulls (e.g., Bufflehead, Mew Gull, Herring Gull, Bonaparte’s Gull, Horned Grebe, and Yellow Rail). These riparian bird species would all experience exposure to aquatic release through water, food (invertebrates), and sediment. As such, in the ERA, Lesser Scaup is expected appropriately address the assessment and protection of a number of other riparian bird species, including Horned Grebe and Yellow Rail.	
IR-162	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.  In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow ( <i>Hirundo rustica</i> ) and Horned Grebe ( <i>Podiceps auratus</i> ) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”  Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.	1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.  2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.  3. Assess individually each SAR that overlaps with the Project and is likely to be affected.  See also related IRs: IR-160 and IR-161.	1. It is acknowledged that Barn Swallows (unlike Common Nighthawks) nest almost exclusively on human-made structures; therefore, specific Barn Swallow exclusion methods will be added as mitigation measures to the final EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.  2. Horned Grebe nesting requirements will be addressed by implementing appropriate activity-restriction setback distances. While the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS) do not specify measures for Horned Grebe, the setback distances for Yellow Rail will be followed: the SARGSS specify setback distances between 150 and 350 m around nesting birds for medium and high disturbance categories, respectively, between May 1 and July 15.  3. The environmental assessment approach was chosen to focus the habitat-based effects assessment; mitigation measures will be updated to include species-specific approaches as determined through the adaptive management process. Note that additional text and a new table will be added to a new Species at Risk appendix to Section 9, listing all avian species at risk (under Schedule 1 of the Species at Risk Act), their conservation status in Saskatchewan, and links to species-specific mitigation measures as they relate to the potential adverse effects on wildlife.	1. The following Barn Swallow exclusion methods will be added to Sections 9.4.5.2.4 in the final EIS: Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.  2. The species at risk new EIS appendix (Appendix 9-D; refer to IR-131) includes the following specific mitigation measure for Horned Grebe: Active and/or suspected breeding and roosting locations identified during the pre-clearing wildlife surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for Horned Grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).  3. A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-163	ECCC	Migratory birds	Section 9.4.3.3.3, Baseline Studies – Avian species at risk VCs	<b>Context and Rationale:</b> The baseline studies and data analysis for species at risk (SAR) birds is insufficient to accurately predict Project effects.  ECCC recommends the use of predictive modeling in relation to survey data and habitat attributes to produce distribution and density maps. Sites within the study area that support particularly high densities or diversity of an individual species, based on direct observation and, where appropriate, distribution or occupancy models, would greatly improve confidence in Project impact predictions.  Additional information on specific habitat use or models of habitat used by SAR would facilitate a more complete analysis of Project effects.	Provide additional information, including mapping/modelling of specific habitat requirements for each avian species at risk or provide a justification of models used in the draft EIS.	Denison is of the professional opinion that the data presented and analysis provided in the draft EIS is sufficient given the local / regional environment and the level of interaction with SAR birds that is expected. The habitat-based EIS approach did not include more detailed mapping/modelling because of the small Project footprint and the location (i.e., bird densities are not expected to be limited by habitat regionally).  The habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties. The VCs and KIs appropriately focused the EA; no additional modelling or assessment is considered to be required. In addition, further modeling is not expected to affect or change the findings and conclusions of the EIS. Based on the results of the baseline studies, supplemented by available additional data sources (e.g., HABISask), most avian species were conservatively assumed to be present and breeding in the Project study areas. Species-specific mitigation measures have been included and additional measures will be added (e.g., Barn Swallow exclusion measures; refer to IR-131 and IR-163). Pre-clearing surveys, ongoing monitoring during all Project phases, adaptive management (refer to the response to IR-159), and accepted, species-specific mitigation measures have been designed and will be implemented to avoid and minimize the potential for adverse Project effects.  In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.	No updates to the draft EIS are needed based on this IR response.
IR-164	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).  As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.	1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.  2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.	1. Refer to the response to IR-158.  2. Section 9.4.3.2.3 Baseline Studies provides an overview of the avian species identified within the various habitat types that were surveyed. No important wildlife or wildlife habitat features have been identified. The effects assessment included appropriate consideration of habitat loss and/or alteration related to migratory birds (regardless of different guilds).	No updates to the draft EIS are needed based on this IR response.
IR-165	CNSC ECCC	Birds (all species)	Section 9.4.4.2.2 Section 9.4.5.2.4, Avian Deterrence	<b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:	The response to this IR is provided in Attachment IR-165.	No updates to the draft EIS are needed based on this IR response.

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			and Prevention of Entrapment  Appendix 10-A (ERA)	<p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>		
IR-166	ECCC	Migratory birds	Section 9.4.5.2 Additional Avian Species-specific Mitigation Measures	<p><b>Context and Rationale:</b> Avian species-specific mitigation measures are not presented in the draft EIS. The Proponent has committed to providing a variety of environmental management plans.</p> <p>Section 9.4.5.2 reads: “Additional mitigation measures specific to the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs, in accordance with the Migratory Birds Convention Act, and tailored to Project features will be incorporated into various Project management and monitoring plans such as the, erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.”</p> <p>Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear; this is known as incidental take. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoiding Harm to Migratory Birds website at: <a href="https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html">https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html</a></p> <p>In order to assess the effectiveness of species-specific mitigations and need for additional mitigations ECCC requires details on the species-specific mitigation measures proposed, and the monitoring plans.</p>	<p>Provide details on species-specific mitigations for species at risk (SAR) and other avian species that will include:</p> <ul style="list-style-type: none"><li>• details on what activity restrictions will be implemented for migratory birds and SAR and when they will be applied;</li><li>• details on mitigations used during regular maintenance activities such as vegetation management (e.g., mowing), access road repair (e.g., aggregate stockpiles), and infrastructure repair;</li><li>• details on methods used to detect species listed on Schedule 1 of the <i>Migratory Birds Convention Act</i> (e.g., Pileated Woodpecker) and mitigations/setback distances and timing to reduce risk to these species.</li></ul>	<p>In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all wildlife SAR potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. Species-specific timing windows and setback distances from the SARGGSS were included in the species-specific sections of the draft EIS (see Section 9.4.3 in the draft EIS). Refer to 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk in Attachment IR-131. This section provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.</p> <p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>Please also refer to response to IR-133, IR-135, and IR-167.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p> <p>Final EIS updates related to wildlife SAR, including new species-specific mitigation measures, are outlined in response to IR-131 and exclusion methods are provided in response to IR-135.</p>
IR-167	ECCC	Migratory birds	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p><b>Context and Rationale:</b> The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: “Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered:</p> <ol style="list-style-type: none"><li>1. Most migratory birds: - Nests are protected only when they are in use or when live eggs or chicks are present.</li><li>2. Migratory birds listed in MBR 2022 Schedule 1: - For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned.</li><li>3. Migratory birds listed under SARA: - For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but</li></ol>	<p>Provide the following information:</p> <ul style="list-style-type: none"><li>• details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR).</li><li>• the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR</li></ul>	<p>Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>



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				are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.			
IR-168	ECCC	Migratory birds	Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment	<p><b>Context and Rationale:</b> The Proponent mentions that avian deterrents will be used on power transmission lines, buildings and other Project infrastructure. However, the Proponent does not mention any deterrents that will be used for deterring birds from the water or waste management facilities.</p> <p>Details on deterrents for all Project components should be identified to assess residual and cumulative impacts to migratory birds.</p>	<p>1. Provide information on avian deterrents to be used to prevent birds or other wildlife entering water or waste management ponds.</p> <p>2. Explain how proposed timing of use of deterrents will reduce risk of migratory birds making contact with treatment waters outside of the nesting season (i.e., during migration and stop overuse).</p> <p>3. Explain which deterrents will be used, which deterrents were considered, and what alternative, adaptive measures will be considered if deterrents are unsuccessful for any Project components.</p>	<p>Refer to response to IR-165 for a discussion on the need for additional avian deterrents at water management and treatment facilities.</p> <p>The following is an excerpt from IR-165:</p> <p>Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:</p> <ul style="list-style-type: none"><li>• Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.</li><li>• Employees and contractors will be educated on waste management policies that limit human-avian interactions.</li><li>• Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.</li><li>• Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.</li><li>• Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.</li><li>• Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.</li></ul> <p>Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. . If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:</p> <ul style="list-style-type: none"><li>• Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.</li><li>• Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006), as birds can habituate to a timely, consistent firing/noise event.</li></ul> <p>References: Exeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.</p> <p>Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.</p> <p>Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119</p>	No updates to the draft EIS are needed based on this IR response.
IR-169	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds, Table 9.4-15 and Map 9.4-11	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density and diversity, it is expected that all ecosites provide migratory songbird habitat.</p>	<p>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</p> <p>2. Explain why other habitat types were not considered as available habitat for migratory songbirds.</p>	<p>1. As per accepted methodology, to appropriately focus the habitat-based effects assessment, as per accepted EA methodology, the most frequently used habitat types (i.e., the ecosites experiencing the highest species richness, highest mean number of breeding songbird pairs, and highest species diversity) within the Project study areas were included as "available habitat" as shown in draft EIS Table 9.4-15 Summary of Available Habitat for Migratory Songbirds in the Project Study Areas and Figure 9.4-11 Available Habitat for Migratory Songbirds.</p> <p>For all three indicators (i.e., highest species richness, highest mean number of breeding songbird pairs, and highest species diversity), the three ecosites with the lowest representation were BS25 (open fen), BS19 (graminoid bog), and BS24 (graminoid fen). These three ecosites were excluded from the description of available habitat for migratory songbirds, as their use/suitability is expected to be low.</p> <p>Denison is confident that this approach is appropriate. Additionally, inclusion of these “low quality” habitat types would not be expected to alter the analysis of the residual effect nor the conclusions of the EA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).</p>	No updates to the draft EIS are needed based on this IR response

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						2. Although the habitat types excluded from the assessment are “available” to migratory birds, their low “suitability” to the KI species selected to focus the EA, resulted in these habitat types not included in the assessment. In Denison’s opinion, including these low suitability habitat types to the analysis would provide no additional value to the EA process, and would not alter the findings of the analysis nor the conclusions contained in the draft EIA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).	
IR-170	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p>Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>1. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA; no updated table or map is considered to be required. In addition, further mapping is not expected to affect or change the findings and conclusions of the draft EIS.</p> <p>2. Common Nighthawk were observed in the Project study areas during the baseline studies and are considered to be present and breeding. Rocky outcrops were not reported during the baseline studies (see Section 9.2.3). Pre-clearing surveys will be conducted, set-back buffers implemented, and pre-clearing survey and monitoring results will be used for adaptive management purposes (see also response to IR-159). Species-specific mitigation appropriate for Common Nighthawk is largely related to loss and/or alteration of habitat (including both direct and indirect effects).</p>	No updates to the draft EIS are needed based on this IR response.
IR-171	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation	<p><b>Context and Rationale:</b> Section 9.4.6.4 Residual Effects Evaluation for Bird SAR – Common Nighthawk reads: “Progressive reclamation is anticipated to begin during Construction. However, a conservative approach is used, with Common Nighthawk (CONI) habitat in the Project Area considered to be unavailable for the duration of the Project, only becoming available as habitat following Post-Decommissioning (i.e., during the regeneration of vegetation following Decommissioning).”</p> <p>CONI may nest on the roadsides of access roads within the Project area. As such, the Project area should still be considered available habitat for the duration of the Project and appropriate mitigations and adaptive management should be discussed for this species.</p>	Develop mitigation plans appropriate for avoiding collisions of common nighthawks with vehicles, when and where nighthawks are observed foraging near or roosting on gravel roads. Demonstrate how the planned mitigation activities will result in reduced residual effects from this pathway.	<p>Project design measures and species-specific mitigation measures outlined in draft EIS are expected to be appropriate to avoid or limit the risk of Project effects on Common Nighthawks. The cited text in the IR context and rationale from Section 9.4.6.4 refers to the anticipated duration of the Project effect.</p> <p>As described in the EIS, a Road and Traffic Management Plan will be implemented and mitigation measures (also described in Section 9.4.5.2.6) will include reduction of traffic volume, implementation of speed limits, installing visible signage at locations with potential for wildlife crossings (including avian species), communication (and reporting) of wildlife collisions, and maintenance of ditches and culverts. This mitigation is expected to reduce/limit potential for interactions between the Project activities and Common Nighthawk and their habitat, thereby limiting the risk of a potential adverse effect.</p>	No updates to the draft EIS are needed based on this IR response.
IR-172	CNSC	Birds (all species)	Section 9.4.6.4.2	<p><b>Context:</b> Populations of listed species may be less resilient to changes in mortality.</p> <p>CSA N288.6:22 Clause 7.2.4.3 states that effects on a few individuals of endangered, threatened, or vulnerable species would not be acceptable.</p> <p>The residual effects assessment for “Change in Mortality” for bird species at risk states that Project mitigation measures identified in Section 9.4.5 are expected to limit interactions between bird species at risk and potential sources of direct and indirect mortality. However, the mitigation measures are not discussed with respect to their effectiveness to limit interactions, specifically for bird species at risk.</p> <p><b>Rationale:</b> It is unclear if the proposed mitigation measures are effective in preventing mortality in bird species at risk for which even only a few deaths could negatively impact the population.</p>	Please provide a discussion on mitigation measures with respect to their effectiveness in minimizing mortality for bird species at risk, for which effects on a few individuals would not be acceptable.	Mitigation measures provided in the EIS were selected in consideration of their proven effectiveness and applicability to the Project, including the habitat types and species that could be adversely affected. A component of the effectiveness of the proposed mitigation is appropriately addressed in the discussion on “Confidence” for each of the residual effect assessment in the EIS. The new Species at Risk appendix that will be added to the final EIS (see IR-131) includes discussions of the effectiveness of mitigation measures that Denison is proposing to implement to avoid or reduce mortality of Bird Species at Risk.	The new Species at Risk appendix that will be Appendix 9-D to Section 9 of the final EIS has been included in this IR response package (Attachment IR-131). This new EIS appendix includes the species-specific, proven, mitigation measures and their effectiveness, that Denison is proposing to implement during the Project to mitigate adverse effects on bird species at risk.
IR-173	ECCC	Migratory birds	Section 9.4.8 Monitoring and Follow-up	<p><b>Context and Rationale:</b> Monitoring and follow up programs are part of adaptive management and implementation of additional mitigations.</p> <p>In Section 9.4.8 the Proponent states: “Considering the Project planning, baseline survey results, and proposed mitigation measures, no follow-up programs are considered to be warranted at this time.”</p> <p>Project impacts related to mortality of birds, such as collisions with the transmission line, mortality along roads and use of waste and water management facilities should be monitored during all phases of the Project and adaptively managed.</p>	<p>Provide details on the follow-up program to monitor impacts to avian mortality. The follow-up plan should include:</p> <ul style="list-style-type: none"> <li>Monitoring of avian use of waste and water facilities</li> <li>Monitoring of mortality along access roads</li> <li>Monitoring of mortality related to transmission lines</li> <li>Monitoring of effectiveness of avian deterrents.</li> </ul>	<p>As described in the draft EIS, a wildlife monitoring plan will be developed to support permitting and licensing and implemented as the Project proceeds. The wildlife monitoring plan will provide details on the monitoring and follow-up programs outlined in Section 9.4.8 of the EIS. In Section 9.4.8 of the draft EIS, Denison has outlined the following as part of monitoring programs:</p> <p>“Avian movements across the Project study areas may bring species or individuals into contact with Project components (e.g., buildings, power transmission lines, waste ponds and waste pads) and activities (i.e., vehicle and aircraft traffic), which can result in mortalities and changes to habitat use. Project design and mitigation measures (Section 9.4.5) have been identified that are expected to minimize the likelihood of adverse Project effects. However, changes in avian habitat and habitat use over the life of the Project require an adaptive management process to update Project design and additional mitigation measures, if required. The potential for these changes will require appropriate monitoring for changes in avian mortality or encounters to determine, in a timely manner, whether changes are warranted through the adaptive management process.”</p> <p>Specifically, as it concerns monitoring avian mortality the following is noted and will serve as the basis of the framework for this component of the wildlife monitoring plan. The objective of this component of the plan would be to (1) document and mitigate potential effects of Project activities on avian mortality; and, (2) reduce interactions between wildlife (in this case birds) and people. Avian mortalities observed by Denison staff would be reported immediately to the Environment Department, and an inspection by Environment staff will be made to determine the probable cause of death. Obvious injuries, the position of the animal, and anything considered unusual would be photographed and recorded. Further information such as time, date, location, estimated time of death, and any sightings of other wildlife in the area would also be recorded. A procedure would be developed for carcass removal to prevent attraction of carnivores and other scavengers to the Project site. Wildlife mortality monitoring would be undertaken as required, continuously throughout the life of the Project. All mortalities would require follow-up to determine if anything can be done to prevent</p>	Section 9.4.8 of the final EIS will be updated to note that Denison is committed to monitoring avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines as documented in the IR response. It will be further noted that such mortalities will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison.



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						<p>similar mortalities from occurring in the future. Data related to avian mortalities would be compiled to identify trends over time and to determine the cause of mortalities and identify any further mitigation would be appropriate.</p> <p>Further, it is noted that avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison. Further, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on developing scope of monitoring regimes, which could include monitoring programs and the reporting on wildlife-vehicle mortality.</p> <p>Additionally, as noted in draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through sequential EA and licensing process. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed it is believed that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p>	
IR-174	ECCC	SAR - Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context and Rationale:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (<i>Myotis lucifugus</i>) and northern myotis (<i>Myotis septentrionalis</i>). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p>Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<ol style="list-style-type: none"><li>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</li><li>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</li><li>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</li><li>4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</li></ol>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to a variety of IRs, including this IR, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. This new EIS appendix provides information on little brown myotis and northern myotis. We note Denison’s commitment to pre-construction surveys to identify potential for maternity and nursery roosting habitat. Refer to response to IR-134 for the timing of clearing activities outside of roosting periods. Results from pre-construction surveys and continuous monitoring (described in Section 9.3.8) will be used in the adaptive management process to update Project design and additional mitigation measures, if required.</p>	No updates to the draft EIS are needed based on this IR response.
IR-175	CNSC	Provincially Listed Species	Appendix 9-B; section 2.2.2	<p><b>Context:</b> Vegetation and wildlife habitat characterization field surveys were completed in 2017, based on which ecosite factsheets were prepared. The factsheets list observations of two provincially listed plant species with a rank of S3 (vulnerable/rare to uncommon; Table 2.4-2) according to the Saskatchewan Conservation Data Centre, which are not discussed in the main EIS document:</p> <ul style="list-style-type: none"><li>• Angle-leaved sundew (<i>Drosera anglica</i>) observed in ecosites BS19, BS20, BS22, BS25</li><li>• Neat Spike-rush (<i>Eleocharis nitida</i>) observed in ecosite BS25</li></ul> <p>Table 9.2-12 in section 9.2.6.2.1 of the EIS indicates that there may be indirect disturbance to some of these ecosites (BS19, BS20, BS25). In section 9.2.6.3.1 it is discussed that listed plant species are not likely to return once lost from a specific location.</p> <p><b>Rationale:</b> Given that not all areas in the revised Project footprint were surveyed for listed plant species in baseline studies, there is uncertainty as to whether any species were missed, in particular those that have been observed in ecosites present in the LSA/RSA (e.g., <i>Drosera anglica</i> and <i>Eleocharis nitida</i>, see also Appendix 2 Table of Appendix 9-B). It should also be noted that rare plant surveys were completed in summer 2017 only (section 2.4.2 of Appendix 9-B), which may underestimate annual rare species that may be dormant in the seed bank in some years due to specific seed emergence requirements.</p> <p>It is acknowledged that the proponent committed to pre-construction listed plant surveys targeted on ecosites encountered in the Project Area but not previously surveyed, as well as ecosites within the Project Area with high potential to support listed plants.</p> <p>More information is requested on the potential indirect effects on rare plant species as well as the planned pre-construction surveys.</p>	<ol style="list-style-type: none"><li>1. Please provide a discussion on the potential risks from indirect effects on ecosites with observed rare plant species</li><li>2. Please provide additional information on the ecosites included in the planned pre-construction listed plant surveys</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends focusing monitoring on ecosites that have known observations of listed plant species outside of the Project Area (e.g., BS19, BS20, BS22, BS25).</p>	<p>1) As described in Sections 9.2.4.2.1 and 9.2.6.3.1 of the EIS, listed plants may be affected indirectly by the introduction and/or proliferation of invasive plants, dust deposition, edge effects, and changes to water quantity and quality. Mitigation measures planned to address these potential effects are described in Section 9.2.5, and include developing the Project footprint within previously disturbed areas to the extent practical (reducing edge effects); reducing dust deposition on vegetation by directing processing plant exhaust through a scrubber prior to release, appropriate stack height design for optimal dispersion, controlling property access, providing a wash bay, undertaking road watering and traffic controls, and monitoring dust during Construction and Operation; maintaining surface water flow (see response to IR-140); and undertaking invasive plant management. The specific risks of residual indirect effects on a given listed plant population are dependent on a suite of site-specific factors, including (but not limited to) the life requisites of the listed plant species, the species’ resilience to disturbance, the size of the population, and the location of the population in relation to Project activities. As described in Section 9.2.8.1, pre-construction listed plant surveys will be undertaken within the Project Area within ecosites that were not encountered during the 2017 surveys, as well as within selected areas of the Project Area with the potential to support listed plants (e.g., transitional habitats favoured by Alaskan clubmoss). Surveys will be undertaken to verify EA predictions and identify mitigation measures to protect Listed Plant Species, as appropriate. Should Listed Plant Species be identified within the Project Area, site- and species-specific mitigation measures will be developed by a qualified vegetation ecologist to avoid and/or minimize potential Project effects.</p> <p>2) Ecosites planned to be included during pre-construction listed plant surveys include all ecosites with the potential to support listed plants that may be directly or indirectly affected by the Project (i.e., ecosites located within the Terrestrial LSA). This includes ecosites where Alaskan clubmoss were historically observed (BS3/BS7, BS4, BS23); ecosites within the Project Area that were not previously surveyed (BS7, BS9, BS23, Waterbody); and ecosystems known to support angle-leaved sundew and neat spike-rush populations (BS19, BS20, BS25). It is noted that ecosite BS22 has not been mapped within the Terrestrial LSA and is not expected to experience direct or indirect Project effects; as such, it is not planned to be included within pre-construction listed plant surveys.</p>	No updates to the draft EIS are needed based on this IR response.

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-176	CNSC	Human Health with respect to radiation exposure	Section 10.1.4.2.1 Section 10.1.6.1.4  Appendix 10-A (ERA)	<p><b>Context:</b> In section 10.1.4.2.1, the proponent provides an evaluation of air quality constituents of potential concern to human health. It states: “A screening value for radon gas of 200 becquerels per cubic metre (Bq/m3) was available from Health Canada, which applies to total radon including background sources (Health Canada 2009). The radon concentrations which were predicted are incremental concentrations (i.e., above background) and were therefore compared to the applicable incremental screening value of 60 Bq/m3 for indoor air established by the Canadian Nuclear Safety Commission (CNSC) (Health Canada 2010a; Radiation Protection Regulations. SOR/2000-203).”</p> <p>The 60 Bq/m3 radon concentration value also appears in section 7.1.2 of Appendix 10-A (ERA).</p> <p>Further in section 10.1.6.1.4, it is stated: “Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 Bq/m3.”</p> <p>The Radiation Protection Regulations do not stipulate a limit for radon above background for sites licensed by the CNSC. The effective dose limits for Nuclear Energy Workers (NEWs) and persons that are not NEWs are listed in section 13 of these regulations, and in subsection 1(3) of these regulations for the general public.</p> <p>The annual effective dose from all sources associated with the licensed activities and within the scope of the Nuclear Safety Control Act and Regulations must be compared to the applicable effective dose limit. For members of the public this limit is 1 mSv per calendar year.</p> <p>In Section 4.2.5.3 of Appendix 10-A (ERA), there appears to be no reference mentioned for the radon equilibrium factors. These factors are a significant input into the dose calculations for radon.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>1. Removing the reference to a 60 Bq/m3 limit.</li><li>2. Reporting the assessment results as the total dose, from all radionuclides combined including radon progeny, and by comparing this annual effective dose to the effective dose limit.</li></ol> <p>Provide a summary of the conservative assumptions that have been included in the dose calculations.</p> <p>Provide a reference that shows how the radon equilibrium factors were determined.</p>	<p>1. While 60 Bq/m<sup>3</sup> (incremental) has been used in CNSC Oversight reports for uranium mines and mills, and referenced by Health Canada, it seems to be no longer used based on the updated Radiation Protection Regulations. Denison will remove any reference to 60 Bq/m<sup>3</sup> from the EIS and Appendix 10-A.</p> <p>2. The predicted radon concentrations will be compared to 200 Bq/m<sup>3</sup> (total) and total effective dose including radon and U-238 decay chain radionuclides will be compared to the 1 mSv/a dose limit. The total dose to the camp worker from radon (1.3E-01 mSv/a) and U-238 decay chain radionuclides (2E-02 mSv/a) is predicted to be 1.5E-01 mSv/a which is below the dose limit for a non-NEW of 1 mSv/a. This will be included in Section 4.4.1.3 of the ERA.</p> <p><u>Conservative Assumptions:</u></p> <ul style="list-style-type: none"><li>- For calculation of radon dose it was conservatively assumed that the camp worker spends 100% of their time indoors when on site (section 4.2.5.3 of ERA).</li><li>- Receptors are exposed to the maximum exposure concentrations at their location for each model scenario and Project phase (section 4.2.6 of ERA).</li><li>- For radionuclides in the U-238 decay chain (other than radon), the camp worker is also exposed through ingestion (water and food) pathways resulting in a conservative dose when also factoring in the dose from radon indoors.</li></ul> <p>The radon equilibrium factors were calculated as described in section 2.4.3 of the IMPACT Model Report, which is Appendix A of the ERA (Appendix 10-A). The equilibrium factors calculated are shown in Table 4-11 of Appendix 10-A.</p>	Per the IR response any reference to 60 Bq/m <sup>3</sup> from the EIS and Appendix 10-A and Section 4.1.1.3 will be revised as indicated.
IR-177	HC	Change to an environmental component due to radiological contaminants	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	<p><b>Context:</b> Section 10.1.4.2.1 states that, “Screening values for radionuclide concentrations in ambient air were not available. All relevant radionuclides were assessed in the HHRA in terms of their contribution to the total radiological dose to human and ecological receptors” (p. 10-22).</p> <p>Section 10 Appendix 10-A (ERA) states that, “No formal screening was conducted for radionuclides. However, since radiation dose to human receptors is of public and regulatory interest, the radionuclides in the uranium-238 decay series are carried forward as COPCs for further assessment” (Appendix 10-A (ERA): Appendix B Ref. 19-2638).</p> <p>Table 6.1-1 lists radionuclides as a key indicator for air quality, but only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.</p> <p><b>Rationale:</b> Health Canada recommends using screening values that are available for radionuclides if they are appropriate for the dose and if the screening values have listed assumptions (such as particulate size and worker exposure time that can be adapted to in Denison’s models). Two examples are ICRP 96, which CNSC uses in their regulatory reports to derive reference air quality values for Pb-210, Ra-226, and Th-230 (CNSC: Regulatory Oversight Report for Uranium Mines and Mills in Canada 2019); and Health Canada’s Guidelines for Management of NORM (Health Canada: Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials, 2011).</p>	<ol style="list-style-type: none"><li>1. Assess predicted radionuclides in Section 10 Appendix 10-A (ERA) using appropriate available screening values. Alternatively, provide a justification for why a screening wasn’t conducted for radionuclides despite the availability of screening values (e.g., ICRP 96 and NORM Guidelines, 2011).</li><li>2. Clarify if uranium progenies in air are considered in the atmospheric transport and air quality modelling and are simply not reported, or if they are not included in the models because no screening criteria are available.</li></ol>	<p>1. The methodology used in the ERA was to carry all radionuclides in the U-238 decay chain forward for quantitative dose calculations. As such, a formal screening was not conducted. No radionuclides were removed from the process, but rather all were considered constituents of potential concern (COPCs). Clause 7.2.5.4.3 of CSA N288.6-22 states “Certain COPCs may be carried forward into the EcoRA for reasons of public perception, even if screening benchmarks are not exceeded. For example, the most important radionuclides may be carried forward to demonstrate acceptable risk based on expressed public concern rather than exceedance of screening criteria.”</p> <p>2. Section 3.2 of Appendix 10-A (ERA) states that based on the ISR process the main source is yellowcake (uranium oxide) and not uranium ore. As such, at the point of release, the uranium mass is almost entirely uranium-238, and on an activity basis the uranium-238 and uranium-234 are equal. Ingrowth of progenies including Th-230, Ra-226 and Pb-210 were not considered in air since compared to the life of the Project ingrowth in air would be minimal. This was confirmed using the WISE Uranium Calculator (<a href="https://www.wise-uranium.org/rccu.html">https://www.wise-uranium.org/rccu.html</a>). Ingrowth of other radionuclides including Th-230 and Ra-226 is included in the air deposition to soil model. Ingrowth of Pb-210 and Po-210 in soil was considered negligible. The human dose results include the soil internal and external exposure pathways and are provided in the ERA results (see Appendix B, Table B.9).</p>	No updates to the draft EIS are needed based on this IR response.
IR-178	HC	Change to an environmental component due to hazardous contaminants	Section 10.1.4.2.1 (p. 10-22)  Section 6.1.4.2, Potential Project Related Effects (p. 6-31)	<p>The Baseline + Project scenario was not provided for radon levels.</p> <p><b>Context:</b> Section 6.1.4.2 states that the predicted levels for radon were not added to the respective baseline air quality levels (p. 6-31), and further explains that “In all modelled phases of the Project, annual average radon concentrations at receptors beyond the Property Boundary are expected to be indiscernible from background levels.”</p> <p>In Section 10.1.6.1.4, a different approach to evaluating predicted radon levels is mentioned: “the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m3“(p. 10-44).</p> <p><b>Rationale:</b> Without a rationale as to why baseline levels of radon were not included in the assessment, HC cannot fully evaluate the appropriateness of the air quality assessment. While Health Canada is of the opinion that using background radon levels as a screening value</p>	<ol style="list-style-type: none"><li>1. Provide further information on whether and how baseline radon concentrations in air were determined.</li><li>2. Include baseline radon concentrations in the predicted total concentrations when comparing to existing guidelines; alternatively, provide a rationale for why baseline concentrations of radon were not included.</li><li>3. Discuss the potential health implications of the project-only increment-over-baseline radon levels</li></ol>	<p>1: The baseline range of &lt;7.4-25 Bq/m<sup>3</sup> referenced in the air quality assessment is discussed in Section 6.1.1.2.3 of the draft EIS and comes from the CNSC document “The Regulatory Oversight Report for Uranium Mines and Mills in Canada” (2018). Measured baseline values presented and discussed in Section 6.1.3.2.3 of the EIS also fall within this range.</p> <p>2. The rationale for not adding baseline to modelled incremental radon concentrations in the air quality assessment is presented in Section 6.1.1.2.3. This approach was discussed and confirmed with the CNSC during a technical meeting on Sep. 17, 2021.</p> <p>3. As discussed in the response to IR 176, the total incremental dose to the camp worker from radon and U-238 decay chain radionuclides is below the dose limit for a non-NEW of 1 mSv/a.</p>	No updates to the draft EIS are needed based on this IR response



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				is appropriate in this case from a health perspective, different approaches to screening predicted radon levels in different sections appear to be used (i.e., background radon levels vs. CNSC incremental concentration).			
IR-179	CNSC	Groundwater quality decommissioning objectives.	Section 10.1.4.2.2, Release of Treated Effluent to Whitefish Lake During Decommissioning	<p><b>Context:</b> It is stated that “This process would continue until the recovered water meets acceptable groundwater quality decommissioning objectives”.</p> <p><b>Rationale:</b> The information provided does not include groundwater quality decommissioning objectives nor a reference to these objectives.</p>	Please provide groundwater quality decommissioning objectives or a reference to the information.	<p>The “groundwater quality decommissioning objectives” referred to in Section 10.1.4.2.2 of the draft EIS are the mining area decommissioning objectives provided in Table 2.3.3 of Section 2.3.3.1.1 in the draft EIS. The mining area decommissioning objectives have been developed through groundwater modelling work and are achievable based on metallurgical testing. Groundwater modelling and metallurgical testing are described in Section 7.6.2.1 of the EIS and in Appendix 7C of the EIS.</p> <p>For clarity, Section 10.1.4.2.2 will be modified in the final EIS to state: “This process would continue until the recovered water is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives (Section 2.3.3.1.1, Table 2.3-3).”</p>	Section 10.1.4.2.2 in the final EIS will be modified as follows: This process would continue until the recovered water <b>is demonstrated to be stabilized (maintained) at</b> meets acceptable <b>groundwater quality mining area</b> decommissioning objectives ( <b>Section 2.3.3.1.1, Table 2.3-3</b> ).
IR-180	CNSC	Human health with respect to hazardous contaminants	Section 10.1.6.1.1, Human Receptors Selection and Characterization	<p><b>Context:</b> Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.</p> <p><b>Rationale:</b> While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.</p> <p>In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?</p>	<p>Please provide justification for excluding a receptor from occupancy at lakes closer to the project during operation (McGowan, Whitefish). Alternatively, conduct a risk assessment to a receptor at these lakes during operation to determine if there is a predicted risk that may require monitoring or mitigation.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>Assessment of a receptor located closer to the point of effluent release may need to be considered to ensure there are negligible risks</li><li>If Se is expected to exceed hazard quotients further upstream, selenium removal technology may be required as part of the effluent treatment process as a mitigation measure. Other COPC’s exceeding an HQ of 1 may also be identified under this process that could require specific monitoring or mitigation measures.</li></ul>	<p>The traditional land use activities closest to the Project site are reported to occur in the Russell Lake area. However, a potential recreational lease has been identified in the McGowan Lake area. As such, a human receptor (Recreational Fisher/Hunter) was assessed at McGowan Lake in Appendix 10-A (ERA). The Fisher/Trapper was included at Russell Lake based on engagement with a local fisher/trapper (Bobby John), who had a cabin at Russell Lake. Overall, based on Indigenous and Local Knowledge, use of the area near Whitefish Lake for fishing, hunting, gathering is limited. As such the closest human receptor assessed during the Project phases was at McGowan Lake.</p> <p>No unacceptable risk was identified for the human receptor (Recreational Fisher/Hunter) at McGowan Lake due to releases from the Project. The ingestion rates for the receptor at McGowan Lake are more reflective of the average country foods diet and consumptions rates expected for human receptors in the area (based on the ERFN country foods study) than the diet of the Fisher/Trapper which would represent a higher consumption of traditional foods. As indicated in Section 4.4.1.1 of the ERA, the annual fish consumption based on engagement with a local fisher/trapper from ERFN was assumed to be 183 kg/yr (approximately 1 to 2 servings per day), which is conservative compared to an annual fish consumption of 27 kg/yr (2 servings per week) from the ERFN’s Country Food Study (CanNorth, 2017) and 88 kg/yr (approximately 1 serving per day) for the high consumer for the Boreal Shield in the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al., 2018).</p> <p><u>References:</u> CanNorth, 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p> <p>Chan, L., Receveur, O., Sadik, T., Schwartz, H., Ing, A., Fediuk, K., Tikhonov, C., 2018. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Saskatchewan (2015). University of Ottawa, Ottawa.</p>	No updates to the draft EIS are needed based on this IR response
IR-181	CNSC	Human Health with respect to radiation exposure	Section 10.1.6.1.4	<p><b>Context:</b> In section 10.1.6.1.4, it is stated: “The maximum incremental radon concentration at the camp worker site during Operation was predicted to be 12.4 Bq/m3, which is below the CNSC limit of 60 Bq/m3 for incremental radon.”</p> <p>As per IR-176, there is no such CNSC limit for incremental radon.</p> <p>The camp worker would be considered a person who is not a nuclear energy worker (NEW) and subject to the dose limits of section 13 and 14 of the Radiation Protection Regulations, not the dose limit for the general public as per subsection 1(3) of the Radiation Protection Regulations. The CNSC has regulatory requirements for the ascertainment and recording of doses of radiation as per section 5 of the Radiation Protection Regulations. Every licensee must ascertain and record the magnitude of exposure to radon progeny, the effective dose and equivalent dose received by and committed to a person who performs duties in connection with any activity that is authorized by the Nuclear Safety and Control Act or is present at a place where that activity is carried on.</p> <p>The camp worker performs duties in connection with the licensed activity and is present at the location where the activity is carried out. Hence, they are not considered to be a member of the general public (who has no connection with the activity)</p> <p>Further, the proponent indicates that the maximum incremental radon dose to the camp worker was estimated to be 0.13 mSv/year during Operation. The assessment assumes that the camp worker spends 100% of the time indoors. Table 10.1-11 shows the maximum total incremental dose for the camp worker to be 0.02 mSv/year. This appears to be a discrepancy.</p> <p>Table 5.2 in Appendix 10-C provides internal annual dose from radon inhalation. The radon doses to some NEW workers (9.44E-02 mSv/a Driller 1 and 1.03E-01 mSv/a Wellfield Operator 1, 2) here appear less than the radon dose (0.13 mSv/year from section 10.1.6.1.4) to the camp worker, who is a non-nuclear energy worker.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>Removing the reference to a 60 Bq/m3 limit for incremental radon.</li><li>Revising all references to the ‘public dose limit’ applied to camp workers (non-NEWs) to align with section 13 and 14 of the Radiation Protection Regulations.</li></ol> <p>The proponent should explain why the radon dose for the camp worker appears as 0.13 mSv/year in one instance and 0.02 mSv/year in another.</p> <p>The proponent is also asked to provide the rationale as to why a non-NEW has a higher radon dose than a NEW.</p>	<p>1. The reference level of 60 Bq/m³ for incremental radon will be removed from the EIS and Appendix 10-A (ERA). The health impact will instead be interpreted based on dose. The incremental radon dose to the camp worker is 0.13 mSv/year during Operations, which is below the dose limit for a non-NEW of 1 mSv/year. The ERA text will be updated.</p> <p>2. The ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW. Note that the same dose limit of 1 mSv/year is applied. Section 10.1.6.1.4 will be modified to state: "Incremental radiation doses due to radionuclides in the uranium-238 decay series were compared to the regulatory public dose limit <b>and dose limit for a non-NEW</b> of 1 mSv/yr as described in the Radiation Protection Regulations under the <i>Nuclear Safety and Control Act</i>."</p> <p>The radon dose to the camp worker is predicted to be 0.13 mSv/year during operations and 0.02 mSv/year during Construction. See Table 4-12: Predicted Radon Dose to Camp Worker during all Project Phases in Appendix 10-A (ERA). No changes to the appendix are required.</p> <p>The radon dose to a NEW is presented in Appendix 10-C (Worker Dose Assessment). The radon dose to a NEW is higher in most instances than to a non-NEW at the camp. As indicated in Section 5.2 of Appendix 10-C, the dose from radon to NEWs in the ISR plant area is predicted to range from 0.53 to 2.27 mSv/year. Radon dose to NEWs from the core shack is expected to be 2.3 mSv/year. Radon dose to the Driller 1 and Wellfield Operator 1, 2 is based on exposure to radon outdoors where exposure is much lower than exposure to radon indoors for the camp worker.</p>	Per the IR response any reference to 60 Bq/m³ from the EIS and Appendix 10-A and the ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW.



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				consistency with the Radiation Protection Regulations and the environmental impact statement.			
IR-182	HC	Change to an environmental component due to radiological contaminants	Section 10.1.6.1.4, (p. 10-44)	<p><b>Context:</b> Section 10.1.6.1.4 states, "The limit is incremental and is exclusive of natural background, such as natural levels of radon and medical exposures. A dose constraint of 0.3mSv/yr was established for the public from all radionuclides and all pathways for the Project, as recommended by Health Canada (2010a). The dose constraint represents a dose lower than the public dose limit that ensures the combined dose from multiple sources does not result in exceedance of the public dose limit. Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m<sup>3</sup>" (p. 10-44).</p> <p><b>Rationale:</b> Calculating radon separately from all radionuclides may underestimate the health risks by not considering combined doses from multiple sources when comparing to the public dose limit constraint of 0.3 mSv/yr recommended by Health Canada (2010a).</p>	1. Provide clarification on how combined doses from all sources would be accounted for in respecting the public dose limit of 0.3 mSV/yr if radon concentrations are being calculated separately.	<p>Health Canada guidance recommends reporting the dose from radon separately. See HC PQRA(rad) document in Section 5.8 Total Dose "In general, it is appropriate to compare the combined dose from external and internal radiation to a dose limit or a reference dose and to compare radon to its own criterion."</p> <p>The existing tables will be kept the same for total dose without radon and a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Note that total dose for the camp worker with radon included would be 0.15 mSv/year which is lower than the defined dose constraint of 0.3 mSv/yr. Additionally, the following text will be added to Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".</p>	Per the IR response a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS will be updated to include the following statement, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".
IR-183	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C	<p><b>Context:</b> Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.	Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. As noted in responses to IRs 185, 186, and 187, some revisions to Appendix A are detailed in Attachment IR-183 to 187.	Changes to Appendix 10-C of the EIS, including example calculations in Appendix A of Appendix 10-C, are as described in response to IRs 185, 186 and 187 (see Attachment IR-183 to 187).
IR-184	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C, 2.0	<p><b>Context:</b> It is stated in Appendix 10-C, section 2.0 that: "In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers."</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p> <p><b>Rationale:</b> The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.	The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation. See Attachment IR-183 to 187.	Per the IR response, in Section 2.0, p.2-1, of Appendix 10-C of the final EIS the following text will be deleted: <del>In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.</del>
IR-185	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2  Appendix 10-C Table 3.10-3.12	<p><b>Context:</b> The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.	The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3 and have changed inputs for drying and packaging in response to IR-186, a revised table is provided here (see Table A.3 in Attachment IR-183 to 187) that will replace Table A.3 in Appendix A of Appendix 10-C.	Per the IR response, revised Table A.3 from the memo will replace Table A.3 in Appendix A of final EIS Appendix 10-C. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same small changes in external dose (see Attachment IR-183 to 187).
IR-186	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6 Section 10.2.4  Appendix 10-C, Section 3.2	<p><b>Context:</b> In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.</p> <p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: "For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA."</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: <i>No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</i></p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p><b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the</p>	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>	<p>A very conservative dust level in drying and packaging areas had been used (representing equipment sources of dust to the exhaust system). While the dust hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for the drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 in Attachment IR-183 to 187).</p>	Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of EIS Appendix 10-C will be revised to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to reliance on PAPR as an exposure control will be removed from text throughout the EIS.

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				radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i> .			
IR-187	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6  Appendix 10-C, Section 3.3, 6.0	<b>Context:</b> The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.  Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, <i>Radiation Protection</i> .  <b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i> .	Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.  Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.  Identify mitigation measures as per the hierarchy of control for radiological protection.	As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 provided in Attachment IR-183 to 187). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.	Per the IR response Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to routine use of PAPR as an exposure control will be removed from text throughout the EIS. Mitigation measures will be described as per the hierarchy of controls.
IR-188	CNSC	Human Health with respect to radiation exposure	Section 10.2.4	<b>Context:</b> The following is stated in section 10.2.4: “Dust inhalation is also a potentially substantial component of worker dose at the core shack. At this location, PAPR will not be required; however, N95 masks will be used, and dust levels will be monitored here...It may be possible to increase air exchange in the core shack, above the planned six exchanges per hour, should this be necessary. This would also reduce radon exposure in the core shack.”  If it is possible to increase air exchanges in the core shack, it is not clear why this was not assessed and incorporated in the design of the core shack.  <b>Rationale:</b> It appears that a control measure (e.g., air exchange protocols in the core shack) to reduce the exposure to workers has been identified. However, it is not certain if it has been formally documented to ensure that it is incorporated in the engineered design of the core shack.	Provide details on how the control measures to reduce the exposure to both workers through the air exchange protocols in the core shack have been formally documented to ensure that it is incorporated in the engineered design of the core shack.	Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. The engineering design of the core shack including control measures to reduce core shack worker exposure will be included in the detailed design and the core shack HVAC design criteria will be provided to the CNSC during Project licensing. The design mitigation measures in the EIS (Appendix 10-C) include: - Ventilation (assumed as 6 room changes per hour) - Monitoring of dust and radon, and worker doses (assumed 3 cores in shack, calculated radon level as 1.18E+3 Bq/m <sup>3</sup> , and assumed dust level as 0.0675 mg/m <sup>3</sup> ) - Managing worker exposure time and dose (time assumed as 120 d/a, 11 h/d) Although use of N95 masks was mentioned, masks were not factored into the exposure estimation.  As described in Section 10.2.4 Mitigation Measures, worker health is managed under the Radiation Protection Program (RPP), which is a worker health and safety plan specifically for radiation exposures. The RPP designates the roles and responsibilities of Denison and contractors, specifies the radiation dose limits, action levels and administrative levels, describes procedures to monitor and manage worker exposures (dust and radon monitoring, personal dose monitoring), and describes the processes for training and record-keeping. The successful implementation of the RPP, in conjunction with in-design measures described for the various project activities, is key to maintaining acceptably low doses of radiation exposure to workers during all phases of the Project.	No updates to the draft EIS are needed based on this IR response.
IR-189	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”  In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”  <b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.	Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70% lichen in the diet.  See also related: IR-138.	A second woodland caribou with a diet of 70% lichen, 20% browse, and 10% macrophytes was modelled for comparison to the existing woodland caribou with a diet comprised of 50% browse, 20% lichen and 30% macrophytes. Compared with the woodland caribou with the lower lichen diet (50% browse, 20% lichen and 30% macrophytes), the predicted total radiological dose for the woodland caribou with the higher (70%) lichen diet increased 65% to 0.0118 mGy/d, which is below the 2.4 mGy/d radiation dose benchmark for terrestrial biota. The predicted maximum hazard quotient (HQ) for the woodland caribou with higher (70%) lichen diet would generally increase by 5 to 81% with the exception of copper and molybdenum where the HQ decrease due to the copper and molybdenum concentration in lichen being lower than in browse. However, all HQs for both the woodland caribou with the lower and higher lichen diet are below the benchmark of 1 for all COPCs.	No updates to the draft EIS are needed based on this IR response
IR-190	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)  Appendix 6, Table 5 (p. 16)	NO2 criteria is not being consistently compared.  <b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.  Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.  <b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.	1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.	The CAAQCs are applicable to measured ambient air concentrations over a three-year period and are not applicable to modelled results from a single facility. In technical meetings between Denison and ENV, the province agreed to the approach of utilizing 1-year of site-specific meteorological data. Use of the CAAQCs would require a three-year site specific data set. Denison agrees to using the 2025 CAAQCs for NO2 in future mitigation and follow-up plans.	No updates to the draft EIS are needed based on this IR response
IR-191	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-9 (p. 3.36) and Table 3-10 (p. 3.46)	Non-threshold substances are not included in screening and monitoring plans.  <b>Context:</b> Fine particulate matter (PM2.5) is not being considered further in secondary air quality screening for short and long-term exposure at human and ecological receptors because it is not predicted to exceed the screening values of the Ontario Ambient Air	1. Include PM2.5 and PM10 in the secondary air quality screening for short and long- term exposure at human receptors.  2. Include PM10 and PM2.5 in the air quality monitoring plan as they are non- threshold substances.	1. PM2.5 and PM10 baseline (background) concentrations were compared to the Project AQ Criteria in Appendix 6-A, Table 5: Model Predicted COPC Concentrations for the Construction Scenario. PM2.5 and PM10 background concentrations were found to be below the Project AQ Criteria. Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5. As noted by the reviewer, PM2.5 was not included for the secondary air quality screening because the predicted maximum concentrations (which includes background air concentrations) did not	Per the IR response, Section 3.2 in Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5.  The commitment to include PM10 and PM2.5 to the air quality monitoring plan during



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			Section 6.1.8 (p. 6-44)	<p>Quality Criteria (OAAQC) or the Canadian Ambient Air Quality Standards (CAAQS) for both annual and 24-hour average periods (Tables 3-9 and 3-10). Furthermore, it is not compared against the baseline for analysis.</p> <p>Table 3-9 indicates that coarse PM (PM10) is predicted to exceed the 24-hour CAAQS during all phases of the project. However, Appendix 10-A p. 3.46 states that, “There were no exceedances of PM2.5 which is generally considered to be a more reliable indicator of potential health effects. However, health effects would be infrequent and reversible, subsiding after exposure; therefore, PM10 was not considered for further quantitative assessment in the ERA.”</p> <p>PM10 and PM2.5 were not included in the air quality monitoring plan (Section 6.1.8).</p> <p><b>Rationale:</b> Particulate matter and NO2 are considered non- threshold pollutants, meaning that health effects can occur at any level of exposure, The CAAQS for PM2.5 PM.10, and NO2 recognize that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). The CAAQS values should not be construed as limits to which polluting up to is allowed. In addition, based on the principles of keeping clean areas clean and continuous improvement, proposed mitigation measures should not be confined to meeting the standards but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>Furthermore, although health risks associated with PM2.5 are higher than those associated with PM10, both fractions are considered non-threshold pollutants and identified by IARC (2013) as causes of cancer.</p> <p><b>Reference:</b> [1] International Agency for Research on Cancer (IARC). 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. Lyon: International Agency for Research on Cancer.</p>	<p>3. Provide a discussion of the significance of predicted exceedances of health- based standards.</p> <p>4. Identify additional mitigation measures to reduce concentrations of non- threshold air contaminants associated with the project.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the <a href="#">2025 CAAQS Management Levels</a> to develop mitigation measures that reduce project contributions of non-threshold pollutants (e.g., PM2.5, NO2).</p>	<p>exceed the Project AQ Criteria. This is considered an appropriate approach as PM2.5 is not exceeding an acceptable risk level for PM 2.5. In the case of PM10, this constituent was included in the secondary air quality screening as it exceeded its Project AQ Criteria.</p> <p>2. Denison agrees to include PM10 and PM2.5 as part of the air quality monitoring plan during construction and determine based on adaptive management if monitoring during future phases is required.</p> <p>3. PM10 and PM2.5 are associated with adverse human health effects because these particulate sizes can be inhaled and entrained within the respiratory system (WHO, 2006). Although there are a broad number of health effects associated with the inhalation of PM10 and PM2.5, the effects target primarily the respiratory and cardiovascular systems. Epidemiological studies indicate that the adverse effects of PM are evident for both short-term and long-term exposures of PM, with the risk for adverse health effects increasing with increased exposure duration (WHO, 2006). As such, the exceedances of PM10 health-based standards, as noted in Appendix 10-A, Section 3.2.1.3.2.2, is the potential for unacceptable adverse effects associated with respiratory symptoms such as coughing or difficulty breathing, or asthma symptoms and chronic bronchitis, with effects being reversible and subsiding after exposure.</p> <p>4. The results of the air quality assessment and ERA do not warrant additional mitigation measures for air quality. However, Denison agrees to using the 2025 CAAQCs in future mitigation and follow-up plans.</p> <p>References: World Health Organization (WHO). 2006. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide Global update 2005, Summary of risk assessment.</p>	construction will be added to Section 6.1.8 and Section 16 in the EIS.
IR-192	CNSC	Human Health with respect to radiation exposure	Appendix 10-A (ERA), Section 3.1.1.2, including Tables 3-1 and 3-2	<p><b>Context:</b> Section 3.1.1.2 in Appendix 10-A (ERA) provides the method of how select constituents including cadmium, chromium, selenium and lead-210 were determined. This section does not mention how the other constituents as listed in Tables 3-1 and 3-2 are determined.</p> <p>The values for Th-230 and U-238 in Table 3-1 are unexpected. Typically, these values should be at equilibrium.</p> <p><b>Rationale:</b> The technical basis for the selection of constituents of concern is required as part of the environmental and human health risk assessments.</p>	<p>1. Provide the methodology of how all listed constituents are determined.</p> <p>2. Provide the rationale as to why Th-230 and U-238 are not in equilibrium.</p>	<p>1. In the first paragraph of Section 3.1.1.2 of the ERA (Appendix 10-A), the text explains that for most constituents the effluent values were based on the results from lab tests conducted by Denison, with a safety factor of three included. Cadmium, chromium, and selenium were singled out because the effluent quality for those constituents were determined based on the back-calculated concentration from a water quality guideline. As stated in the response to IR-117, the ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>2. The effluent quality for Th-230 and U-238 were based on lab results from Denison with a safety factor of 3. U-238 and Th-230 are not expected to be in secular equilibrium in the effluent as they have come out of a chemical process in which uranium and thorium partition differently. The effluent quality will continue to be refined through the licensing process based on continued testing conducted by Denison. No changes to the EIS.</p>	Per the IR response, a minor edit, same as response to IR-117. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".
IR-193	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.1.2  Section 8.2.4.2.3	<p><b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>1. Provide acute and chronic water quality thresholds for all required COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>1. The application of acute water quality thresholds will be added to Section 8.2.4.2.3 and will be used to refine the effluent quality during the licensing phase (see the response to IR 114 for the updated mixing zone model results). The effluent presented in Table 8.2-9 is based on maximum effluent concentrations; however, Denison is committed to ensuring all effluent released will be below MDMER limits as well as short-term CCME guidelines for protection of aquatic life.</p> <p>2. Water quality thresholds have been applied appropriately in the draft EIS and fit for purpose. Water quality thresholds in Section 3.1.1.2 of the ERA (Appendix 10-A) were based on site-specific hardness of 5.26 mg/L (95th percentile of LA-5 and LA-6). This was to provide a conservative screening for COPCs to be carried forward for further quantitative assessment in the ERA. Water quality thresholds in Section 8.2.4.2.3 are based on Project induced hardness which is assumed to be 250 mg/L. This results in known discrepancies for some water quality parameters that are hardness induced such as cadmium, copper, zinc, and sulphate.</p>	Per the response the application of acute water quality thresholds will be added to Section 8.2.4.2.3 and where applicable are presented in Attachment: IR-114.
IR-194	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li></ol>	<p>1. As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</p> <p>2. Provide the information on predicted maximum receiving</p>	<p>1. See response to IR-114. No revisions to Appendix 10-A, ERA are needed based on the response.</p> <p>2. See response to IR-114 for the predicted maximum receiving environment surface water concentrations for constituents regulated under Schedule 4 of MDMER. As indicated in Section 3.1.1 of the ERA in Appendix 10-A a long list of constituents was initially identified for</p>	No EIS updates are anticipated to address this IR.

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				<p>2. Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</p> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided.</p>	<p>environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</p> <p>3. Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</p> <p>4. Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment.</p>	<p>consideration in the ERA based on they are known to be present in treated effluent, have existing water quality guidelines or were identified in MDMER (with the exception of cyanide). The focus of the MDMER constituents were those regulated under Schedule 4. Denison will monitor for all MDMER constituents with required monitoring in the environment. This will be included as part of Denison's Effluent and Emissions Plan to support licensing.</p> <p>3. As indicated in Section 3.1.1.1 of the ERA in Appendix 10-A the long list of constituents was reduced further based on potential for exceedance of a water quality guideline (for both protection of human health and aquatic life). Any MDMER constituent that was identified as exceeding a water quality guideline was considered a COPC and assessed further in the ERA (see Table 3-1 in the ERA). For example, effluent quality for arsenic, copper, and zinc which are all Schedule 4 constituent were identified as COPCs in the ERA based on exceeding a water quality guideline.</p> <p>4. The ERA followed the guidance in CSA N288.6-22 which does not require COPCs with elevated baseline concentrations to be considered COPCs for further quantitative assessment in the ERA. Clause 6.2.5.9 indicates that constituents with naturally elevated concentrations should be excluded from further consideration as a COPC. As indicated in Section 8.2.3.3 of the EIS constituents in baseline water quality that exceeded water quality guidelines included aluminum, and occasional exceedances for cadmium, iron, and lead. All of these constituents were considered in the ERA screening; however, were not identified for further assessment (other than cadmium) since based on a conservative screening of effluent quality water quality guidelines would not be exceeded. Section 8.4.3.2.3 of the EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines. Section 3.1.2.3 of the ERA in Appendix 10-A provides the predicted maximum sediment quality in Whitefish Lake for a list of constituents. These concentrations included background concentrations and are screened against sediment quality guidelines. The only constituents that exceed sediment quality guidelines are molybdenum and selenium; however, other COPCs are assessed further in the ERA (see Table 3-14 in the ERA in Appendix 10-A) even though sediment quality guidelines are not anticipated to be exceeded.</p>	
IR-195	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>	<p>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</p> <p>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</p> <p>3. Update ERA figures and conclusions as needed.</p>	<p>1. Per the draft EIS effluent is conservatively assumed to be discharged to the Whitefish Lake Middle during the operations (15 years) and decommissioning (5 years) phases at the same constant discharge rate of 36.5 m<sup>3</sup>/hr (10.1 L/s) with the same stable effluent quality as shown in Table 3-2. Therefore, the modelled maximum COPC concentrations in water are the same for operations and decommissioning phases (which is considered conservative), the same peak concentrations appear annually due to the variation of the monthly local inflow. Since COPCs are accumulated in sediment, the modelled maximum COPC concentrations in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning in Figure 3-3.</p> <p>2. The predicted effluent quality during the Project decommissioning phase is expected to be the same as those during the operations. Effluent was set to be released during operations but not during the decommissioning phase in the current model.</p> <p>3. The model has been updated to include effluent discharge during the decommissioning phase, and the ERA figures and result tables will be updated in the next submission accordingly. <b>See attachment IR-195 for the updated Table 3-3 and Figure 3-2.</b></p>	Per the IR response, edits will be made to Table 3-3 and Figure 3-2 in Appendix 10-A. These edits are provided in Attachment IR-195.
IR-196	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.3	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>	<p>1. Provide further information and justification for the selection of less stringent thresholds.</p> <p>2. Update the ERA as needed.</p>	<p>1. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the selection of the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.</p> <p>2. The guidelines for copper, lead, and vanadium from Burnett-Seidel and Liber (2013) were inadvertently excluded from Table 3-6 in Appendix 10-A which results in changes to selected screening values for copper (9.1 mg/kg dw), lead (16.3 mg/kg dw), and vanadium (35.1 mg/kg dw). The predicted sediment quality for copper, lead, and vanadium are still below the sediment quality guidelines; therefore, no changes to the table are needed other than changes to the sediment quality guidelines identified above. The updated Table 3-6 is provided in Attachment IR-196 – red text indicates a change from the existing table in the draft EIS, Appendix 10-A.</p> <p><u>References:</u></p> <p>Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.</p> <p>Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.</p>	Per the IR response edits to Appendix 10-A, Table 3-6, as shown in Attachment IR-196, will be made in the final EIS.
IR-197	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<p><b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.</p> <p><b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that</p>	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in	Per the IR response, the following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from

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				are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.		the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible." References: Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I	the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."
IR-198	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.  Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.  <b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.	The response to IR-198 is provided in Attachment IR-198.	No updates to the draft EIS are needed based on this IR response.
IR-199	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.  <b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.	1. Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.  2. Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).	1. Model calibrated concentration inputs of COPCs were preferable over measured baseline concentrations because of the interrelation of metals and radionuclides between water and sediment. In all cases the measured baseline concentrations were used to verify that the modelled relationship between water and sediment for each constituent was considered valid. The geometric mean values of the measured baseline data were preferentially used as the baseline inputs for COPCs that had a good amount of measured data over the detection limit, which is the case for most of the COPCs in Figure 3-2 (where the modelled values overlap with the measured geometric mean values in the plots). In the case of COPCs for which most or all measured values in water were under the detection limit (i.e., 140 out of 142 measured selenium concentrations are below its detection limit), but their sediment concentration measurements were over the detection limit, the baseline water concentration was calculated from the geometric mean of the sediment measurements using the regional water-to-sediment partitioning coefficients (Kd).  2. The "poor" agreement between calibrated and measured concentrations for selenium, uranium and lead-210 is the result of more than 95% of the measured concentrations in water being reported as less then the detection limit for selenium (140 out of 142), uranium (141 out of 142) and lead-210 (136 out of 142). It's unlikely that these three COPCs are under-predicted in water.  Poor agreement between modelled and measured concentrations in sediment for arsenic and radium-226 may be a result of only one sampling campaign being available for sediment. The modelled sediment concentrations can be refined in the future when more measured sediment data are available as the Project progresses. Even though arsenic and radium-226 are conservatively over-predicted in sediment, no significant adverse effect on either aquatic or terrestrial populations or communities are predicted during the Project phases or during the future centuries.	No updates to the draft EIS are needed based on this IR response.



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IR-200	HC	Indigenous Peoples' health / Socio-economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)	<p>Indigenous consultation should be included in the Country Foods analysis.</p> <p><b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following</i>: “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p>1. Evaluate the suitability of using the 2017 EFRN survey results and consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.</p> <p>2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>	The 2017 report was authored by ERFN and as such there is no need for Denison to ask ERFN to validate their own report.	No updates to the draft EIS are needed based on this IR response.
IR-201	ECCC	Aquatic species	Appendix 10-A (ERA), Section 5.0	<p><b>Context:</b> For the ERA methodology the Proponent followed CSA N288.6-12 for the assessment of risk to aquatic biota from radionuclide and non-radionuclide COPCs. This is the 2012 version, and a more recent 2022 version was publicly released.</p> <p><b>Rationale:</b> The Proponent should review the most up-to-date version of the standard to ensure no changes to the methodology of the COPC exposure assessment are required for the ERA.</p>	Update the COPC exposure assessment methodology in the ERA using the most recent CSA N288.6-22 standard, as needed.	Denison confirms that the updated CSA N288.6-22 was reviewed and that no changes to the ERA methodology are required. Denison confirms that the ERA is also compliant with CSA N288.6-22. The EIS and ERA (Appendix 10-A) will be updated to reference the most recent 2022 version of the standard, CSA N288.6-22.	Per the IR response all references to N288.6-12 will be replaced with N288.6-22 in the EIS and Appendix 10-A.
IR-202	CNSC	QA/QC	Appendix 10-A (ERA), Section 6.0-Quality Assurance	<p><b>Context:</b> This section provides only Quality Assurance (QA) of the ERA, including planning and preparation of the ERA.</p> <p><b>Rational:</b> The Quality Control (QC) aspects are not included. Both QA and QC aspects provide confidence that ERA results are defensible and fit for use in decision-making.</p> <p>The N288.6 (Clause 10.2) requires that “Appropriate QA/QC requirements shall exist for all aspects of the ERA and should be specified prior to conducting the ERA”.</p>	Please include appropriate QC aspects, as per a Clause 10.2 of the N288.6.	<p>The ERA (Appendix 10-A) was completed in alignment with CSA N288.6-22 including the specific QA/QC requirements in Clause 10.2 and 10.3 of the standard. The ERA following the Ecometrix Quality Management System for review and verification ensuring that modelling results were correct and accurate. The ERA report as well went through a thorough review and verification by senior technical staff. The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered fit for use in the ERA.</p> <p>Another layer of review included Denison's review of the ERA. Final acceptance and submission of the ERA with the EIS package indicated Denison's acceptance of the final product. Section 6.1 of the ERA in Appendix 10-A will be updated to include some additional discussion of QA/QC activities. Specifically, the following will be added. "The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements</p> <p>Denison provides inputs to the ERA based on metallurgical test work that has been conducted under the QA/QC protocols of the Saskatchewan Research Council. The metallurgical test plan and test results are validated by a third-party Qualified Person. Once Denison provides the input values to be utilized in the ERA, Ecometrix summarises the data and provides the summary to Denison for acceptance by a Professional Engineer or a Professional Geologist prior to running the ERA model.</p>	<p>Section 6.1 pf Appendix 10-A will be updated to include the following statement:</p> <p>"The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements."</p>
IR-203	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<p><b>Context:</b> This section of the ERA states “If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p>	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the maximum upper bound discharge rate scenario.	<p>As part of the sensitivity analysis, if treated effluent is released at the maximum upper bound discharge rate, the modelled vanadium concentration in sediment is expected to be below the Severe Effect Level (SEL) of 160 mg/kg but exceed the Lowest Effect Level (LEL) of 35.2 mg/kg in Whitefish Lake Middle/South. The SEL and LEL values are defined by Thompson et al. (2005).</p> <p>The cadmium concentration in Whitefish Lake Middle/South is expected to be over the CCME sediment quality guideline of 0.6 mg/kg dw for the maximum upper bound discharge rate scenario.</p>	Per the IR response, Section 6.2 of Appendix 10-A will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "

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				<b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.		The plots in Figure 6-2 are correct. The statement in Section 6.2 will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "	
IR-204	CNSC	Human health with respect to hazardous contaminants	Appendix 10-A (ERA), 7.1.1, Non-radiological Human Health Risk Assessment	<b>Context:</b> In the human health risk assessment of the non-radiological COPCs, it was determined that the project incremental HQ was predicted to remain below 0.2 for all non-carcinogens and all pathways during all phases of the project, except for selenium for the fisher/trapper at Russell Lake from the fish ingestion pathway.  <b>Rationale:</b> Given that the fisher/trapper receptor will likely be exposed to higher concentrations of selenium from the consumption of fish at Russell Lake, there is an elevated risk of selenosis in exposed individuals. This potential for selenosis would be further exacerbated in individuals who consume fish taken from other lakes closer to the mining operation. There is, however, no discussion of mitigation of these risks to exposed individuals.	Please provide a discussion of measures that could be applied to mitigate the risk of selenosis in exposed individuals who consume fish from Russell Lake and other waterbodies closer to the mining operation.  <b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following: <ul style="list-style-type: none"><li>Selenium abatement technologies may be considered to eliminate or reduce selenium in effluent entering the lake system.</li><li>If HQs continue to exceed 0.2, then it may be necessary to post fish consumption advisories, in consultation with the Medical Officer of Health for the jurisdiction where the project is located.</li></ul>	Health Canada (2017) conducted a screening assessment of selenium and its compounds under the Canadian Environmental Protection Act. Selenium is an essential element for humans; however, there may be potential human health risks at elevated exposure levels. Selenosis (also known as chronic selenium toxicity), is considered by Health Canada as the critical health effect for selenium. The symptoms of selenosis may include: intestinal upset, hair loss, nail loss, changes in nail morphology, excessive decay and discolouration of teeth, garlic odour in breath, nervous system abnormalities, and fatigue. The BC MOE (2014) identified 7.3 mg/kg dw of selenium in fish as an appropriate limit for subsistence fishing. This would equate to 1.8 mg/kg fw, assuming a dry weight to fresh weight ratio of 0.25 from CSA N288.1-20 for fish. The maximum selenium concentration in Whitefish Lake (LA-5) is predicted to be 1.57 mg/kg fw for northern pike and 2.29 mg/kg fw for white sucker (see Table B.5 in Appendix 10-A). The maximum predicted selenium concentrations in McGown Lake for northern pike and white sucker are 1.02 mg/kg fw and 1.39 mg/kg fw, respectively. The maximum predicted selenium concentrations in Russell Lake for northern pike and white sucker are 0.81 mg/kg fw and 1.06 mg/kg fw, respectively. As such, based on current predictions in lakes where fish consumption is assumed to occur (McGowan Lake and Russell Lake), fish tissue concentrations for selenium are expected to be below the BC MOE limit, indicating people eating fish from these lakes would likely be protected from selenosis.  Any further selenium abatement technologies will be considered through the BATEA process during licensing.  <b>References:</b> British Columbia Ministry of Environment, Beatty JM, Russo GA. 2014. Ambient Water Quality Guidelines for Selenium. Technical Report Update. Water Protection and Sustainability Branch. Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment. 270 pp Health Canada. 2017. Screening Assessment: Selenium and its compounds. December. <a href="https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71">https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71</a>	No updates to the draft EIS are needed based on this IR response.
IR-205	CNSC	Geology and Groundwater	Section 7, appendix H	<b>Context:</b> In this appendix the analytical concentration of various groundwater samples taken from monitoring wells is reported.  <b>Rationale:</b> There is one sample labeled as “Tracer Tank” with no definition available in the current report. It is difficult to judge whether the results presented are relevant to the EIS and how it may impact the findings therein.	Please clarify the definition of “tracer tank”.	The 'Tracer Tank' label referred to the predetermined KCl tracer concentration of 15% (75,000 to 85,000 ppm Cl and K) utilized for injection as part of the 2021 Tracer Test. This clarification will be added to Appendix 7-A, Appendix H.	Per the IR response the clarification will be made as indicated in Appendix 7-A, Appendix H.
IR-206	ISRD	Current use of lands and resources for traditional purposes	Section 11 Section 12 Section 15 Section 16	<b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.  <b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEEA 2012.	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find solutions or continue discussions with the potentially impacted Indigenous Nations and communities.	Refer to response to IR-28.	Refer to IR-28.
IR-207	CNSC	Current use of lands and resources for traditional purposes	Section 11, Perceived Risks to Lands and Resources	<b>Context:</b> The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are “ <i>perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well-being</i> ” (ERFN and SVS 2022a).” (p. 11-11)  Resource harvesters may experience Project-related disturbances and, depending on how these changes are perceived, it may cause some resource harvesters to avoid the Project Area.  Reductions in harvests may occur based on fear or uncertainty about the ongoing quality of country foods. For example, “ <i>People stopped picking berries in this area when Key Lake mine was established because of concerns about health impacts</i> ” (ERFN and SVS 2022b).  <b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEEA 2012). For the mitigation measures intended to address the effects of changes to the	How does Denison plan to work directly with Indigenous Nations and communities who currently use the potentially impacted areas, including the RSA, to mitigate and monitor the perceived risks and/changes to the RSA?  Has Denison had discussions with the potential impacted Indigenous Nations and communities on how fear and avoidance behaviors and related impacts on traditional land use will be mitigated, especially within the RSA?  Additional information is needed to determine if Denison has engaged directly with the Indigenous Nations and communities to develop potential mitigation measures to address fear and avoidance impacts, such as a community monitoring program, which could help to reduce the perceived risk to lands and resource use through education, collaboration, and long-term monitoring with Indigenous Nations, in order to build trust.  <b>Suggestions for mitigation and follow-up measures:</b> It is recommended that Denison consider engaging with potentially impacted Indigenous Nations and communities on the collaborative development and implementation of a monitoring program to help address concerns about potential impacts on lands and resources as a result of the	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, and in part due to their continued efforts to engage meaningfully with Indigenous communities relative to the Project which support continued relationship and trust building. Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time. Denison expects that important country foods harvested for food and cultural purposes (i.e. moose, fish, etc.), surface water quality, and other areas of interest will form part of this monitoring program. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.  The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are	No updates to the draft EIS are needed based on this IR response.

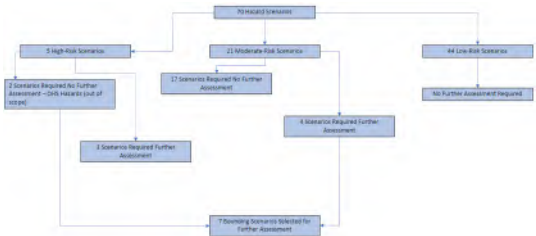


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				environment for Indigenous peoples, the proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.”  These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.	project. The program(s) could help to monitor changes over time related the potential perceived risk of contamination of the land from Project activities and subsequent effects on the quality of fish, vegetation, and wildlife resources, which in turn could affect the safety of traditional foods and human health, and impacts on culture practices, and overall community well-being that travel to region yearly.	currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).	
IR-208	CNSC	Indigenous physical and cultural heritage	Tables 11.1-3, 11.1-4 and 11.1-5  Section 11.1.3.2.6	<b>Context:</b> Black bear is listed as a species hunted by several Indigenous nations, including Pinehouse residents. CNSC participated in an in-person engagement with Pinehouse residents in October 2022 and bears eating waste was identified as a concern for hunting and consumption.  <b>Rationale:</b> Perceived risk of eating animals that are contaminated by hazardous or radiological wastes could deter community members from harvesting animals that are normally part of their traditional diet. Fencing for waste was specified as a deterrent for human trespassers, not animals.	Please specify measures that Denison will take to ensure bears and other animals do not scavenge from waste facilities.	Denison has proposed a number of Project design measures and wildlife-specific mitigation measures that will limit wildlife scavenging activities. Project design measures include waste characterization and segregation, and fencing the domestic and industrial landfills (refer to Section 2.8 Project Design Features and 9.3.5.1 Project Design Measures). Importantly, Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the landfill generating odours. For the wildlife-specific mitigation measures, refer to Section 9.3.5.2.5 Wildlife Deterrence and Prevention of Wildlife Entrapment and Section 9.3.5.2.8 Waste and Hazardous Materials Management.	No updates to the draft EIS are needed based on this IR response.
IR-209	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).  <b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)	Please provide detailed proposed mitigation measure for KML’s concerns related to loss of cultural knowledge and language should they work for Denison.	Denison respects the concern raised by KML regarding language and culture related to working at an industrial operation. Denison and KML will be working on specific items of interest to mitigate these types of concerns through private contractual arrangements, which may include specific mitigation and accommodation measures in this respect.  Mitigation measures associated with potential effects to cultural continuity (including knowledge transfer and language) are described in Section 12.1.5 and include: - working with Indigenous COIs to understand culturally important periods relative to harvest times and cultural camps to facilitate Indigenous employees taking time off to participate in such activities; - implementation of Denison's Indigenous Peoples Policy and advancement of reconciliation - Using a commuter rotation system has also shown to be effective in allowing Indigenous employees continued opportunities to spend time on the land, and important factor in the transmission of knowledge and language (see Section 11 for a description of potential effects to land use).  In discussions with Indigenous Communities of Interest since the filing of the draft EIS, it has become apparent that Denison should add additional commitment / mitigation measure in relation to this area of interest, as follows: - Encouragement to speak languages of choice while at site, except during safety sensitive situations	Section 12.1.5 of the final EIS will be updated to include the additional commitment / mitigation measure in relation to culture and language, as follows:  - Encouragement to speak languages of choice while at site, except during safety sensitive situations.
IR-210	CNSC	Current use of lands and resources for traditional purposes	Section 12.1.4.2.2, Potential Effect 2: Change in Traditional Diet, Perceived Suitability of Country Foods (p. 12-26)	<b>Context:</b> The EIS states: “Project activities could change the perceived suitability of country foods. An ecological risk assessment (ERA) was conducted to consider both radiological and toxicological risks to ecological receptors such as terrestrial and aquatic invertebrates, terrestrial and aquatic vegetation, fish, and terrestrial and aquatic mammals and birds. Results for the radiological assessment predicted no exceedances of the radiation dose benchmark for the ecological receptors. For non-radiological COPCs, no exceedances were predicted except for selenium in fish from Russell Lake, based on a conservative dietary assumption for one resource user. The traditional foods diet for the fisher/trapper is conservative as it assumes that their annual fish consumption (183 kg of fish per year) would be obtained from Russell Lake, meaning the exceedance of the benchmark for selenium from fish would only occur if fish were only sourced from this one lake. This one exceedance could potentially change the perceived safety of country foods for community members and make country foods a less desirable part of a traditional diet.  <u>Experience from other uranium operations in northern Saskatchewan suggests that resource use will continue despite the potential selenium exceedance. An examination of members of the Hatchet Lake Denesutliné First Nation who live in Wollaston Lake near the Rabbit Lake operation found that over years of being active on the landscape both with and without the presence of the uranium industry, members had developed their own culturally appropriate practice of risk assessment and management based on their relationship with the land. Hatchet Lake Denesutliné First Nation members appear to be more concerned with the direct effects of uranium mining on the local environment and less concerned about uranium mining’s effects on their health through consumption of plants and animals. This is likely due to their high level of confidence in recognizing affected plants and wildlife and avoiding them (Elias et al. 1997).</u>  The usage patterns of the ERFN Trapper have similarly allowed for continued use and access to areas proximal to other uranium operations. The ERFN Trapper had a positive relationship with other uranium operations in the ILRU LSA. He also continued to trap (i.e., used his trapline in Fur Block N-18), fish, and opportunistically pick berries, and consumed those resources during operations (KPI Program 2021). Good relationships between Denison and a new trapper who eventually	Given concerns with psycho-social impacts and the influence of perception discussed by ERFN earlier on in the EIS, does Denison have information on the perspectives from Indigenous Nations and communities to validate this conclusion is applicable?	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, combined with the fact that ERFN, KML, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.  See also response to IR-212.	No updates to the draft EIS are needed based on this IR response.

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				takes over the trapline from the ERFN Trapper would promote continued use.” (p. 12-26)  <b>Rationale:</b> The underlined reference suggests that negative perceptions may not prevent traditional resource users from continuing to consume, due to adaptation to potential risks in the environment.			
IR-211	CNSC	Accidents and Malfunctions	Section 14.6.1, Bounding Scenario 1, Vehicle Accident and Aquatic Release of Radioactivity	<b>Context:</b> Scenario 1 describes a spill of uranium concentrate into the lake. It’s not clear how the ecological risk assessment was performed. It is stated that sediment concentrations in post-remediation conditions are expected to exceed the benthic invertebrate benchmark and that these results indicate that a spill of uranium concentrate could potentially affect benthic invertebrate populations following a spill, but the spatial extent would be limited. For water, it is stated that when evaluating the potential effect, a comparison was made between the results of the estimated short-term water quality 1,892 µg/L (1.892 mg/kg) and the guideline (33 µg/L). This indicates that there may be some aquatic species that could be affected, but the effects are expected to be transient as the water concentration quickly drops to a long-term level of 0.19 µg/L. However, when looking at dose to other receptors, the results of the ecological risk assessment indicated short-term ingestion of contaminated water resulting from an accident would not result in potential risks to grouse, vole, or deer, however rationale for how these receptors were chosen is not provided.  <b>Rationale:</b> It’s not clear from the EIS, why the receptors grouse, vole, and deer were chosen to evaluate ecological effects from a potential spill, and why they differ from receptors in the ERA. It is also not clear if the pathway from sediment ingestion/contact was considered for semi-aquatic receptors as they could be exposed to the increased concentrations post-spill. It is also not clear if SARA species exposure to sediment and water post-spill was considered.	Please clarify why grouse, vole, and deer were chosen as receptors for the ecological risk assessment performed for accidents and malfunctions scenario 1 and clarify if the sediment pathway to receptors post-spill was considered, as well as if SARA species were considered.	The indicated species were utilized to ensure representation of a variety of both aquatic and terrestrial species that could be affected by the release scenario to ensure relevant potential contaminant pathways were considered in the assessment, understanding however that exposure of local aquatic species was the most direct exposure pathway since Bounding Scenario 1 was a release to the aquatic environment.  To clarify, the sediment pathway to receptors post-release was consider in the assessment.  Also to clarify, specific SAR were not considered in the assessment; however as noted, representative aquatic and terrestrial receptors were considered that include the exposure pathways to which SAR species would also be subject and therefore the assessment and its results can be more broadly applied.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-212	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.  <b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).  The commitment regarding monitoring and follow-up activities appears limited to “ <i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i> ” (p. 14).  <b>Rationale:</b> Country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the predictions.	1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.  2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and the direct involvement of communities in monitoring, surveillance, and risk communication activities.	We refer the reviewer to the following sections of the draft EIS, which are more applicable as it concerns engagement activities within the context of information sharing related to follow-up and monitoring compared to the sections listed in the <i>Reference to EIS, appendices, or supporting documentation</i> column of the IR: <ul style="list-style-type: none"><li>- Draft EIS Section 1 Project Introduction and Overview. Refer to Section 1.7.5 Licensing and Permitting for text describing that the Project is proceeding through sequential EA and licensing process. While a preview of the permits, approvals, and licences required after the EA process is complete is important to consider and provides valuable context, detailed information needed to support licensing and permitting has not be included in the EIS.</li><li>- Draft EIS Section 2 Project Description. Section 2.9 outlines the timing and framework for the Project’s management system.</li><li>- Draft EIS Section 4 Engagement. Section 4.2 outlines Denison’s engagement approach. Section 4.7 outlines future engagement activities.</li><li>- Section 11 Land and Resource Use provides a fulsome assessment of both Indigenous (Section 11.1) and other (Section 11.2) land and resource use. These assessments include the Key Indicator of <i>perceived suitability of lands and resources therein</i>.</li></ul> 1. The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. Engagement on licensing requirements, such as the environmental monitoring program and the associated surface water quality and monitoring regime will occur later in 2023 and into 2024. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).  Denison’s plans are in line with Health Canada’s recommendations to go beyond passive dissemination of information and the intent is to solicit involvement of the Interested Parties during follow-up program development and subsequently execution.  Denison is committed to sharing information with Indigenous Communities of Interest (COIs) in a mutually agreed-upon fashion. Overall, the approach that will be utilized with respect to Indigenous community engagement will be aligned with Denison’s Indigenous Peoples Policy. Denison’s Indigenous Peoples Policy commits the company to respecting Indigenous knowledge and values regarding environmental stewardship and Indigenous peoples’ connection to the land. The relevant monitoring plans for the species/resources that support a traditional diet will reflect and incorporate these values, and will be reflective of the Indigenous COIs priorities. The monitoring plans when drafted will include more detail about	No updates to the draft EIS are needed based on this IR response.

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						<p>communication methods and their effectiveness would be assessed through ongoing engagement with communities.</p> <p>Denison will solicit input and involvement in program development and execution from Indigenous COIs. Environmental monitoring results will be presented in an accessible way including a focus on country food if relevant to Indigenous COIs. As the COIs with reserves and residential communities most proximal to the Project, Denison will be collaborating with English River First Nation and Kineepik Metis Local on a community-specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that surface water management and monitoring will form part of this information-sharing process. It is expected that fish species that will be monitored will be those species that have been identified as important by ERFN in their 2017 Country Foods Study, as well as using the KML Land and Occupancy Map and associated information. These programs may be adjusted based on community feedback throughout the life of the Project.</p> <p>Regulators will be involved with setting specific requirements for follow-up and monitoring, as well as reporting, through licence conditions (CNSC) and provincial approvals. A number of monitoring and reporting requirements will be generated through the completion of the environmental assessment process. Denison and its lifecycle regulators will be in regular communication throughout the life of the Project as part of routine reporting, site inspections, licence and permit renewals. Denison is committed to ongoing engagement with regulators and recognizes that this will include information sharing related to follow-up and monitoring results and any needed adaptive management plans.</p> <p>It is also noted for further reference that there are existing, non-Denison monitoring programs such as the CNSC's Independent Environmental Monitoring Program (<a href="https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm">https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm</a>), and the Eastern Athabasca Regional Monitoring Program (<a href="http://www.earmp.ca/">www.earmp.ca/</a>). Results from these programs provide relevant information and can complement Denison's Project-specific monitoring program. One forum for discussion of monitoring results is the Northern Saskatchewan Environmental Quality Committee (<a href="https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee">https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee</a>).</p> <p>2. The relevant focus for country food intake are changes in COPC concentrations. These are integrated into the CSA N288.6 framework with ongoing updates to the ERA with new monitoring results. There are very few parameters with intake guidelines where advisories would be implemented. Adaptive management triggers and conceptual triggers will be developed as the Project advances.</p>	
IR-213	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A	<p><b>Context:</b> The proponent states that the assessment of accidents and malfunctions began with the initial identification of hazard scenarios. Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components.</p> <p>The hazard identification was conducted to identify a comprehensive list of potential project-related accident and malfunction scenarios associated with the key project components and activities with further details provided in Appendix 14-A. The initial hazards were then screened qualitatively based on likelihood and consequence to determine overall risk level using a risk matrix approach. Bounding scenarios were then selected from this initial list of hazard scenarios.</p> <p>The results of numerical analyses (RESPEC, 2021) of detailed strip model suggest that the deformation imposed on the cemented steel casing from downward movement of the rock mass may exceed the assumed casing-strain yield limits and the failure limit locally after extracting the uranium ore. However, this potential hazard is not identified in the hazard identification.</p> <p><b>Rationale:</b> Exceedance of steel casing yield limits and failure limit would either compromise the steel casing integrity or damage the steel casing and result in the leakage of injected solution, which could impact on mine operation and contaminate the surrounding groundwater.</p>	Please include the hazard of steel casing yield or damage in the table of hazard identification evaluation and conduct an initial risk screening and further detailed assessment as required.	<p>Table 3-2 of Appendix A in the A&amp;M technical supporting document (Appendix 14-A) includes a hazard scenario "piping failure in the well field" that was characterized as a "low" likelihood scenario (Score 2) with "moderate" consequence (score 3) for an overall risk ranking of "low". This scenario is thought to generally be consistent with and cover off the scenario envisioned by the IR; nevertheless, and as recommended a new hazard scenario will be added to the hazard identification evaluation to specifically reflect the FIRT review comment.</p> <p>The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as Scenario 2.4 Well Casing Yield and/or Damage (refer to Attachment: IR-213 for the updated table). For reference, and based on hazard screening analysis, this scenario is evaluated to be a low likelihood scenario (2) with moderate consequence (score 3) for an overall risk ranking of low. The scenario is viewed as a low likelihood scenario due to the proposed multilayer design of the injection / recovery well design. Further, and contrary to the comment, we do not believe the RESPEC (2021) analysis shows an increased likelihood of subsidence that could be an initiating event to a pipe casing failure; rather, anything more than very minor ground subsidence in the well field is interpreted as a very low probability event. Potential subsidence and the analysis thereof is discussed in more detail in response to IR-21 and the reviewer is referred to that response for further information.</p> <p>The scenario is viewed as one having moderate consequence. Despite the fact the scenario would result in a temporary loss of control of mining solution associated with one or a limited number of injection/recovery wells the volume of solution would be limited to the volume of solution in the pipe(s) and the release would occur within the freeze wall where it would be contained limiting the spatial extent of effects and increasing the likelihood of success of recovery.</p> <p>Overall, and based on the screening methodology used for the hazard identification / screening process this scenario has been ranked as having a moderate level of risk and as a result would not be passed on for more detailed analyses in the accidents and malfunctions analysis.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>With respect to Appendix 14-A the following is noted. The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as shown in Attachment: IR-213. In addition, editorial changes to the report reflecting the increase of one additional hazard scenario being evaluated will be made (Section 4.0; " ... a total of 69 70 hazard scenarios were identified and evaluated.") and indicating an increase of one further scenario being characterized as having low overall risk (Section 4.0; "The balance of the scenarios evaluated, 41 42, were characterized as low-risk scenarios, ...").</p> <p>With respect to the EIS, editorial changes will be made in Section 14.5.5 to reflect the editorial changes highlighted above.</p>
IR-214	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A, section 3.2.3	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <p>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is</p>	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.	<p>The clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency.</p> <p>For reference, the proposed revisions to Appendix 14-A are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for transparency. Comments include rationale for likelihood or consequence scoring where requested by the IR.</p> <p>It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>As noted, the clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. The proposed revisions are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for clarity to support IR response review.</p>



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				<p>denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</p> <p>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</p> <p>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</p> <p>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</p> <p>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</p> <p>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</p> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>			<p>Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency. Specifically, the revisions identified in the tables will be reflected in changes to the text of Section 14.5.5 of the EIS describing the outcome of the screening process (including revision to Figure 14.5-3). Section 14.5.5 of the EIS will read as follows:</p> <p>“A summary outlining the results of the initial risk screening of accident and malfunction scenarios is provided in this subsection and summarized in Figure 14.5 3.</p> <p>Three of the hazard scenarios characterized as high risk were recommended for further assessment. An additional four moderate/ALARP-moderate scenarios were identified as requiring further detailed assessment for more accurate characterization of risk.</p> <p>Twenty-one of the scenarios evaluated were characterized as moderate-risk scenarios. Generally, the moderate-risk scenarios were deemed to represent a tolerable level of risk in consideration of proposed safeguards and design features that reduce the risk level to ALARP. As previously mentioned, four moderate/ALARP-moderate scenarios require additional detailed assessment for more accurate characterization of risk. The four moderate-risk scenarios that are subsequently assessed in more detail are associated with a contaminant release to the environment, which may have potential effects that are more far reaching than can adequately be assessed by the screening assessment. As such, a more quantitative evaluation was deemed appropriate.</p> <p>The remaining scenarios evaluated (44) were characterized as low-risk scenarios based on low likelihood of occurrence and/or low consequence in consideration of planned existing safeguards and design features. Low-risk scenarios were not carried forward for more detailed analysis as they were considered to be adequately characterized by the screening process.</p>  <p>Figure 14.5-3: Summary – Initial Screening of Accident and Malfunction Scenarios”</p>
IR-215	CNSC	Human health with respect to hazardous contaminants	Section 14.6	<p><b>Context:</b> One of the potential risks of a uranium mine and mill is a spill of untreated effluent.</p> <p><b>Rationale:</b> In the EIS, it doesn't appear that the scenario of a spill of untreated effluent to the environment has been considered.</p> <p>A failure of the piping containing the untreated effluent could result in an uncontrolled release to the environment and could affect the groundwater, soil quality, and terrestrial biota.</p>	Please evaluate and provide the results for a bounding scenario of a spill of untreated effluent or provide justification for its exclusion.	The scenario envisioned in the IR has in fact been considered in the hazard screening process (Appendix 14-A) and based on that process the scenario was not passed on for more detailed analysis as a Bounding Scenario. More specifically, Table 3-12, Appendix 14-A, considers accident and malfunction scenarios associated with the wastewater treatment system, including equipment and piping failures, effluent clarifier overflows and equipment and control system failures. The overall risk ranking associated with these scenarios were ALARP-moderate, ALARP-moderate and low, respectively, in consideration of likelihood and consequence and design safeguards and features (i.e., mitigations). Per the evaluation methodology outlined in Appendix 14-A and EIS Section 14, these scenarios were not carried forward for further detailed assessment as they do not meet the threshold for such detailed analyses.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-216	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether the expected doses meet the dose limits set out in the Radiation Protection Regulations.</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.	<p>While it is understood that potential radiological doses to human receptors are an important consideration for operations such as that proposed by the Project, issues related to worker health are beyond the scope of the Accident and Malfunctions Assessment (Appendix 14-A), which focuses on environmental receptors. Worker health, including the issue raised by the review comment, will be addressed independently and part of the licensing process as required. This is why chemical toxicity was selected as the basis for the assessment of risk in this case.</p> <p>With specific regard to public risk the following is noted. Radiological risk was not considered an appropriate pathway of exposure in these scenarios since there is little chance of exposure to members of the public. As noted above, chemical toxicity was selected as the basis for the assessment of risk in this case since it is the relevant exposure pathway for these scenarios.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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IR-217	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.	<p>As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. This information is provided in a technical memorandum that accompanies this IR response/disposition table (please see Attachment IR-217). For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. The information in the technical memorandum will be added to Appendix 14-A during preparation of the Final EIS.</p> <p>As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.</p>	Based on the response, revisions to Appendix 14-A are needed. Specifically, the technical memorandum provided as Attachment IR-217 will be added in its entirety as an appendix (Appendix B) to technical supporting document Appendix 14-A.
IR-218	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.	Acknowledged. The transcription errors identified will be corrected in the final EIS as recommended. Refer to Attachment IR-218 for revised Table 14.6-5 and Table 8-5.	Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the transcription errors noted will be provided, as follows:  <u>Revisions to Section 14:</u>  - The last two rows of Table 14.6-3 will be removed.  - From Section 14.6.4.1, second to last sentence in first paragraph, “The flow rates considered for this assessment were 5 <sup>th</sup> percentile annual flows of 10.9 m <sup>3</sup> /s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m <sup>3</sup> /s (average flow), and the 95 <sup>th</sup> percentile annual flow of 24.67 m <sup>3</sup> /s (maximum flow).”  - Table 14.6-5 to be revised as shown in Attachment IR-218.  <u>Revisions to Appendix 14-A:</u>  - From Section 8.1, second to last sentence in first paragraph, “The rivers flows considered for this assessment are 5th percentile annual flow of 10.9 m <sup>3</sup> /s (minimum flow), the average annual flow of 24.3 m <sup>3</sup> /s (average flow), and the 95th percentile annual flow of 24.67 m <sup>3</sup> /s (maximum flow).”  - Table 8-5 to be revised shown in Attachment IR-218.
IR-219	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.	<p>The rationale for the 95% recovery is explored in Section 8.1 of Appendix 14-A where the hypothetical uranium concentrate release is examined. The density of uranium concentrate particles is high (8.3 g/cm<sup>3</sup>) and settling of these particles in the aquatic environment is expected to be rapid (USDOE 2001). As such the concentrate is not expected to be transported far from the incident/release location. Figure 8-2 from Appendix 14-A shows the modeled distribution of deposited uranium concentrate from the release location under different flow scenarios and is reproduced below for reference. As can be seen in the figure most (&gt;95%) of the mass of the uranium concentrate would settle within a short distance of the release, even under high flow conditions. This indicates that the hypothetical release would be confined to a small area.</p> <p>Given the relatively small area affected it is reasonable to assume that the affected area can be successfully remediated and that there would be a very high level of uranium recovery.</p> <p>For these reasons, it is believed the 95% recovery rate is a reasonable assumption.</p> <p><u>Reference</u> USDOE (United States Department of Energy). 2001. Characteristics of Uranium and Its Compounds. U.S. Department of Energy, Office of Environmental Management, Depleted Uranium Hexafluoride Management Program, Fall 2001. <a href="https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF">https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF</a></p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-220	CNSC	Accidents and Malfunctions	Section 14.6.1.1.1  Appendix 14-A, Section 5.1.1	<p><b>Context:</b> The proponent states that based on drum deformations performed in a previous analysis (McSweeney et al. 2004), if a drum experienced a crush force of 100,000 lbs., then the deformation of the drum would cause the lid to detach from the drum. Using this drum failure mechanism, and assuming the drums weigh 450 kg and are arranged four across in the truck, at a speed of 48 km/h, the front 25% of the drums would fail, at 60 km/h to 97 km/h 55% would fail, at 145 km/h 75% would fail, and at ≥193 km/h all would fail. Given that the</p>	Please provide information and/or rationale as to whether drum stacking would impact drum failure at different speeds and confirm whether 55% drum fail for such an accident is still valid.	<p>While the review comment correctly indicates that drum stacking would impact drum failure, Denison will not stack drums for shipment and the analysis has been completed based on that assumption. The assumption is supported given that the trucks that will be used for transport are 26 ft long by 10 ft wide and can accommodate 13 rows of drums with 5 drums per row for 2 ft diameter drums. As noted in the draft EIS and Appendix 14-A it is anticipated that 40 drums would be shipped from the site per day.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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				<p>speed of the truck is likely between 60 km/h to 97 km/h, it was concluded that less than 55% of the drums would fail upon a traffic accident scenario.</p> <p>It is assumed to be 40 drums per shipment, so some stacking or rows of drums should be expected in this scenario. The drums stacked above could be at greater risk of deformation in a traffic accident. It is not clear whether drums stacking was considered in the previous study cited by the proponent and whether less than 55% fail is still an adequate percentage of drum failures in such traffic accident scenarios if drums stacking is needed.</p> <p><b>Rationale:</b> Drum failure percentage will impact the release quantity of uranium in such an accident scenario and then impact the consequence assessment. Therefore, the drum failure should be adequately assessed and supported with sufficient information and justification.</p>		<p>For further reference, the following is also noted with respect to the McSweeney et al. (2004) document on which the drum failure mode is based. The document discusses the most common failure mode of the top of the drum coming off - that is, for the scenario assessed in the A&amp;M evaluation 55% of the drum lids are assumed to fail (come off) at truck speeds between 60 and 97 km/h. Conservatively the analysis assumed that all of the contents of these drums would be released to the environment, though this is not likely to be the case.</p> <p>References: McSweeney, T. I., S. J. Maheras, and S. B. Ross. 2004. Radioactive Materials Transport Accident Analysis. Proceedings of 14th International Symposium on the Packaging and Transportation of Radioactive Materials (PATRAM 2004). Berlin, Germany, September 20–24, 2004. Paper #274.</p>	
IR-221	CNSC	Accidents and Malfunctions	Section 14.6.1.3, Appendix 14-A, Section 7.1	<p><b>Context:</b> It is projected that there would be about 100 drums packaged per mill operating day. One trip per day for 330 days per year is assumed for the probability evaluation. This means 100 drums per trip, which is inconsistent with description in section 14.6.1.1.1 where assuming 40 drums in one shipment per day.</p> <p><b>Rationale:</b> Shipments per day will impact the probability evaluation, and number of drums per trip will impact the release of uranium during an accident.</p>	Please clarify the number of shipments per day and number of drums per shipment that are expected and re-calculate the probability as necessary.	<p>In Section 7.1 of Appendix 14-A and Section 14.6.1.3 its states that there would be approximately 100 drums packaged per mill operating day. This was incorrectly stated in both Appendix 14-A and Section 14 of the draft EIS.</p> <p>As noted elsewhere in Project documentation there will be 40 drums packaged per day and Denison has confirmed this number.</p> <p>The 40 drums per day can be transported in one shipment per day and therefore the calculation of probability that has assumed one trip per day is correct and need not be revised.</p> <p>The text of Appendix 14-A and the EIS will be revised accordingly.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the number of drums of uranium concentrate that will be package per day (40 and not 100) will be provided.</p> <p>The revision to Appendix 14-A, Section 7.1 would be as follows: "In the case of the accident scenario envisioned, calcined uranium concentrate would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be about 40 <del>100</del> drums packaged per mill operating day (Wheeler River project description documentation). It was also assumed that a traffic accident on the bridge or within 40 m from either side of the bridge has the potential for release to the Wheeler River.</p> <p>The revision to the Section 14.6.1.3 of the EIS would be as follows: "In the case of the accident scenario envisioned, UOC would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be approximately 40 <del>100</del> drums packaged per mill operating day (Denison 2019). It was also assumed that a traffic accident on the bridge, or within 40 m of either side of the bridge, would have the potential for release to the Wheeler River."</p>
IR-222	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<p><b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.</p> <p><b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.</p>	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.	<p>Strictly speaking the review comment is correct in that the release of organic chemicals, including fuel does not bound the non-organic chemicals such as acids or bases and this will be clarified for context in the final EIS as well as Appendix 14-A for clarity.</p> <p>The following is noted however and provides rationale the release of fuel (diesel) was carried forward for more detailed analysis. Through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the choice to carry the diesel releases as opposed to the release of acid will be provided. The following will be added to Section 8.2 of Appendix 14-A, <i>"For the purpose of assessing the potential effects on the aquatic environment from a release of fuels and hazardous chemicals, as described in Section 5.2, the release of diesel fuel was chosen as a representative scenario, rather than other chemical such as acids and bases. Through the hazard identification screening process (see Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the scenario screening assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP."</i></p>
IR-223	CNSC	Accidents and Malfunctions	Section 14.6.4.1	<p><b>Context:</b> The EIS states that the 3D strip numerical model predicted that stresses and displacements did not show instability in the altered</p>	Please provide information on the stresses and displacements/deformation of the area northeast of the	Additional conservative modelling scenarios were run which determined that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable	No updates to the EIS in response to this IR.



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			Appendix 7-A, Appendix K	<p>sandstone or basement rock at the location where a freeze wall would be placed around the Phoenix Deposit boundary (RESPEC 2021). The potential damage to the freeze wall due to mine-induced stresses and displacements under this scenario is excluded.</p> <p><b>Rationale:</b> One outer section of the freeze wall (i.e., north-east freeze wall of the phase 4 mining area) and some internal cross walls are located in the desilicified zone. The RESPEC 2021 report (i.e., Appendix K of Appendix 7-A) appears not to have included the desilicified zone in the geomechanical modeling, nor is provided the stresses and the displacements/deformation of the area northeast of the phase 4 ore body where a significant extent of the desilicified zone exists.</p>	<p>phase 4 ore body from the geomechanical studies to demonstrate the resulted stresses and displacements will not impact on the freeze wall integrity after IRs for geomechanical studies for ore extraction are addressed.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>(1.0 &lt; factor of safety [FS] &lt; 1.25), and no-failure conditions are apparent (RESPEC 2023; included here as Attachment: IR-21). The predicted surface displacement is negligible at approximately 2.4 to 2.8 mm. For desilicified sandstone properties, failure conditions are predicted in 12.6 % of the modeled desilicified sandstone volume, which is located within 20 – 35 meters of the ore zone. The updated results are considered negligible by the author. Notable observations from modelling include that based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone.</p> <p>Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan ground freezing is used to support the sinking of deep potash mine shafts which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5m thick which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because there is no mechanism in the ISR process to create a zero stress “atmospheric” state on the ore side of the freeze wall. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. NGL is very familiar with both projects as the author of this memorandum was the responsible engineer for the initial freeze designs and oversight at both mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several meters in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it is located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.</p>	
IR-224	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 5 (Process System and Piping Failure), doses to receptors at distances of 100 and 500 metres (0.25 and 0.01 mSv respectively) are predicted. The assessment also indicated that the dose to the unprotected worker staying inside the processing plant during the spill could exceed the 50 mSv dose limit specified by CNSC if workers did not leave the area quickly after the spill.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 5 (Process System and Piping Failure).	<p>As noted in Appendix 14-A (see Section 5.5, 8.5) and the draft EIS (see Section 14.6.5) the dose calculations presented for Bounding Scenario 5 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009). In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of radon from failed or leaked thickener. The assessment assumed 20% of the contents of the thickener was released inside the processing building (US NRC 2009). Typical radon concentrations in circulating lixiviant range from 300 to 7,000 Bq/L (Brown 2008). The GEIS used a concentration of approximately 4,000 Bq/L for its assessment and this is in the range of activity of radon that is expected in lixiviant before entering the processing building.</p> <p>For transparency, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium In Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (United States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.
IR-225	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 5 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 5.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for the chemical spill emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Building ventilation to maintain the workplace air quality.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above, such documentation is in the process of being developed as part of Project-related licensing and would be available for review and acceptance by the CNSC as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li></ul>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.



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						<ul style="list-style-type: none"><li>Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including: <b>Eliminate</b> – Remove hazardous materials, processes and activities. <b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items. <b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous. <b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed. <b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p>	
IR-226	CNSC	Accidents and Malfunctions	Sections 14.6.6.1 and 14.6.6.4	<p><b>Context:</b> It is stated that in the case of the accident and for a release amount of 1 kg inside the processing plant, the dose to offsite receptors at 200 m from the project site was calculated to be less than the CNSC public dose limit of 1 mSv. The analysis also indicated that the dose to a worker in a full-face-piece powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p><b>Rationale:</b> Section 14.6.6.1 indicates that 2 kg of uranium concentrate could be released in case of the accident. No rationale is provided why 1 kg rather than 2 kg uranium concentrate is used for dose calculation. If 2 kg is used as the source term, the dose to offsite receptors at 200m and workers in the area would be higher.</p>	Please provide the rationale for using a source term of 1 kg rather than 2 kg of uranium concentrate for the dose calculation to offsite receptors and workers. If sufficient rationale cannot be provided, the doses to offsite receptors and workers should be recalculated using 2 kg uranium concentrate, and the results provide.	The rationale for the 1 kg source term is provided in Section 5.6 of Appendix 14-A. The 2 kg source term was calculated but as noted was thought to be an overly conservative value based on the conservatism layered upon conservatism. The professional decision was made to use the source term of 1 kg consistent with the referenced 2009 US NRC study as a more realistic but still conservative value.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-227	CNSC	Accidents and Malfunctions	Section 14.6.6.1.1	<p><b>Context:</b> Bounding Scenario 6 involves a fire and/or explosion within the processing plant, resulting in the release of a large amount uranium to the atmosphere. The airborne source term for this scenario is estimated with equation developed by the United States Department of Energy (USDOE), where the respirable faction is assumed to only include particles of 10 mm and smaller.</p> <p><b>Rationale:</b> No rationale was provided to support the consideration of only 10 mm and smaller particles. As provided in Table 14.6-3, the particle size of uranium &lt;15 mm is less than 20%. Majority of the uranium particle size is larger than 10 mm. The airborne source term is an important factor for the effects assessment and should be calculated with transparent and justified information/data.</p>	Provide rationale for only considering 10 mm and smaller particles for the respirable fraction.	<p>Note that the assessment in Appendix 14-A assumed a particle size of 10 µm, not 10 mm as stated by the reviewer.</p> <p>As noted in Appendix 14-A (Section 5.6) a 10 micron diameter particle size (or smaller) is a commonly assumed size fraction as a respirable/inhalable particle and is referenced by various organizations as such US EPA (see <a href="https://www.epa.gov/pm-pollution/particulate-matter-pm-basics">https://www.epa.gov/pm-pollution/particulate-matter-pm-basics</a>).</p> <p>Uranium particles emitted from the fire would be secondary particles or aerosols that are formed during the fire. In most cases these aerosols are sub-micron in size. In consideration of this, the 10 micron diameter assumption is conservative assumption since it essentially contemplates that that all the particles are therefore respirable. Moreover, as noted in Section 5.6 of Appendix 14-A the value “1” has been used for the respirable fraction (RF) to develop the exposure source term. This again is conservative because it assumes that all the uranium content formed as particles are respirable.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-228	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 6 (Facility Fire and/or Explosion), the predicted dose is less than 1 mSv to a member of the public 200 metres away from the project site. The analysis also indicated that the dose to a worker in a full-face powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 6 (Facility Fire and/or Explosion).	<p>As noted in Appendix 14-A (see Section 5.6, 8.6) and the draft EIS (see Section 14.6.6) the dose calculations presented for Bounding Scenario 6 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009) and the dose calculations are presented therein. In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of yellow cake inside the processing plant due to an explosion in the dryer. The scenario considered a release of 1 kg and conservatively assumed the fraction respirable was 100 percent.</p> <p>For transparency, and details related to the analysis, a hyperlink to the US NRC document is as follows:</p> <p><a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a></p> <p>The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium in Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (Unite States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.

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IR-229	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 6 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 6.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for fire and explosion related emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Fire safety plan and firefighting systems to ensure fire safety and effective fire fighting system to ensure the damage from the fire is limited.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above such documentation is in the process of being developed as part of project-related licensing and would be available for review and consideration as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li><li>• Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including:</p> <p><b>Eliminate</b> – Remove hazardous materials, processes and activities.</p> <p><b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items.</p> <p><b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous.</p> <p><b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed.</p> <p><b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>• manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>• process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p> <p>Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 6 such as ventilation will be included in the detailed design and will be provided to the CNSC during Project licensing.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-230	CNSC	Accidents and Malfunctions	Section 14.6.7.4	<p><b>Context:</b> It is stated that a conservative penetration time of 15 min was applied in the assessment. Based on this assumption, the maximum depth of contamination could be 90 cm (for penetration rate of 0.1 cm/s). It is not clear why the penetration time of 15 minutes is considered conservative as the penetration time would depend on the time needed for the emergency response team to respond.</p> <p>It is also stated that the wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from 0.15 m to 100 m. It is not clear how the groundwater travel distance of 0.15m and 100m is calculated.</p> <p><b>Rationale:</b> The penetration time will influence the penetration depth of the released materials, which in turn, considering the groundwater travel distance, will impact the potential areas and volumes of contaminated soils and shallow groundwater.</p>	Please provide justification for applying 15 minutes of penetration time, and why it is considered conservative. In addition, please provide information on how the groundwater travel distance of 0.15 m and 100 m was obtained.	<p>The calculations showed that the release of 30 m<sup>3</sup> partially saturates soil to the depths less than 1 m. Contamination deeper than 1 m is not expected due to released diesel availability and volume.</p> <p>If the penetration rate is slower than what was used in calculations, the released hydrocarbon would stay on the surface and the depth of contamination would be less. Therefore, 15 minutes is a conservative assumption that produces the maximum depth of contamination for the volume of hydrocarbon released.</p> <p>Eventually the depth of the contamination is more dependent on the volume of release than the time of the penetration. If the penetration is faster, the contamination would occur faster but would be limited by volume so would not penetrate deeper.</p> <p>With respect to the groundwater travel distance the distances provided in the Section 14.6.7.4 of the draft EIS the following are noted. The values provided are the upper and lower bound values associated calculated from the range of input parameters in the report. The calculations are based on the attenuation / degradation of diesel at the release site which is expected to occur within 75 days (Berry and Burton, 1997; Ledezma-Villanueva et al., 2015). In review of the text of Section 14.6.7.4 in preparation of this response a typo was noted and therefore to address the typo and provide some further clarity with respect to the groundwater travel distance the following revision will be made. The third from the last paragraph of Section 14.6.7.4 will be changed as follows (proposed ne text in bolded for reference):</p> <p><i>“The wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. <b>Studies by Ledezma-Villanueva et al. (2015) and Berry and Burton (1997) show that residual contamination in soil and groundwater is degraded within 75</b></i></p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Section 14.6.7.4 in the EIS would be revised per the IR response. A similar revision would be made to Appendix 14-A.

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						<p><i><b>days.</b> The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from <del>0.15 m</del> 0.03 m to 100 m.</i></p> <p>• <b>Dmax = 1.5 × 10-5 m/s x 75 days x 24 x 3600 ~ 100 m</b> • <b>Dmin = 4.4 × 10-9 m/s x 75 days x 24 x 3600 ~ 0.03 m</b></p> <p><i><b>As highlighted by the calculation,</b> <del>Ø</del>during this time period, no major migration of groundwater is expected. Thus, the contamination of soil and shallow groundwater is expected to be limited to a small area near the release location, <b>given that release site remediation would occur well within the 75 day window.”</b></i></p> <p>References Berry, K.A.T. and D/L. Burton. 1997. Natural attenuation of diesel fuel in heavy clay soil. Can. J. Soil. Sci. 77: 469–477. Ledezma-Villanueva, A. J. M. Adame-Rodríguez, I.A. O’Connor-Sánchez, J.F. Villarreal-Chiu and E.T. Aréchiga-Carvajal. Biodegradation kinetic rates of diesel-contaminated sandy soil samples by two different microbial consortia. Ann. Microbiol. (2016) 66:197–206.</p>	
IR-231	CNSC	Accidents and Malfunctions	Sections 14.6.6.4 and 14.6.6.5	<p><b>Context:</b> The EIS states that in the unlikely event of an unmitigated accidental release of uranium due to a dryer explosion, doses to the workers are expected to have a moderate effect, while doses to members of the public are expected to have a minor effect. Based on this evaluation, the severity of the consequences of this accident and malfunction scenario is predicted to be moderate. In consideration of both probability and consequences, the overall risk related to Bounding Scenario 6 is predicted to be low.</p> <p><b>Rationale:</b> When there is an explosion within the process plant, it is likely there will have worker fatality. The severity of the consequences of an explosion would be catastrophic and the risk of Bounding Scenario 6 would be higher.</p>	Please re-evaluate the consequence and the risk of Bounding Scenario 6 by considering the potential worker fatality resulted from an explosion.	<p>There was no attempt to minimize the consequence of the explosion scenario with respect to a potential fatality of a worker in the draft EIS. The hazard screening evaluation for this scenario that was presented in Appendix 14-A did acknowledge worker fatality as a potential consequence on an explosion; however, the more detailed evaluation of the scenario as presented in Bounding Scenario 6 focused on the release, for which we believe the consequence ratings were appropriate. Protections afforded to workers are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.</p> <p>It is acknowledged that the text could have been more explicit as to the above and additional text will be added to the text of the EIS and to Appendix 14-A.</p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the decision to carry the exposure scenario forward for further analysis, rather than the potential fatality aspect of the explosion will be provided. The following text will be added to Section 5.6 of Appendix 14-A, <i>“For reference it is acknowledged that this accident scenario could result in significant worker injuries and/ore fatalities and therefore this the reason that it was rated as “catastrophic” from a consequence perspective in the hazard identification screening evaluation (see Appendix A). The more detailed evaluation of the scenario as presented herein as Bounding Scenario 6 focuses on the release of uranium to the atmosphere. Protections afforded to workers in the processing plant are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.”</i>
IR-232	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 14-A, Table 3-7, ID# 7.1  Appendix 14-A, Table 5-5	<p><b>Context:</b> The Proponent indicates in Appendix 14-A, Table 3-7 that a release of sulfuric acid is a low consequence event therefore would not require further assessment. However, according to a Safety Datasheet on high concentrated sulfuric acid (ICSC 0362 - SULFURIC ACID, concentrated (&gt; 51% and &lt; 100%) (ilo.org)), the substance is incompatible with certain materials and can give off toxic fumes. Furthermore, it reacts with various metals to produce hydrogen gas, which is explosive.</p> <p>The Proponent provides estimates of chemicals, including sulfuric acid, to be transported to site in Appendix 14-A, Table 5-5. The annual consumption of sulfuric acid is estimated at 15,417 m3, in 617 trucks per year, but the concentration is not stated.</p> <p><b>Rationale:</b> Given the high reactivity and inherent corrosive nature of sulfuric acid combined with the volume and concentration that may be stored on site, ECCC requests that the Proponent provide a detailed risk assessment related to a terrestrial spill of sulfuric acid, specifically at the processing plant.</p>	<p>1. Provide the volume and the concentration of sulfuric acid that will be stored on site.</p> <p>2. Provide a detailed risk assessment of the fate and behavior of sulfuric acid during a release into the environment.</p>	<p>In response to Question 1 the following is noted. It is expected that a maximum of 143 m<sup>3</sup> of 93% sulfuric acid will be stored on site at any given time. Per Section 2.2.7.6.3 of the draft EIS, bulk storage tanks for chemicals that will be used for mining, processing, and water treatment, including sulfuric acid, will be located inside the processing plant, in a separate contained space away from the processing equipment. The storage tanks will sit inside appropriately designed and sized concrete secondary containment basins. The secondary containment basin for each applicable chemical system will be physically separated from the containment basins for other chemical systems.</p> <p>In response to Question 2 the following is provided. We do not feel a detailed risk assessment of the fate and behaviour of a sulfuric acid release to the environment is warranted at this time. The A&amp;M assessment has considered the transport and use on site of sulfuric acid and in neither case did the screening assessment conclude that additional more detailed assessment was needed. As noted in response to IR 222, through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology that scenario was not carried forward further evaluation. It was reasoned that released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, and the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p> <p>As noted above sulfuric acid will be stored in a dedicated area with secondary containment provided. There is no pathway from storage to the environment on which to assess risk and therefore consideration of such risks are not warranted.</p> <p>The hazard identification process considered use of sulfuric on site and its release in the process plant through a piping failure and concluded a low overall risk. It was specifically considered a low consequence event because the release would be contained in the process plant and there was no plausible pathway for the acid to the environment outside the plant.</p> <p>Overall, the risks of transport, storage and use sulfuric acid are well understood and characterized, and risks from sulfuric acid resulting from the Project to workers and the environment will be mitigated to ALARP.</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.
IR-233	HC	Human health with respect to hazardous contaminants	Appendix 14-A, Section 8.7 (p. 8.10)	<p>An effects assessment for a transportation accident scenario involving radioactive materials was not included.</p> <p><b>Context:</b> The proponent provided an effects assessment relating to a diesel spill on the ground (Section 14 Appendix 14-A, Section 8.7). However, no information was provided regarding the potential human health effects of a uranium concentrate release at the two locations considered (Section 14 Appendix 14-A p. 8.10).</p>	<p>1. Assess and describe the potential health effects (chemical and radiological) of a transportation accident involving a uranium concentrate spill at the following locations:</p> <p>a) km 160 of Hwy 914, which is the location of a cultural camp that has been established by the ERFN.</p> <p>b) km 67 of Hwy 914, which is a gathering location for the Kineepik Métis Local associated with the Northern Village of Pinehouse.</p>	<p>Such a release as envisioned by the Information Request was considered in the A&amp;M assessment (Appendix 14-A) and summarized in the draft EIS. The assessment focused generically on hazardous chemicals and utilized the release of diesel fuel to ground as a means to describe the potential spatial extent of effects and resulting consequences.</p> <p>A release of uranium concentrate to ground as the result of a transportation accident was not directly quantitatively evaluated for two primary reasons. Firstly, given the relative importance of such an event it is assumed that containment and removal would be high priorities within the emergency response and spill response plans. Response and isolation of</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				<b>Rationale:</b> An accident involving radioactive material may have an impact on human receptors, based on the proximity of receptors and the proposed response protocols.	c) All other potential sites of importance for the public and Indigenous peoples.	<p>the material is expected to be rapid, and clean-up is expected to be timely, efficient and complete. Secondly, the spatial extent of effects is expected to be small in size and essentially limited to the immediate vicinity of the accident location given the small size of the gamma field that would be associated with the uranium concentrate. In these regards exposure to members of the public is expected to be mitigated and based on the A&amp;M assessment methodology did not warrant consideration from a detailed perspective beyond initial screening.</p> <p>As noted in the review comment, the release to ground accident scenario focused on the two locations of interest along Hwy 914. The locations were developed with the Denison team and reflected the result of and input from Denison’s Interested Party engagement activities. These locations can serve more broadly to represent release to ground scenarios at additional locations along the transportation corridor. Since the outcomes of the accident scenarios are specifically tied to conditions at the release location as the are to the nature of the release it would not be practical to conduct such an assessment at all points of interest as suggested by the review comment. The use of representative locations, such as was done in the current A&amp;M assessment, is consistent with past practice on similar project proposals.</p>	
IR-234	CNSC	Effect of Environment	Section 15.2.2	<b>Context:</b> Effects of seismic events on the uranium extraction and post decommissioning are not assessed.  <b>Rationale:</b> Seismic events could further exacerbate the stability of the voids induced by the uranium extraction, which will result in extra stresses and displacements/deformation in the overlying rock formations. These extra stresses and displacements/deformation could impact on the mine operation and post decommissioning groundwater flow and contaminant transport.	Please provide an assessment of seismic events on the mine-induced voids stability and the resulted effects on the mine operation and post decommissioning.  <b>Technical Discussion Required:</b> Yes	<p>See response to IR-64 that concerns potential for ground subsidence.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains will be a honeycomb texture with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No EIS updates are anticipated to address this IR.
IR-235	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”  RCP4.5 represents predicted climate conditions of a moderate carbon future.  RCP8.5 represents predicted climate conditions under a high carbon future.  The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.  <b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.  ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a>  ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a>  The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.  These values do not match the averages shown in Tables 15.5-1 and 15.5-2.	<p>1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.</p> <p>2. Provide detailed calculations for the following average values:</p> <ul style="list-style-type: none"><li>25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li><li>25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li></ul> <p>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</p> <p>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</p> <p>5. Compare model derived data against:</p> <ol style="list-style-type: none"><li>Natural variability of the observed data.</li><li>Variability in the statistics generated via observation based time series.</li></ol> <p><b>Technical Discussion Required:</b> Yes</p>	<p>As a preamble to this IR response, Denison notes that ECCC used a different spatial scale (Geike River is a ‘large grid’ area) in the Climate Atlas compared to what was presented in Section 15 of the EIS for Tomblin Lake (which is a ‘small grid’ area). Although Tomblin Lake region is within the Geike River region, this difference in spatial scale explains the discrepancies noted by ECCC in their IR context and rationale and explains why ECCC was unable to duplicate the results.</p> <p>1. The links to the Tomblin Lake regional grid unit are as follows.</p> <p>Tomblin Lake 4.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line</a></p> <p>Tomblin Lake 8.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line</a></p> <p>The Tomblin Lake chart data were downloaded from the Climate Atlas for each scenario.</p> <p>2. We used average function in excel to calculate mean values from the chart data.</p> <p>Historical Mean = Average of annual mean historical values from 1976 to 2005. As shown in Table 15.5-1, the historical mean for the Max 1-Day Precipitation was 24.1 mm.</p> <p>Ensemble mean – Near term = Average of predicted annual mean values from 2021 to 2050. As shown in Table 15.5-1, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP8.5 scenario.</p> <p>Ensemble mean – Far term = Average of predicted annual mean values from 2051 to 2080 As shown in Table 15.5-1, the far term mean for the Max 1-Day Precipitation was 26.7 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the far term mean for the Max 1-Day Precipitation was 27.5 mm under the RCP8.5 scenario.</p> <p>3. The information in Section 15 was not used in Section 8. Section 8 PMP was conservative to account for any changes in future precipitation.</p> <p>4. The ensemble model is made up of many different models (compilation). The variability is depicted for each model, and the ensemble model predicted data are presented as the annual mean and include the 10th and 90th percentiles for each annual mean.</p> <p>5. The data in Section 15 was not used in other assessments and the PMP used in Section 8 is conservative.</p>	No EIS updates are anticipated to address this IR.
IR-236	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”  As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.  <b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.  It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>1. In the draft EIS Tables 15.5-1 and 15.5-2, the maximum 1-day precipitation values were obtained from the chart data file downloaded from the Climate Atlas for the Tomblin Lake regional grid (refer to IR-235 for links to the datasets on Climate Atlas). The Historical Mean value was calculated as the average of annual mean historical values from 1976 to 2005 = 24.1 mm.</p> <p>2. The values provided in Section 15 for the maximum 1-day precipitation are correctly referenced and summarized from the Climate Atlas and have been used appropriately in the assessment. The discrepancy in spatial scale and how it effects the representation of the data between Geike River and Tomblin Lake is described in IR-235. See also response to AD-15.</p> <p>As discussed during the April 19, 2023 meeting between Denison and ECCC, the final EIS will be updated to include new tables comparing precipitation estimates for existing and future climate toas context for the Project design PMP. These have been included here as Attachment IR-236; Attachment IR-236 will be appended to Appendix 6-C of the final EIS.</p>	<p>The information in Attachment IR-236 will be added as Appendix D Summary of Precipitation Values Presented in the EIS to Appendix 6-C in the final EIS.</p> <p>The following sentence will be added to Section 15.5.2 in the final EIS:</p> <p>“Please refer to Appendix D to Appendix 6-C for a summary of precipitation values presented in the EIS.”</p>

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.			
IR-237	CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>	Please see response in Attachment IR-237.	Section 16-C in the final EIS will be updated to reflect the final summary of monitoring and follow-up programs. Compared to the version contained in the draft EIS, it will be updated to include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project’s Commitment Report which will be provided as part of the final EIS documentation. Refer to Attachment IR-237 where <b><u>bold underlined</u></b> text indicates where Denison commits to revising or adding information into the final EIS.
IR-238	CNSC	Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	<p>Denison provided ERFN, KML, and the YNLR with the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR).</p> <p>Mitigation and monitoring was part of an in-person engagement tour undertaken in 2022 with the Indigenous and non-Indigenous Communities of Interest. Further, information about mitigation and monitoring measures were mailed out in booklets, and will be topics revisited in engagement activities set to occur in fall 2023.</p> <p>As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.</p> <p>See also response to IR-28, IR-125, IR-128, IR-129 and IR-212.</p>	No EIS updates are anticipated to address this IR.

<sup>1</sup> **Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation**  
Health Canada, Water and Air Quality Bureau, October 2022

Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m3 increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:

$$e^{(\beta \times 10 \text{ } \mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \text{ } \mu\text{g}/\text{m}^3$$

$$e^{(\beta \times 10 \text{ } \mu\text{g}/\text{m}^3)} = 1.127$$

$$\beta \times 10 \text{ } \mu\text{g}/\text{m}^3 = \ln 1.127$$

$$\beta = (\ln 1.127)/(10 \text{ } \mu\text{g}/\text{m}^3)$$

$$\beta = 0.01196$$

The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

ALCM = additional lung cancer mortality cases per 100,000 population

β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))

Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)

Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation

Years = years of project or project phase

Sample calculation:

Project estimates an exposure from relevant source(s) of 0.067 µg/m3 over 50 years of operation

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

$$ALCM = \left[ \left( e^{0.01196 \cdot 0.067} - 1 \right) / e^{0.01196 \cdot 0.067} \right] \cdot 45.5 \cdot 50$$

ALCM = 1.8 additional lung cancer mortality cases per 100,000

**References:**

- [1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: [cancer.ca/Canadian-Cancer-Statistics-2021-EN](https://cancer.ca/Canadian-Cancer-Statistics-2021-EN)
- [2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <https://doi.org/10.1186/s12889-020-08771-w>
- [3] Health Canada. Lung cancer and ambient PM2.5 in Canada: a systematic review and meta-analysis.
- [4] Health Canada, 2022. Available online at: <https://publications.gc.ca/site/eng/9.907038/publication.html>

## Attachment: IR-06

Number	IR-06
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4, Wellfield for In Situ Recovery Mining
Context and Rationale	<p>Context: This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p>Rationale: Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted . This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p>References:</p>



	<p>[1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p.</p> <p>[2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p.</p> <p>[3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>
Information Requirement	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery . This information should include:</p> <ul style="list-style-type: none"> <li>• feasibility of meeting remediation targets.</li> <li>• groundwater flow conditions and validation of flow models.</li> <li>• mobilization of contaminants (e.g., Al, Se or V).</li> <li>• potential for free gas evolution/two-phase flow.</li> <li>• identifying composition of lixiviant and production solutions.</li> <li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A).</li> <li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li> </ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>

### **Response to IR-06 Part 1**

Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.

During the operation phase, and under normal operational conditions there is no interaction between the mining area and surface or down gradient environment, and the assessment focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions.

Denison provided the FIRT team with a presentation and summary of the test work completed to date on June 16, 2023, to address IR-06. Summaries of relevant field and lab tests including the 2021 Tracer Test, 2022 Feasibility Field Test (FFT), and various site-specific lab tests are provided as part of this IR response and additional details will be provided to support licence applications.

#### **Tracer test**

An ion tracer test was completed in 2021 and the key results are summarized as follows:

- The test achieved the commercial-scale production flowrate assumed in the 2018 Pre-Feasibility Study (SRK 2018).
- The test demonstrated hydraulic control of injected solution. No elevated values of the tracer were observed in the monitoring wells surrounding the commercial-scale test pattern.
- The test established breakthrough times between injection and recovery wells, spaced 5 to 10 meters apart, that were consistent with previous proof of concept hydrogeological modelling conducted by Petrotek Corporation.
- The clean-up phase completed after the conclusion of the tracer test demonstrated the ability to remediate the test pattern. The clean-up phase was successful; the tracer concentrations were reduced to as low as 4% of peak test levels within eight days of remediation.

#### **Feasibility Field Test (FFT)**

The purpose of the FFT was to validate previous field and laboratory testing and determine the feasibility of the ISR mining methodology. The leaching and neutralization phases of the FFT were completed in 2022. The leaching phase was designed to assess the effectiveness of the ISR mining method. This phase included controlled injection of an acidic solution into the mineralized zone with recovery of the solution through existing test wells. The neutralization phase involved the injection of a mild alkaline (basic) solution into the leaching zone to neutralize the area and verify the groundwater in the area is returned to acceptable, permitted conditions.

The FFT provided the following results:

*Leaching Phase:*

- Recovered approximately 14,400 lbs U3O8 over ten days of active leaching following completion of initial acidification of the Leaching Area.
- Returned maximum uranium head grade of recovered solution of 43 g/L when the leaching phase of the FFT was completed, with grades still rising (indicative of the ramp-up segment of a well production profile).
- Achieved suitable acidification for ISR mining within 7 days post initial injection at 5 metre well spacing (GWR-41) and within 17 days for 10 metre well spacing (GWR-38).
- Demonstrated ability to achieve and maintain uranium mass flow rate consistent with the assumptions in the 2018 Pre-Feasibility Study (SRK 2018).
- Further demonstrated hydraulic control of injected solution during the FFT, reporting no responses in the monitoring wells outside of the designed FFT test area.
- Confirmed breakthrough times between injection and recovery wells, consistent with the Project's hydrogeological model and the previously completed tracer test.

*Neutralization Phase:*

Sampling of groundwater monitoring wells around the FFT site has confirmed the successful restoration of the leaching zone to environmentally acceptable pH conditions, as outlined in the applicable regulatory approvals for the FFT and summarized in Table IR-06-1 below.

**Table IR-06-1: Feasibility Field Test Leaching Zone Remediation Targets compared to Interim (December 2022) Groundwater Well Monitoring Results**

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
pH	pH units	3.5	6.24
Aluminum (Al)	mg/L	9.1	3.3
Arsenic (As)	mg/L	0.7	0.05
Barium (Ba)	mg/L	0.2	0.07
Calcium (Ca)	mg/L	535	203
Cadmium (Cd)	mg/L	0.3	0.00001
Cobalt (Co)	mg/L	0.24	0.0001
Chromium (Cr)	mg/L	0.38	< 0.0005
Copper (Cu)	mg/L	0.19	0.001
Iron (Fe)	mg/L	390	144
Potassium (K)	mg/L	45	185
Magnesium (Mg)	mg/L	8.92	22.6
Molybdenum (Mo)	mg/L	0.16	0.04
Sodium (Na)	mg/L	628	193
Nickel (Ni)	mg/L	1.17	0.02
Lead (Pb)	mg/L	2	0.04
Sulfate	mg/L	4,147	1114
Selenium	mg/L	0.47	0.0002
Uranium	mg/L	501	85

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
Vanadium	mg/L	19.3	0.2
Zinc	mg/L	17.1	0.5

<sup>1</sup> Results are the average of three groundwater monitoring wells (GWR-038, -040 -041) sampled in December 2022

## **Response to IR-06 Part 2**

Field programs conducted over the past 4.5 years were focused on de-risking key elements related to the implementation of the ISR mining methodology specific to the Phoenix deposit in a high-grade Athabasca Basin setting. These key elements were focused on:

- Permeability
- Leachability
- Containment
- Processing

De-risking programs were carried out in the lab and field setting initially on an individual basis. As the programs progressed, elements were combined in additional test work ultimately culminating in the FFT, where all elements were evaluated in a single test to inform the design of ISR.

### ***Response to IR-06 Part 2a: Feasibility of meeting remediation targets***

Groundwater remediation targets provided in the draft EIS were derived from metallurgical test results completed from 2017 to 2021 with over 125 kg of material recovered from Phoenix deposit that underwent leaching and neutralization test work (see response to IR-67). In 2022 and 2023, metallurgical test work continued to further optimize remediation and strategies and confirm test work results presented in the draft EIS. It is expected that metallurgical test work will continue in the future to further optimize remediation targets, and this will be advanced through updates to the Decommissioning Plan.

The FFT provided additional confirmation that pH target and remediation targets could be met. Data gathered during the neutralization phase of the FFT provide confidence that groundwater targets proposed in the draft EIS can be met technically and economically.

Based on laboratory testing and the results of the 2022 field testing, subsurface remediation is planned to consist of rinsing the ore zone with 35 pore volumes of fresh water, slowly raising the pH and then pumping about 75 pore volumes of basic solution through the same portion of the ore zone. This basic solution will in effect further raise the pH to a level that impedes further leaching of the deposit and reduces aqueous concentrations of contaminants of concern to below their environmental target levels.

### ***Response to IR-06 Part 2b: Groundwater flow conditions and validation of flow models***

#### **Background of Data Collection**

Hydrogeological investigations have been ongoing in the field and in laboratories since 2014. Packer, open hole, and cross hole tests have been completed in conjunction with exploration drilling programs. As well, permeability tests have been completed on sections of available competent core within the

Phoenix deposit. Open hole water level surveys have been completed across the site in 2015, 2017, 2021 and 2022. The hydraulic conductivity related field and laboratory test work data are summarized in Table IR-06-2.

Table IR-06-2: Hydraulic Conductivity Related Data Set from Phoenix and Regional Wells

Test Type	Location	Number of Data Points <sup>1</sup>
Field – Packer / Injection / Pumping / Slug	Athabasca Group	56
	Unconformity	173
	Basement	20
Lab – Permeability	Athabasca Group	721
	Unconformity	1149
	Basement	1250
Total		3,369

Note: <sup>1</sup> This is not necessarily the number of tests conducted, as a single test can yield multiple data points.

Additionally, the following hydrogeological characterization work has been completed at Phoenix:

- Geophysics surveys including:
  - Neutron survey x 5
  - Borehole or nuclear magnetic resonance (BMR or NMR) x 10
  - Sonic x 1
  - Acoustic televiewer x 9
  - Gamma/caliper x 9
  - Electromagnetic flow meter (EMFM) x 9
- Tracer Test (2021)
  - Advanced FFT (2022)

Lithology at Phoenix is considered in terms of nine HGUs that have been defined to be present adjacent to or define the main Phoenix mineralized zone (Phases 1 to 5) including:

- HGUs 1a and 1b: Athabasca Group (overlying the mineralized zone)
- HGU 2a: Upper clay cap
- HGUs 2b, 2c, 2d: Main body of the mineralized zone
- HGU 2e: Lower clay cap
- HGUs 3a and 3b: Weathered and unweather basement.

In the mineralized zone, HGUs 2b, 2c and 2e (in that order) have the highest hydraulic conductivities.

Hydraulic conductivity values in the mineralized zone in Phase 1 average  $1\text{E-}06$  m/s, with the southeastern half of the phase generally having higher values than the northwestern half. Phases 1 and 3 do not appear to be hydraulically connected. In Phase 2 there is considerably less data than for Phase 1. There appears to be no hydraulic connection between Phases 1 and 2. Based on aquifer testing and electromagnetic flow meter (EMFM) data, mineralized zone hydraulic conductivity values in Phase 2 ( $\sim 4\text{E-}06$  m/s) are on the same order of magnitude as those in Phase 1 and approximately one order of magnitude greater than those in Phases 3 and 4. In Phase 3 the mineralized zone hydraulic conductivity values ( $\sim 6\text{E-}07$  m/s) average one order of magnitude lower than those in Phase 2. The mineralized zone Phase 4 has been tested at four locations. With one exception, all values obtained from pumping, injection and slug tests have been in the range  $1\text{E-}08$  to  $8\text{E-}07$  m/s. The hydraulic conductivity values ( $\sim 3\text{E-}07$  m/s) are on the same order of magnitude as those in Phase 3. Much of the mineralized zone water in Phase 4 is capillary bound, but there are some reasonably fractured intervals in Units 2c, 2d and 2e. Comparison of mineralized zone hydraulic conductivities, averaged by mining phase, indicates that Phases 1 and 2 have the highest values due to the large presence of a thick and relatively continuous section of HGU 2b in these phases. Phases 3 and 4 have intermediate values and Phase 5 has the lowest permeability due to a thinner HGU 2b unit, and relative abundance of the clay zones in this phase.

There are several lines of evidence (from laboratory testing, observations during the FFT and geomechanical modelling of the deposit) that localized hydraulic conductivity increases may occur due to the dissolution of uranium from the mineralized zone.

#### Numerical Modelling

Numerical groundwater modelling has been conducted by SRK (2018), Petrotek (2020 and 2021), and Ecometrix (draft EIS Appendix 7-C). The degree of complexity and the purposes of these models have varied. SRK (2018) created a two-dimensional model that was bound by geological outline of the defined mineral resource in the mineralized zone as part of their PFS. This simplified approach was used based on the assumption that there was a freeze cap above the deposit (the earlier version of the freeze wall). Homogenous K values were assigned to the model and incrementally increased by roughly half an order of magnitude to estimate flow rates.

Petrotek (2020, 2021) built and calibrated several models which had differing purposes. These models were calibrated to the observed responses to aquifer tests conducted in 2019, 2020 and 2021 but they assumed that there was no vertical heterogeneity within mineralized zone and only simulated the response in Phases 1 and 3. Potential well configurations and well spacings were investigated and used to predict the response to the 2021 tracer testing. A high degree of variability in the travel times from the various injection wells and to the pumping wells was found. The variability was attributed to the high degree of heterogeneity in hydraulic conductivity and storage within the mineralized zone. One of the main purposes of this work was to provide a demonstration of proof of concept for application of ISR to the Phoenix deposit.

EcoMetrix (draft EIS Appendix 7-C) developed a regional three-dimensional FEFLOW groundwater flow and transport model that was used to both evaluate residual effects from the FFT and then as part of Denison's draft EIS to examine the post decommissioning effects on regional receptors. The model was calibrated to the regional groundwater flow patterns, was consistent with their conceptual model and was also consistent with the observed hydrochemistry in the Upper and Lower Sandstone Aquifer systems. The groundwater flow in the vicinity of the deposit was observed and simulated in the calibrated groundwater model to travel eastward within the Lower Sandstone Aquifer before moving upward through the desilicified zone in the Athabasca Group sandstone units and overlying overburden deposits toward Whitefish Lake.

As part of the Feasibility Study, Denison retained Dr. Walter Illman and his Ph.D candidate Ning Luo from the University of Waterloo. The University of Waterloo group conducted hydraulic tomography (HT) analysis of the hydraulic test data from the Phoenix deposit to aid in the characterization of the subsurface heterogeneity in  $K$  and specific storage ( $S_s$ ). The areas of the HT model, with high confidence estimation were incorporated into the 2023 WSP FEFLOW model as they represented the best estimation of the 3D distribution of the hydraulic conductivity and storativity. The FEFLOW model is a numerical representation of the site hydrogeology and groundwater flow regime in the mineralized zone and was calibrated to hydraulic testing data that has been collected for the site. FEFLOW model specified well designs including well screen locations and any planned permeability enhancements to specific wells or HGUs within wells.

The FEFLOW results were used as an input into GoldSim (GoldSim V14, Technology Group, LLC). GoldSim is a mathematical model that uses the outputs from FEFLOW to estimate the uranium dissolution by HGU and by extraction well with time. GoldSim simulated the dynamic nature of the lixiviant injection and uranium recovery systems associated with the wellfield.

#### Recovery Curve

The test work and derivation of the recovery curve from laboratory testing that has been standardized to one condition and grade. The recovery curve indicates the concentration of uranium bearing solution (UBS) produced as a function of pore volumes (PVs) recovered. Therefore, by determining the hydrogeological flow field for an array of injection and recovery wells and the related PVs recovered with time, an aggregate wellfield recovery can be calculated by applying the recovery curve to each recovery well's PV distribution.

The recovery curve is scaled in the modelling to account for variations in in situ grade.

#### Hydrogeological Modelling

The numerical groundwater flow modelling methodology was conducted using FEFLOW and was described earlier. The physical setting of the mineralized zones was numerically represented in FEFLOW based on the Denison geological block model. FEFLOW was used as the basis of wellfield layout and the



simulation of the lixiviant flow within the mineralized zone. For production modelling, the following values for each of the FEFLOW numerical elements in 3 dimensions was output:

- Production unit or well capture zone that element belonged to
  - Flow per unit time
  - Element volume
  - Effective porosity
  - HGU and uranium in situ grade

#### Wellfield Production Modelling

Using the FEFLOW simulation outputs for each mesh unit, GoldSim calculated the uranium recovery based on the number of PVs through the unit and the corresponding concentration of  $U_3O_8$  in each recovery well. The mesh units are aggregated based on the associated recovery well number from FEFLOW.

Wells are started and stopped in GoldSim to simulate the progression of mining in the wellfield. Well starting is set manually. The end of operation for each well is determined by a cutoff recovery grade. In this way the overall production from the wellfield is controlled to provide process plant feed of the required flow and grade over time. At a detailed level, well operating times can be adjusted to smooth the mass flow rate of uranium to the plant, within the limits of the model granularity.

Optimizing the production rate and total quantity required several iterations of FEFLOW and GoldSim modelling. GoldSim outputs were analyzed to identify wells that were under-performing compared to expectations. The number and position of injection and recovery wells and their flow rates were adjusted based on these results, and the FEFLOW model was re-run. This iterative process involved examination of the under-performing areas and adjustment to the flows in these areas in both FEFLOW and GoldSim.

Throughout the optimization iterations, the number of unexpected low-performing wells was reduced. When it appeared the effort had reached its asymptote the remaining low performing wells were reviewed. A statistical analysis showed that four wells patterns or production blocks were outliers. These four wells that were located in areas with otherwise consistent recovery had shown more reasonable response in prior iterations. The results from these four production units was therefore assumed to be non-representative. It was assumed these production units can be mined by varying the pumping rates, wellfield stimulation and/or adding possibly adding additional wells. Recovery from these four wells were therefore added at the average rate per HGU for their Phase and included in the overall production.

Data gathered during the field tests have been utilized for both the EA groundwater model as well as the mining model.

#### ***Response to IR-06 Part 2c. Mobilization of contaminants (e.g., Al, Se or V)***

Contaminants mobilized during the FFT were similar in concentration compared to the UBS solutions that were collected during lab scale core and column leach testing at SRC which suggests that the testing Denison conducted at lab scale and the information collected is representative of the deposit. The column test assay results in Table IR-06-3 below include the maximum as well as weighted average from all phases of the leaching and remediation test. The FFT result presented in Table IR-06-3 below was the sample with the highest concentration of uranium during the test.

**Table IR-06-3: Potential for Mobilization of Contaminants - Comparison of Results from Lab Scale Column Tests and Groundwater Results from the Feasibility Field Test**

Analyte	Column Tests		FFT
	Max	Weighted Avg	GWR-041, Oct 13, 2022
U, ppm	48222.3	13902.0	43400
Al, mg/L	783.9	284.1	180
Fe, mg/L	7029.1	1757.4	1200
Ca, mg/L	1135.1	445.8	1100
Mg, mg/L	672.3	170.5	10
K, mg/L	329.6	54.0	150
Na, mg/L	927.4	52.0	90
Pb, mg/L	16.4	3.3	1
Mo, mg/L	296.6	24.8	15
P, mg/L	44.5	6.8	20
Cd, mg/L	6.2	0.2	0
Mn, mg/L	263.3	57.9	83
Cr, mg/L	14.1	0.8	5
V, mg/L	148.3	33.8	22
Sr, mg/L	17.1	2.5	16
Ba, mg/L	6.4	1.9	5
Cu, mg/L	1610.8	280.8	2
Zn, mg/L	1276.2	38.8	5
Co, mg/L	49.3	4.1	1
Ni, mg/L	166.2	6.6	1
As, mg/L	95.9	10.4	3
Se, mg/L	1.6	0.1	1
S, mg/L	24115.4	14740.9	12333

***Response to IR-06 Part 2d. Potential for free gas evolution/two-phase flow***

Calcium carbonate is known to be present in the deposit in relatively low percentage amount. The reaction between acid and calcium carbonate can release CO<sub>2</sub> gas and therefore cause two phase flow, especially when going from the hydrostatic pressure of the deposit to the atmospheric pressure at surface which will encourage degassing of solution. It is expected two-phase flow will occur during the mine life, especially as carbonate containing material are being decomposed with the sulfuric acid of the lixiviant. The FFT provided confirmation that the proposed radon degassing surge tank directly fed by

downhole recovery pump is adequate for operations and does not pose additional Health & Safety or environmental risks.

***Response to IR-06 Part 2e. Identifying composition of lixiviant and production solutions***

As part of the metallurgical test program, over 125kg of core from the Phoenix deposit has been leached in a variety of settings, including bottle rolls, column tests, and intact core tests. This has helped to predict concentrations of both the lixiviant as well as the production solutions.

The lixiviant (mining solution) concentrations will vary depending on each individual well production profile. To ensure reagent consumption is effective and efficient it will be varied during the life of each well dependent on its characteristics.

The initial acidification of the well requires a lower acid content to ensure the formation does not plug due to precipitation, whereas during periods of high production the well can accept a higher acid concentration. Towards the end of the recovery curve, the uranium is more difficult to access and therefore the strength of the acid or the flow rate to the well need to be optimized to ensure efficient use of reagents.

It is expected that the lixiviant concentrations will vary between 0-60 g/L H<sub>2</sub>SO<sub>4</sub>, and 0-20g/L H<sub>2</sub>O<sub>2</sub> and will be situationally dependent. There is also the capability to add Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, however it is not expected that this will be required in significant concentration due to the natural abundance of iron in the deposit.

**Table IR-06-4: Representative Concentration Ranges of Uranium Bearing Solution**

	<b>Lower-end Concentrations</b>	<b>Upper-end concentrations</b>
<b>U, ppm</b>	2976	116395
<b>Al, mg/L</b>	25.8	8506.1
<b>Fe, mg/L</b>	134.0	21737.9
<b>Ca, mg/L</b>	99.7	10736.0
<b>Mg, mg/L</b>	21.7	1776.4
<b>K, mg/L</b>	8.0	756.2
<b>Na, mg/L</b>	7.0	5361.9
<b>Pb, mg/L</b>	0.1	124.5
<b>Mo, mg/L</b>	0.1	64.8
<b>P, mg/L</b>	4.0	276.6
<b>Cd, mg/L</b>	0.1	66.4
<b>Mn, mg/L</b>	8.0	980.7

	Lower-end Concentrations	Upper-end concentrations
Cr, mg/L	0.1	145.9
V, mg/L	3.4	942.4
Sr, mg/L	0.6	178.8
Ba, mg/L	0.1	104.8
Cu, mg/L	1.7	1337.9
Zn, mg/L	2.7	987.9
Co, mg/L	0.5	114.9
Ni, mg/L	0.1	216.4
As, mg/L	0.1	96.5
Se, mg/L	0.1	203.2
S, mg/L	1751.3	29671.1

***Response to IR-06 Part 2f. Success despite presence of >2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A)***

The metallurgical test work and FFT completed to date has shown that carbonate minerals present in deposit does not pose a material impact on the ISR mining method proposed for the project.

***Response to IR-06 Part 2g. Site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.)***

Please see summary above under response to IR-06 Part 2b under the heading Background of Data Collection.

### **Response to IR-06 Part 3**

Expected total recovery from deposit is 80.6%. Average uranium concentrations recovered from wellfield is estimated to be 22.5/L U. The nominal case ISR wellfield reagent consumptions are shown in the Table IR-06-5.

Table IR-06-5 Nominal ISR Wellfield Reagent Consumptions

<b>Area</b>	<b>Reagent</b>	<b>kg/kg U in feed</b>	<b>kg/m<sup>3</sup> UBS feed</b>
In situ leach (ISL)	93% sulphuric acid	1.40	12
	70% hydrogen peroxide	0.40	-
	50% ferric sulphate	0.024	-
ISL remediation	50% sodium hydroxide		15

Solutions recovered contain minimal solids based on test work completed to date. Any entrained solids in solutions will be removed through the precipitation circuits of the process plant. Should they contain appreciable of uranium, solids can be processed at another licensed facility.

#### References:

Petrotek. 2020. Interim Hydrogeologic Report – Wheeler River Project Phoenix Deposit. Unpublished report prepared for Denison Mines Corp. March 2020.

Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.

SRK Consulting. 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report prepared for Denison Mines Corp. October 2018

## Attachment: IR-10

Number	IR-10
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall
Context and Rationale	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</li> <li>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</li> </ol>

	<p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p>Technical Discussion Required: Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause</p>
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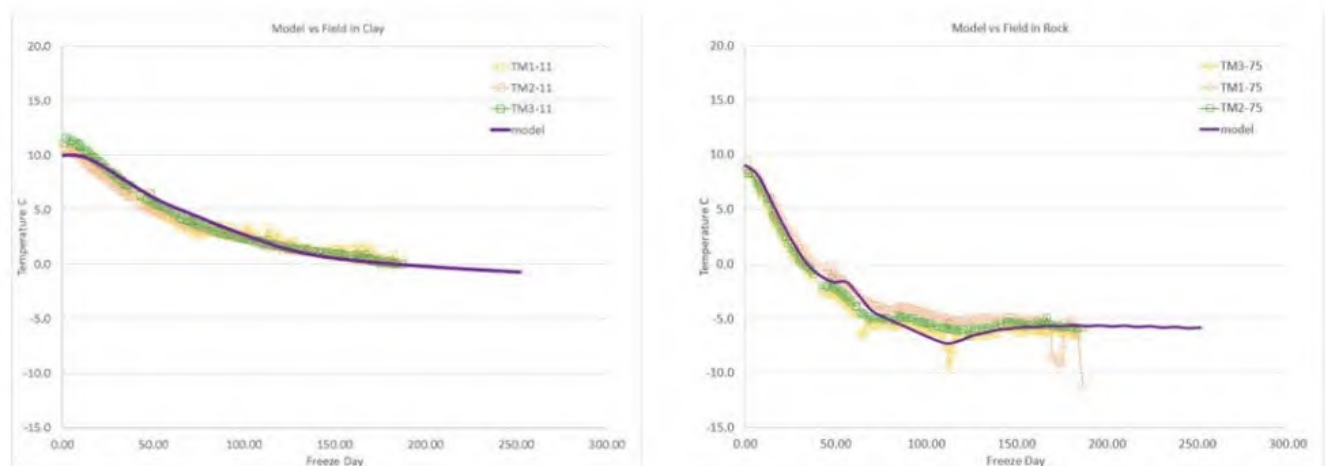
Response:

The general theme of the comments and questions stated above seem to be related to:

- verification of the freeze wall extents;
- response of the freeze wall to potential chemical interaction with the lixiviant;
- response of the freeze wall to induced hydraulic or lithostatic stress; and
- response of the freeze wall to potential exothermic processes related to ISR.

The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed on both the ore and non-ore sides of the freeze wall to confirm the thickness of frozen ground and to validate thermal finite element models of the entire area. Thermal models can very accurately represent real conditions because ground thermal properties used in the analyses only vary by a factor of two to four across all ground types, unlike hydraulic or strength properties, which can vary by many orders of magnitude across relatively short distances.

The figures below are an example of field data validating modelled predictions for a shaft freeze wall at depth.



**Figure 1: Illustration of a calibrated FEM model for freezing in clay (left) and rock (right). Temperatures were measured offset from the freeze wall pipe locations and compared with model predictions at the same location.**



The injection and recovery wells will be set up such that they are within the confines of the ore itself and migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall should be minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. Having said that, if significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice. The freezing point depression of the lixiviant proposed for this project was determined to be  $-1^{\circ}\text{C}$  and, as such, it would freeze off and become immobile before significant volume could negatively impact the freeze wall. If the lixiviant were to dissolve some of the host soil / rock binding material at the freeze wall surface, it would occupy the resulting void space, but then freeze off, which would halt further migration within the freeze wall.

Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan, ground freezing is used to support the sinking of deep potash mine shafts, which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5 m thick, which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because the interior side of the freeze wall where active ISR mining is occurring is not open to atmosphere and is fluid filled in the same way that the regional groundwater system is on the exterior side of the freeze wall, creating a balanced pressure system, where loading is equal on both the interior and exterior sides.. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several metres in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it will be located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.

The leaching process has the potential to be exothermic and generate heat, which may flow toward the freeze wall. In this instance, there is low sulphur content in the ore zone and the exothermic reaction will be minimal. Despite this, all thermal modelling in support of the freeze design assumed that the freeze wall had to develop and be sustained in the presence of an ore zone that generated a nominal amount of heat—sufficient enough to sustain a minimum temperature of  $10^{\circ}\text{C}$  even though it would naturally tend to cool below this in response to the freeze system. It is understood that the lixiviant may be heated as part of the pre-injection process, so some accounting for heat in the ore zone was included in the analysis to date. Should the lixiviant generate more exothermic reaction than predicted, there is a very low risk of it degrading the freeze wall in any significant amount. Referring back to the potash mine shaft freezing illustration, it is not uncommon for in shaft excavation activity and concrete work to

generate temperatures between 30 and 60°C that act on a freeze wall only 5 m thick and only a few metres away from the exposed shaft wall. In this extreme case, the freeze wall is more than capable of removing the generated heat. The physics of heat flow are such that heat generated by the ISR process would be free to flow towards the freeze wall; however, most of it would flow to the coldest location (e.g., the actual freeze pipes at the mid-point of the wall thickness) before it is manifested as an observable significant rise in ground temperature. Even if the heat were to warm the ore side of the freeze wall, it would not impact the non-ore side of the wall (which is where half of the total wall thickness resides). This heat may penetrate to the center of the wall but if the refrigeration plant is operating, that heat can not then flow “up gradient” on the non-ore side of the wall and thaw that side.

The concentration of the lixiviant (max ~8% sulfuric acid conc.) has a freezing point of ~-4°C. The lixiviant itself will not react chemically with the freeze wall, other than having a slightly different freezing point than formation water. The main reaction expected is dissolution of uraninite with the combination of sulfuric acid, hydrogen peroxide, and ferric iron. This reaction is exothermic, but there are several natural mitigating factors of the wellfield that aid in minimizing heat transport to the freeze wall:

- The wellfield will have flexibility in terms of reagent concentrations being added. With the bulk of the uranium being contained within a higher-grade core (interior to the deposit), the exterior of the deposit will see either lower injection/recovery flows or lower concentrations of lixiviant to be efficient with reagent consumption. Whether the concentration or flow is reduced, this limits the reaction rate and therefore total heat generation at the extremities of the deposit.
- There is no refortification of reagents underground compared to typical uranium tank leaching. This prevents additional heat generation from dilution of sulfuric acid or hydrogen peroxide.
- The heat capacity of lixiviant/UBS should be higher than the ore in the deposit, which means the UBS solution will carry the majority of the heat to surface rather than keeping the heat of reaction at depth.
- In the event the freeze wall thickness monitoring network detected an actionable thinning to the freeze wall, the concentration of lixiviant could be decreased which would reduce the heat generated per m<sup>3</sup> of lixiviant and re-establish the desired freeze wall thickness.

To summarize the risk of the degradation of the freeze wall due to exothermic reaction, it is almost impossible—with the freeze plant operating—to practically add sufficient sustained heat to thaw the proposed freeze wall to the point hydraulic containment is compromised. Sufficient operational controls will be in place to verify the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on adjacent sides of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues are to lower the temperature of the freeze system to draw more heat out, to increase the freeze coolant flow rates in freeze wells nearer to active ISR cells, or to adaptively manage the lixiviant injection and recovery rates in cells located nearer the freeze wall.

## Attachment: IR-18

Number	IR-18
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.2.3.9, Project Description Appendix 8-E
Context and Rationale	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent's responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>
Information Requirement	1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.

	<p>2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</p> <p>3. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</p> <p>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</p> <p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>
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Supporting table to the response provided in IR table:

Table 2.2-1 - Upper Bound Industrial Wastewater Treatment Plant Effluent Quality (updated)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration
Chloride	mg/L	120	SEQG/CCME	<b>600</b>
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>
Sulphate	mg/L	128	BC MOE	<b>3915</b>
TDS	mg/L	500	SEQG	<b>6420</b>
TSS	mg/L	15	Schd 4 - MDMER	6
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>
Lead	mg/L	0.005	CCME	0.0003
Molybdenum	mg/L	0.07	WHO	2.5
Nickel	mg/L	0.07	WHO	0.014
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>
Vanadium	mg/L	0.12	FEQG	0.059
Zinc	mg/L	0.1	FEQG**	0.042
Mercury	mg/L	0.000026	SEQG/CCME	0.000001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078
Phosphorus	mg/L	0.015	BC MOE	N/A
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>
Lead-210	Bq/L	0.2	HC	<b>0.419</b>
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>
Notes (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia calculated				

## Attachment: IR-20, IR-67, IR-69

Number	IR-20
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.1 Appendix 7-C
Context and Rationale	<p><b>Context:</b> The proponent's objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent's acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCan's opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent's decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>
Information Requirement	NRCan requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.

Number	IR-67
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.1 (Remediation Objectives)
Context and Rationale	<p>Context: Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices. Rationale: The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given</p>

	its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).
Information Requirement	1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities. 2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining. 3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.

Number	IR-69
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2
Context and Rationale	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCAN's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This information is important when considering source terms in reactive transport modeling.</p>
Information Requirement	NRCAN requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.

Response:

It is also important to note that Denison is completing a sequential EA and licensing process for the Project (see draft EIS Section 1). Detailed ISR mining-related information needed to support licensing



and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.

For the EIS, an initial understanding of the mining area remediation was needed to initiate the assessment of migration of constituents of potential concern in groundwater out of this area in the post-decommissioning period. The findings and conclusions of the EIS were also used, in turn, to inform and bound the engineering and feasibility work. The coreflood 2b and 3c, plus the Pre-Feasibility work (Denison, 2018) on mining area remediation (Section 2 (decommissioning section), Section 7, Appendix 7-C) was used in the draft EIS. This IR response provides additional information to support the selection of these studies.

#### Response to #1

### **1.0 Summary of Test Work**

This response is focused on the metallurgical test work done to support an understanding of the:

- a) mineralogy and hydrogeochemical changes in the ore and barrier zones as a result of the lixiviant (mining solution) injections (see IR-69);
- b) the composition of the uranium bearing solution (UBS) at the end of mining and prior to any remediation (see IR-20); and
- c) water quality and secondary mineral phases formed during remediation of the ore zone (IR67; this IR).

Metallurgical testing completed, the objectives and results of the work, and the information carried forward for discussion in this response are summarized in Table 1.

Further details on the metallurgical testing, including the sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition) are provided in the sections below. All data presented herein are from the metallurgical test programs used to support the 2018 Prefeasibility Study (Denison 2018) and the Feasibility Study (Denison 2023).

Table 1: Summary of Metallurgical Testing

Years	Description	Objective	Results	Information informing IR-20, IR-67 and IR-69
2017-2018	Batch leach tests and bottle roll/agitation leach tests	Early testing of leaching with alkaline and acidic based lixivants	Supported decision for Acid Leaching	No discussion herein; very preliminary testing.
	A column leach test conducted using sulfuric acid followed, which also included simulated groundwater restoration tests.	Initial column test with acid leaching and evaluation of groundwater remediation	Early indication of groundwater remediation needs	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation)
2021	Column leach tests on blended crushed ore	Test leach recoveries on a range of feed grades. Determine potential recovery and generate a representative sample for process plant testing.	Operationally, the feed sample for Column 1 is was verified as a reasonable blend to represent ISR wellfield production of UBS. Groundwater remediation with groundwater and alkaline solutions	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Column leach and remediation tests on crushed and screened core from individual hydrogeologic units	<ul style="list-style-type: none"><li>•Develop information to support geochemical modelling of the deposit, including leaching and neutralization phases.</li><li>•Generate a detailed chemical and mineralogical characterization of the dominant hydrogeological units(HGUs) within the ore zone</li><li>•Evaluate behaviour of different HGUs during ISR and neutralization, in particular those hosting the majority of the resource.</li><li>•Compare the efficacy of neutralization of different HGUs, with the use of dilute sodium hydroxide</li></ul>	Uranium leachability was found to vary amongst the HGUs. Also, there were some indications of an HGU ("2A") to be avoided during operations to prevent clay mobilization.	Water Quality of UBS at the end of mining.
2018	Static uranium ore dissolution (jar) test on intact core	Room temperature, 1,138 hours (48 days) exposure of drill core to concentrated sulphuric acid (35 g/L) in a very slow-motion shaker.	Provided visual indication that with sufficient soak time, lixiviant will penetrate into intact high grade uranium pieces. The incomplete recoveries at the end of the tests can be attributed largely to requiring longer residence time	No discussion herein; testing limited to visual information.
2018-2022	Coreflood tests on intact core in 2018 to 2022	Simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Objectives were to: evaluate the rate of uraninite dissolution and changes in permeability of the core with leaching; generate laboratory scale test results applicable to planning the 2022 field test; and delineate a life-of-well-pattern production profile.	<p>Results were inconsistent in the early work (Coreflood 1 to 3C) due to highly variable reagent dosages in this pioneering work. Coreflood 4 and 5 (2021-ongoing).</p> <p>In Coreflood 4, as uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase. Lessons learned from past testing, particularly with respect to reagent adjustments, were put into practice with this testing to enable completion of the longest test run to support the feasibility work. In total, 51.8% of the initial dry mass of the sample was removed by leaching; 50% of this was the result of uranium leaching. Feed grade was 26.66% U3O8.</p> <p>In Coreflood 5 is ongoing and is focused on HGU 2B, which has the majority of contained uranium, highest grade and highest natural permeability. The methodology was different from the other coreflood tests in that the flow was directed through a pencil hole in core. Cumulative recovery at end of February 2023 was 33%.</p>	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Feasibility field test (FFT) leaching and remediation in 2022	The FFT was a full-scale proof of concept in an ISR method; to demonstrate injection of lixiviant and recovery of UBS from the CSW test pattern. Injection was into 1 well (GWR-041).	After pH below 3 was achieved in GWR-041, active leaching of uranium began. UBS grade from GWR-041 rose while pH declined. Uranium grade trended upwards to 25 g/L over four days, while injection pressure decreased. This suggests that leaching played a role in reducing resistance to flow. A peak sample grade of 43 g/L U was collected from GWR-041 after a further three days, so the acid injection phase was ended (on October 12). A global leaching recovery curve could be developed using the field testing and coreflood tests.	No discussion included herein.

### **1.1 2018 Column Leach and Groundwater Restoration Test**

In early 2018, a column leach test with acid lixiviant was performed. The core material used for testing came from three drill holes. Select intervals of overlying very low-grade sandstone was blended with very high-grade intervals to create a composite feed grade of 24.2% U. Details on the core material used in the leach tests are provided in Appendix A to this response, in Table A1.

A total of 137 pore volumes (PVs) of uranium bearing solution (UBS) was generated at flow rate ranging between 2 to 4 PV/d. A 90% recovery was achieved with a peak individual sample uranium grade of 27.4 g/L and average UBS grade of 8.4 g/L U. Following the leaching, the column was flushed with simulated groundwater to simulate groundwater restoration. Analytical results from the first pore volume of water removed from the column during the restoration phase are incorporated into the range in UBS composition at the end of mining presented in Table IR-20, IR-67, IR-69-2.

*Table 2 addresses IR-20. This table summarizes information from the metallurgical testing with respect to composition of the UBS at the end of mining, prior to remediation.* See further discussion below in Section 1.3.

Flushing of the column with simulated groundwater (Phase 1 of restoration) was continued for 84 pore volumes. Phase 2 (RPV 84-108) circulated simulated ore zone water quality fortified with 1 g/L Bicarbonate [from  $\text{NaHCO}_3$ ]. The test simulated the operation of a Reverse Osmosis (RO) water treatment step where solution exiting the column would be treated prior to being re-introduced. Phase 3 (RPV 108-114) re-established injection of simulated groundwater quality. The objective of this phase was to displace the bicarbonate and to ensure ground water stability once the circulation of fluid is halted. Analytical results for groundwater collected during this restoration process are shown in Table 9 and Table 10. Information presented in those tables is discussed further in Section 2.0.

### **1.2 Column and Coreflood Tests**

The following were common to all column and coreflood tests performed:

- The pore volume was determined by pumping water (deionized water, site groundwater) into each column or core until filled.
- Temperature was controlled to 10°C by placing the apparatus in a walk-in cooler.
- An online UBS or Remediation/Flushing Solution sample was taken daily.

Table 2:UBS Chemistry at end of Leaching (Mining)

Test	Units	Coreflood 2B (2021)	Coreflood 3C	Number of Samples	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Baseline Ore Zone Groundwater Chemistry
Sample Name		D-CF2B-57	D-CF3C-142		Minimum	Maximum	GWR-032 (2021-06-04)
Acidity	mg/L			5	65000	87000	
Bicarbonate	mg/L	-	-	6	0	<1	118
Carbonate	mg/L			5	<1	<1	<1
Chloride	mg/L			1	<10	1220	220
Hydroxide	mg/L			0	<1	<1	<1
P. alkalinity	mg/L			0	<1	<1	<1
pH	pH units	2.1	1.1	13	0.63	2.10	6.83
Specific Conductance	uS/cm			9	52100	303000	860
Eh	mV			10	580	870	
Sum of ions	mg/L			5	52700	70100	504
Total alkalinity	mg/L			5	<1	<1	97
Total hardness	mg/L			5	202	1480	182
Nitrate	mg/L			5	<4	<40	<0.04
Fluoride	mg/L			5	1	34	0.23
Total dissolved solids	mg/L			5	8970	47900	599
Calcium	mg/L	557	723	13	58	723	55
Magnesium	mg/L	47	<63	13	<10	240	11
Potassium	mg/L	148.8	<86	13	6.2	149	4.6
Sodium	mg/L	17.9	<77	13	6.0	12300	81
Aluminum, dissolved	mg/L	1738	71	13	69	4609	0.0006
Antimony, dissolved	mg/L			5	0.040	1	<0.0002
Arsenic, dissolved	mg/L	<0.1	<1	13	<0.1	21	0.2
Barium, dissolved	mg/L	<0.1	<1	13	<0.05	<0.5	0.063
Beryllium, dissolved	mg/L			5	0.07	0.4	<0.0001
Boron, dissolved	mg/L			1	<1	<10	0.43
Cadmium, dissolved	mg/L	<0.1	<1	13	0.018	1.809	<0.00001
Chromium, dissolved	mg/L	9.1403	<1	13	<0.1	9.140	<0.0005
Cobalt, dissolved	mg/L	5.41	<1	12	0.5	15	<0.0001
Copper, dissolved	mg/L	5.16	10.23	13	5.2	964	<0.0002
Iron, dissolved	mg/L	3309	4094	13	820	4094	4.2
Lead, dissolved	mg/L	0.97	19.45	13	0.20	19	<0.0001
Manganese, dissolved	mg/L	16.35	<81	13	2.70	41	0.22
Molybdenum, dissolved	mg/L	1.65	59.57	13	1.65	60	0.0038
Nickel, dissolved	mg/L	15.7	<1	13	<1	27	0.001
Selenium, dissolved	mg/L	18.4	<1	13	<0.025	26	<0.0001
Silver, dissolved	mg/L			5	<0.005	<0.05	<0.00005
Strontium, dissolved	mg/L	5.2	<1	7	0.60	5	1.66
Thallium, dissolved	mg/L	-	-	5	0.05	<0.2	<0.0002
Tin, dissolved	mg/L	-	-	5	0.07	0.30	-
Titanium, dissolved	mg/L			5	2.80	32	<0.0002
Uranium, dissolved	mg/L	7.45E+03	3.88E+04	13	7.70E+02	3.88E+04	1.10E-02
Vanadium, dissolved	mg/L	160.88	62.57	13	6.16	161	<0.0001
Zinc, dissolved	mg/L	134.37	4.03	13	2.30	331	2.62
Sulfur	mg/L	9,263	22,877	13	5211	209411	4.3
Phosphorous	mg/L	-	75.4	13	2	75	<0.01
Silica, soluble, dissolved	mg/L	-	-	6	31	192	13.3
Radium-226*	Bq/L	-	-	4	230	3000	180
Radium-228*	Bq/L	-	-	1	5	5	-
Lead-210*	Bq/L	-	-	4	600	1700	2200
Polonium-210*	Bq/L	-	-	4	290	2000	110
Thorium-230*	Bq/L	-	-	4	21000	220000	7
Thorium-232*	Bq/L	-	-	4	2	12	-
Radium-226*	mg/L	-	-	4	6.29E-06	8.21E-05	4.92E-06
Thorium-230*	mg/L	-	-	4	2.75E-02	2.88E-01	9.17E-06

Notes

* Analytical results for radionuclides are limited. The ranges of radionuclide concentrations (Bq/L) provided are considered conservative because they reflect composite samples collected over the ISR leaching period in the 2021 column samples, not UBS at the end of mining	
	Analytical results for Coreflood 2B and 3C are provided (in addition to the range of UBS Constituent Concentrations) because results from the remediation portion of these tests was used for development of the Restored Solutions modelled in the draft EIS (Appendix 7-C)
	Used to highlight baseline groundwater quality in the ore zone for comparison with UBS Composition at end of mining.

## 2021 UBS Column Tests

The objective of the 2021 column tests was to test leach recoveries on a range of feed grades. Four samples were generated from nine drill holes, all proximal to the WS Shear where most of the resource lies. The samples contain varying amounts of uraninite, sulphides, clay and iron and represent blends of the various hydrogeologic units within the deposit (HGUs). Samples were crushed to -10 mm. Columns with a diameter of ~100 mm were packed with the samples. Four column tests were conducted, with details for each sample listed in Table 3.

The 2021 column tests used the full-size distribution of crushed core and achieved relatively high mineral liberation in contact with lixiviant. This results in relatively rapid leach kinetics compared to intact core. The initial flow rate was calculated based on a retention time of eight hours (3 column pore volumes per day (PV/d)).

Table 1: Summary of Samples for Column Test 1 to 4

Column No.	Sample ID	Mass (g)	Feed U <sub>3</sub> O <sub>8</sub> (wt%) <sup>a</sup>	HGUs in Blend <sup>b</sup>	Hole IDs	Number of PVs - Leaching	Number of PVs - Remediation
1	Sample A	27,338	48.1	2A/B/C/D	GWR-10, 16, 19, 21	116	6.7 (D.I. Water)
2	Sample B	18,619	46.1	2B	GWR-10, 19, 23, 26	120.4	16.5 (Site GW, 10g/L NaOH Solution)
3	Sample D	9,180	1.8	2A/C/D/E	GWR-15, 16, 19, 26	14.7	15.5 (Site GW, 10g/L NaOH Solution)
4	Samples C&E	8,742	26.9	2A/C/D/E	GWR-01, 19, 22	29.7	11.2 (Site Water, 1.5g/L NaHCO <sub>3</sub> )

Notes

<sup>a</sup> Back Calculated

<sup>b</sup> HGUs = Hydrogeological Units in the Ore Zone

A single pass flow of dilute sulfuric acid and hydrogen peroxide lixiviant was run between 22 to 38 days. Lixiviant strength was generally decreased over the course of each run. UBS composition from each of the column leach tests at the end of leaching is shown in Table 2.

On completion of the leaching tests, each column was flushed with water (de-ionized water or groundwater) and for columns #2, #3 and #4, neutralization of groundwater was evaluated using alkaline solutions. Solutions used and porewater volumes flushed are summarized in Table 3. Analytical results for solution composition during the remediation phase are included in Table 9 and Table 10.

Mineralogy of the column samples pre-testing were analyzed by XRD and QEMSCAN; the mineral assemblages aligned with the overall understanding of the ore zone mineralogy, provided as Table IR-20, IR-67, IR-69-A2 (Appendix A to this response). XRD results for the fine particles are provided as Table 4. These results show the formation of secondary sulphate minerals during the uranium ore leaching process. The other mineral phases are associated with the (pre-mining) ore zone mineralogy, provided in the draft EIS as Table 3-1 of Appendix 7-C, and provided herein in Appendix A as Table 2.

Table 4: XRD Results for Fine Particles in UBS, Column Experiments #1 to #4 (2021)

Mineral Phase	Column #1	Column # 2	Column #3	Column #4
Anglesite	18.1	9.8	-	6.6
Anhydrite	7	-	-	-
Biotite	-	38	24.2	8.3
Chlinochlore	62.6	21.2	20.3	20.1
Gypsum	-	4.4	-	-
Kaolinite	-	22	41.1	57
Quartz	-	-	5.4	-
Pyrite	12.3	4.6	8.9	7.1

Notes

Secondary Minerals

## 2022 Column Leaching and Remediation Tests

A suite of 5 column leaching tests was undertaken to support remediation planning. Whereas core flood testing may more realistically represent the ISR conditions with respect to operational conditions (i.e., using intact core and pressure applied), this phase of column testing used crushed material to accelerate the testing process and, thus, provide key information on the remediation phase and prepare for the (2022) field feasibility study.

The 2022 column testing program consisted of five 100mm diameter columns loaded with samples from different HGUs providing characterization of ore variability. The samples were selected from a blend of assay sample splits of fresh core from GWR-054 through GWR-061, supplemented by preserved core from GWR-016, GWR-022 and GWR-024 stored frozen by Denison. The hole locations are shown Figure 1 ranging along the length of the deposit. Intervals from five to eight different drill holes were composited to meet required sample mass and/or to meet representativeness for each HGU.

The samples were hand crushed to minimize fines generation, to a maximum size of 30 mm. Minimum size fraction was +0.212 mm by wet screening out fines. This was designed to promote flow through the column and minimize exposed mineral surface area. Overall procedures were like 2021 column tests. The lixiviant was a mixture of sulphuric acid and hydrogen peroxide and was prepared using Wheeler River groundwater. Lixiviant was injected upwards in essentially flooded plug flow conditions. The flow rate was calculated based on ~0.67 measured column PV/d. Test parameter variables were minimized, so the differences between HGUs could be distinguished.

Initially, all five columns were fed lixiviant from a common tank. The low-grade columns 2A and 2E were run until fully leached. From that point forward, 2A and 2E were fed from a separate tank to perform groundwater flush and neutralization. A summary of details of the column tests including pore volumes during leaching, during post-leaching flushing with groundwater, and during neutralization are provided in Table 5.

UBS composition at the end of the leaching period is provided in Table 2, and groundwater quality following the groundwater flushing and neutralization is provided in Table 9 and Table 10.

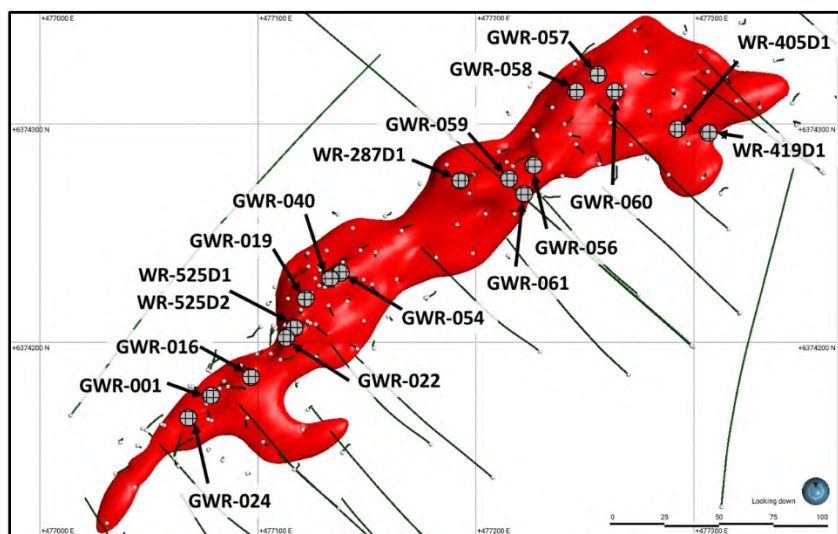


Figure 1: Metallurgical Hole Locations for 2022 Column Leach Testing

Table IR-20, IR-67, IR-69-2: 2022 Column Leach Testing Details

Columns	2a	2b	2c	2d	2e
Estimated Grade (wt % U <sub>3</sub> O <sub>8</sub> )	5.0%	58.3%	41.3%	46.1%	1.6%
	Numbers of Pore Volumes				
Phase 1: Groundwater equilibration	2.9	3.1	3.0	2.8	3.1
Phase 2: In-Situ Recovery (ISR)	20.8	66.7	64.1	62.4	19.4
Phase 3: Groundwater Flushing	15.0	16.2	15.1	11.6	14.9
Phase 4: Neutralization	4.4	4.2	11.0	2.6	3.7
Total Pore Volumes	43.1	90.3	93.1	79.4	41.1
pH at end of Phase 2	0.93	0.95	0.91	0.91	0.95
pH at end of Phase 4	9.53	7.1	3.8	7.22	7.87

QEMSCAN was done on the column pre-testing and at the end of the flushing period. The results are presented as Table 6. Mineral phases that reflect basement-derived materials in the ore zone residuals include biotite, spodumene, petalite and garnet.



Table 6: 2022 Column Leach Test QEMSCAN results

QEMSCAN	Column 2a		Column 2b		Column 2c		Column 2d		Column 2e	
	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)
Mineral	2A-BATCH-1	DCL-2a-R	2B-BATCH-1	DCL-2b-R	2C-BATCH-1	DCL-2c-R	2D-BATCH-1	DCL-2d-R	2E-BATCH-1	DCL-2e-R
Anglesite		3.84		3.28		3.99		14.18		1.15
Biotite	4.84	1.38	0.25	0.44	4.26	0.83	1.16	1.41	2.96	1.98
Bornite	0.36	0.07					0.70	1.15	0.43	0.20
Calcite			0.42	0.69		0.14				
Chalcocite (CuS)			1.54		0.28		0.31		1.28	
Chalcopyrite	12.37	13.03	0.71	2.27	0.11	0.16		0.25	8.76	3.48
Chlorite				3.15						
Clinocllore-(Fe)		11.34				0.8		9.39		52.26
Covellite (CuS)	0.35	0.38	0.19	2.61	0.39	1.34	0.06	0.18	0.10	0.20
Fe-oxide		0.03				1.15		0.53		0.03
Galena	0.63	0.40	0.43	1.23	0.25	0.3	0.53	3.06	0.10	0.02
Garnet	0.25				2.52		1.47		0.43	
Goethite-Clay mix	4.31	0.03	0.35	0.10	7.37	16.78	10.95	1.66	1.52	0.41
Illite	0.21	0.52		0.05					0.32	0.67
Ilmenite		0.08				0.09				0.47
Kaolinite	42.04	40.41	1.52	3.28	7.12	11.67	0.75	2.09	62.20	28.63
Muscovite	9.46	6.09	0.79	3.35	0.81	1.2	0.15	2.06	13.69	8.79
Petalite		0.15		0.05				0.03		0.02
Pyrite	8.48	10.44	1.49	3.38	0.98	1.58	0.12	0.09		0.84
Quartz	4.40	9.11		1.05	0.05	0.42		1.74	1.01	0.12
Rutile	0.61	0.58	0.07	0.04	0.04	0.04			0.44	0.32
Sphalerite	0.56	0.41		0.04	0.03			0.02		
Spodumene		0.17		0.05		0.16				0.05
Uraninite	10.70	1.07	92.10	74.89	75.74	58.72	83.73	61.93	6.67	0.29
Zircon	0.36	0.45	0.06	0.02		0.04				
Siderite						0.54				

## 2018-2022 Coreflood Tests

Core testing machines (CTM) were typically used to study in situ oil recovery processes, for flooding uranium deposit drill core with lixiviant to simulate ISR conditions on a micro scale which are referred to as coreflood tests. All drill cores tested were from vertically oriented drill holes allowing the flow from end to end of the coreholder to simulate flow in the vertical direction of the deposit. This is tangential to the intended predominantly horizontal flow path between wells in situ.

From late 2019 to mid-2021, coreflood tests numbered 1, 2A, 2B, 3A, and 3C were performed. The main objective was to simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Priority was placed on testing a large number of samples over short durations. Tests were ended early, so, uranium recoveries were low relative to later testing (generally < 10%). Results for Coreflood 2B and 3C are discussed further herein.

### Coreflood 2B and 3C

Details for the testing of Coreflood 2B and 3C are provided in Table 7.

Table 7: 2021 Coreflood Test Details

Coreflood	2B		3C	
Corehole	GWR-024		GWR-019	
Core Dimensions (average diameter, average length), in mm	60 x100		78*70	
Core Pore volume (mL)	36.9		53.1	
Estimated Grade (wt % U3O8)	24		70.7	
	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)
In-Situ Recovery (ISR)	34.4	2.1	82.7	0.98
Groundwater Flushing	22.7	1.91	91.6	2.83
Neutralization with NaOH	55.6	11.92	-	-
Neutralization with NaHCO <sub>3</sub>	-	-	62.4	6.87
Post-Neutralization Groundwater Flush	9.3	11.47	17.2	6.43
Total Pore Volumes	122	-	253.9	-

The UBS composition at the end of leaching for Coreflood 2B and 3C is provided in Table 2. The analytical results for these samples were provided in Table 2 because Corefloods 2B and 3C were the primary basis for the development of the restored solutions. UBS composition during flushing for these coreflood tests is discussed further in Section 2.0 and is summarized in Table 9 and Table 10.

At the end of testing, the core from Coreflood 2B was frozen. The frozen core was cut in the middle into two sides. XRD, QEMSCAN and SEM was done on one half of the sample, on the inside cut. The XRD results indicated:

- 19.5 wt% Kaolinite
- 26.7 wt % Montmorillonite
- 45.3 wt % Dickite
- 2.9 % Fluorite
- 5.6 % Pyrite

The cumulative uranium recovery for core 2B was low, and thus the sample (post-leaching) has a mineralogical composition comparable to that of the unmined ore zone. The portion of the sample that underwent mineralogical analysis was also rich in clay minerals. The QEMSCAN results are shown in Figure 2. The SEM image (not shown) shows the presence of uraninite, pyrite, and sphalerite.

The QEMScan shows a minor amount of mineral phase suggestive of a small amount of jarosite (“Fe-Al-Si-S”) closely associated with pyrite. This suggests formation of oxidation products/secondary minerals in the core with exposure to lixiviant.

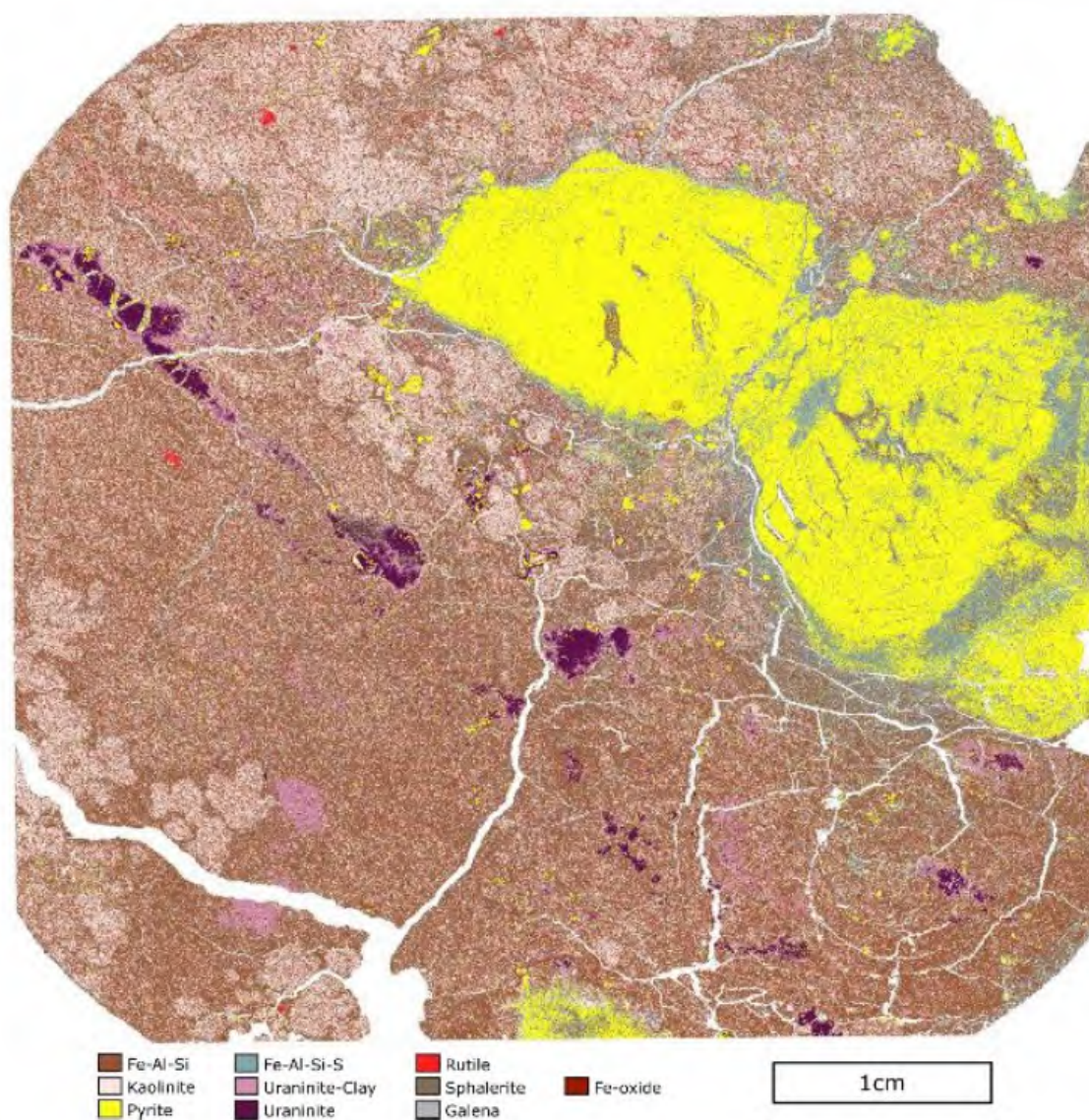


Figure 2: Coreflood 2, QEMSCAN

#### **Coreflood 4**

The Coreflood 4 sample was taken from a high-grade segment of HGU 2C from hole GWR-040, which is the middle CSW in the planned field feasibility test (FFT) well pattern. Thus, it was an excellent candidate to correlate with subsequent FFT results.

Coreflood 4 feed sample side view is shown in Figure 3. Near-horizontal mineral banding is evident.



Figure 3: Coreflood 4 Feed Sample Side View, Prior to Placement in Coreflood Machine

Coreflood 4 ran for a total of 113 PVs over 391 days, with life-of-test average UBS grade of 18.7 g/L U and reagent consumptions of 2.78 kg H<sub>2</sub>SO<sub>4</sub> and 0.35 kg H<sub>2</sub>O<sub>2</sub> per kg U. Part of the difficulty of production ramp-up of Coreflood 4 was due to the flow constraint of low micro scale permeability through the intact core, particularly with generally lower permeability in the vertical flow direction of coreflood samples. As uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase.

In total, 51.8% of the initial dry mass of the sample was removed by leaching. Just over half of the mass loss is accounted for by uranium leaching, and the remainder is accounted for by gangue mineralization leaching. The feed grade was back calculated from measurements of the total uranium in UBS collected throughout the test plus leach residue sections. Feed grade was 26.66% U<sub>3</sub>O<sub>8</sub>, and final recovery was 97.1%. Coreflood 4 is the most comprehensive simulation of ISR for the Phoenix FS, with the highest recovery demonstrated from an intact core to date.

Coreflood 4 provides the most information about the mineralogical and hydrogeochemical changes that are occurring in the ore zone during mining. Post-leaching, the core leached in Coreflood 4 was cut into segments, as shown in Figure 4, assayed and visually examined (photographed) for changes to the core due to leaching. The mineralogy of each section was determined.



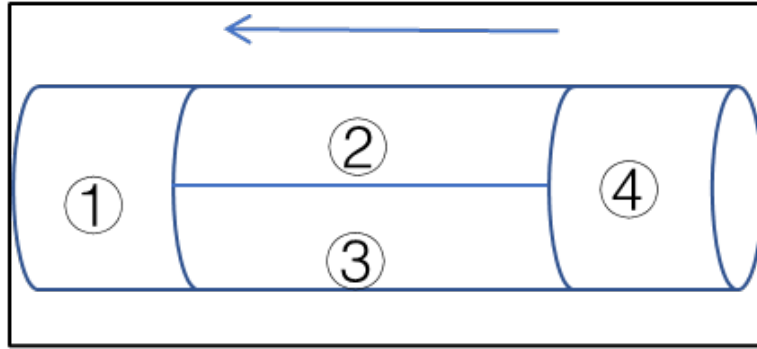


Figure 4: Coreflood 4 Cut Sections and Direction of Flow

Coreflood 4 feed side puck (Section 4), inlet face view is shown in Figure 5. The feed end was deeply eroded, nearly through to the discharge side of the section.



Figure 5: Coreflood 4 Feed Side Puck (Section 4), Inlet Face View

Coreflood 4 middle (Section 2), centre longitudinal cut face view is shown in Figure 6. It was strongly bleached throughout, with cracks that appeared after drying.



Figure 6: Coreflood 4 Middle (Section 2), Centre Longitudinal Cut Face View

Coreflood 4 discharge end puck (Section 1), inlet face view, dried, is shown in Figure 7. It was strongly bleached across the entire cross-section.



Figure 7: Coreflood 4 Discharge End Puck (Section 1), Inlet Face View, Dried

XRD for each of the sections is given in Table 8. Mineral phases that reflect basement-derived materials in the ore zone residuals include anorthite.



Table 8: XRD Results for Coreflood 4 Core Sections

Mineralogical Composition Post-Extraction	D-CF4A-1	D-CF4A-2	D-CF4A-3	D-CF4A-4
Location/section in the coreflood column	Discharge End	Midsection	Midsection	Feed End
Kaolinite (Al <sub>2</sub> Si <sub>2</sub> O <sub>9</sub> H <sub>4</sub> )	74.7	22.1	38.3	43.8
Pyrite (FeS <sub>2</sub> )	17.9	20	12.4	16
Chamosite (Mg <sub>2.518</sub> Fe <sub>2.482</sub> Al <sub>1.25</sub> Si <sub>3.80</sub> H <sub>10</sub> ) (Chlorite Group)	7.3	5.8	1.4	--
Gypsum (CaSO <sub>4</sub> H <sub>2</sub> O)	--	7.5	4.5	4.8
Barite (BaSO <sub>4</sub> )	--	1.6	0.7	--
Anorthite (CaSi <sub>2</sub> Al <sub>2</sub> O <sub>8</sub> )	--	30.7	31.8	--
Goethite (FeO <sub>2</sub> H)	--	12.4	10.9	4.3
Anglesite (PbSO <sub>4</sub> )	--	--	--	31.1

### 1.3 Composition of the UBS remaining in the Ore Zone at the end of Mining (IR-20)

The analytical results for the UBS composition in Coreflood 2B and 3C are shown in Table 2 along with a range of UBS composition that was developed from the relevant analytical results for a total of 13 samples from across the column and coreflood tests. The ranges of values for constituents of potential concern (COPCs), as defined in Appendix 7-C of the draft EIS, are provided in Table 2. Uranium and other COPC concentrations generally vary by 2-3 orders of magnitude. There is expected variability in the UBS composition because of the nature of the deposit, which has been captured in the conditions of the metallurgical testing, and the nature of the testing (e.g., core vs. crushed rock, test duration, lixiviant composition, etc.). The analytical results were given explicitly for Coreflood 2B and 3C because of the use of results from these coreflood tests to develop the restored solutions, which is discussed further in Section 2.0.

***The range of UBS composition at the end of mining has been included in Table 3-5 of Appendix 7-C as was requested as part of IR-20, such that UBS quality at the end of mining and remediated conditions (represented by the Restored Solutions) can be compared. The updated Table 3-5 has been added to this response as Appendix B.***

### 1.4 Mineralogical and Hydrogeochemical Changes to the Ore Zone with Mining (IR-69)

Understanding of changes in the mineralogy of the ore zone with mining are informed by the XRD results from Coreflood 4, as this test was terminated at the completion of the ISR process, and QEMSCAN results for the 2022 columns, because these tests provide quantitative information on the mineral assemblage following mining and with remediation. The following conclusions are made with respect to changes in the mineralogy in the ore zone with mining:

- The mining process is effective as leaching uraninite from the ore zone and also results in partial dissolution of sulphide minerals (pyrite, sphalerite, galena, etc.);
- Secondary sulphate minerals are formed as a result of the mining process. The associated equations are shown in Appendix A. Jarosite minerals were suggested surrounding pyrite particles in the QEMSCAN of Coreflood 2, but were not detected in any of the other post-mining residuals. Gypsum and barite were detected in XRD but not present at quantifiable levels in association with the 2022 column residuals. Formation of anglesite is shown by XRD and QEMSCAN in post-mining residuals.

- The elevated concentration of aluminum in solution evidences clay mineral dissolution, but overall the relative abundance of clays in the ore zone increases with ISR mining, as would be expected with ore dissolution.

The hydrochemistry of the ore zone post-mining is presented in Table 2. Consistent with the dissolution of parent minerals and the pH of the UBS, most COPCs concentrations in the UBS at the end of mining are elevated with respect to baseline groundwater conditions in the ore zone.

## 2.0. Composition of the Restored Solutions (Addresses Question #2 of IR-67)

The restored solutions were developed using the metallurgical data that were available when conditions in Post-Decommissioning were being conceptualized in 2020-2021 for numerical modelling and effects assessment (Appendix 7-C of the draft EIS). This included the early results on acid leaching of the core (2018) and Coreflood 2B and 3C results. At that time, the coreflood tests provided the most detailed information from which to develop the chemistry of the Restored Solutions #1 and #2, using the remediation portion of the tests. From the results of that testing, “Restored Solution #1” and “Restored Solution #2” (Table 3-5) were developed to represent the bounding scenarios for groundwater quality considered in the reactive transport model to evaluate the potential for environmental effects following remediation of the mining area. As is discussed further below, these solution compositions were developed to reflect remediation of the ore zone through flushing and neutralization, without over-neutralization – meaning, base addition past circumneutral conditions to alkaline conditions.

Since that time, more information from the column and coreflood tests has become available that supports the composition of the Restored Solutions put forward in the draft EIS as being representative of porewater within the mining zone with remediation.

When developing the restored solutions for the draft EIS, the approach was generally to select concentrations for any given element/parameter that represented a low to mid-range value for the COPC from the metallurgical testing solutions, to be conservative with respect to evaluating potential effect, but also to reflect the goal of the remediation (to align with ALARA, as is discussed below). For dissolved uranium, the concentration in Restored Solutions #1 and #2 were set to upper bounds of 100 mg/L and 30 mg/L, respectively. In some cases, like Co and Ni, the values selected for modelling were identified to be on the high end upon subsequent metallurgical testing. Thus, the concentrations for these elements modelled are conservative with respect to anticipated pore water concentrations of these elements post-remediation.

The basis of the selected concentrations for Restored Solution #1, which was the solution modelled in Appendix 7-C of the draft EIS, is provided below in Table 9. As Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone), this solution was carried forward for geochemical reactive transport modelling to evaluate environmental effects.

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Table 9: Groundwater Chemistry basis for Restored Solution #1

Metallurgical Test	2018 Pre-Feasibility: Restoration Phase Data	Coreflood 2B	Coreflood 2B	Coreflood 2B	Coreflood 3C	2021 Column, 2	2021 Column, 3	2021 Column, 4	2022 Column, 2a	2022 Column, 2c	2022 Column, 2d	2022 Column, 2e	2022 Column, 2e	Restored Solution #1	Notes on Value Carried Forward in Restored Solution for Model	
Sample Name	RPV30-23	D-CF2B-121-143	D-CF2B-134-144,146	D-CF2B-COMBINED-1 (D-CF2B-134-144,146)	D-CF3C-225-237	D-CL2-FW-2	D-CL3-FW-2	D-CL4-FW-2	D-CL2A-68	D-CL2C-114	D-CL2D-111	D-CL2E-63	D-CL2E-68			
Statistic	-	Average Value <sup>a</sup>	Average Value <sup>a</sup>	-	Average Value <sup>a</sup>	-	-	-	-	-	-	-	-			
Remediation Method	GW Flush	NaOH Neutralization	NaOH Neutralization	NaOH Neutralization	Bicarbonate Neutralization	Groundwater	Groundwater	NaOH Neutralization	NaOH Neutralization	GW Flush	GW Flush	GW Flush	NaOH Neutralization			
pH	pH units	3.87	4.4	4.42	2.97	2.6	2.44	2.66	3.80	2.58	2.46	2.48	4.05	4.3	High end of observed	
Eh	mV		520	525	Same as adjacent (D-CF3C-238-256)					570	542	426	648	-	Set in model to reflect oxidized conditions	
Pore Volumes of remediation	-	30-32	59-74	69-76		109-130				19.4	15.1	11.6	14.9	18.6	-	
Aluminum, dissolved	mg/L	5.6	9.7	10.3	7.0	<5	5.4	26	9.1	9.0	9.9	12	32.8	15.6	7	Low end of observed
Arsenic, dissolved	mg/L	<0.010	0.17	0.22	0.03	0.48	0.15	0.31	0.1	0.02	0.14	0.06	0.4	0.012	0.06	Low end of observed
Barium, dissolved	mg/L	<0.05	0.10	<0.1	<0.05	<0.1	<0.005	<0.05	<0.05	<0.05	<0.05	0.006	0.018	0.05		Mid range of observed
Total Inorganic Carbon (C(4))	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	58		Assumed to be approximately equivalent to GW values and considers some bicarbonate
Calcium	mg/L	109	228	210	-	81.7	11	43	23	21	22	380	20	35	110	Mid range of observed
Cadmium, dissolved	mg/L	<0.001	<0.1	<0.1	0.015	<0.1	0.061	0.033	0.020	0.051	0.001	0.004	0.0004	0.0003	0.015	Mid range of observed
Chloride	mg/L	37	-	-	-	1	<1	1	33	<1	6	3	9	200		Very limited information available. Set to a higher value to consider potential for values closer to baseline ore zone water quality
Cobalt, dissolved	mg/L		2.8	2.1	2.0	<0.1			0.15	0.03	0.16	0.53	0.42	2		High end of observed
Chromium, dissolved	mg/L	0.04	0.22	0.14	<0.05	<0.1	0.18	0.76	0.16	<0.05	<0.05	0.17	0.013	0.05		Mid range of observed
Copper, dissolved	mg/L	2.23	0.21	0.24	0.17	<0.1	6.2	5.8	9.2	25	3.1	3.2	20.1	4.7	0.17	Low end of observed
Fluoride	mg/L	NA	-	-	-	2.4	0.32	1.6	3	6.0	4.2	2	3			No data available at time of developing Restored Solution
Iron, dissolved	mg/L	54.1	378	334	324	13.0	23.2	92	40	124	33	75	74	57	100	Mid range of observed
Potassium	mg/L	<1	10.1	9.5	-	<8	3.5	4.7	1.5	3.7	1.5	5.6	1.9	1.4	9	High end of observed
Magnesium	mg/L	3.7	-	-	-	<6	0.6	11	0.2	3.0	0.4	4.4	38	43	6	Mid range of observed
Manganese, dissolved	mg/L	0.68	9.3	-	3.4	<8	0.57	0.63	0.85	2.0	0.98	4.1	0.31	0.30	3.4	Mid range of observed
Molybdenum, dissolved	mg/L	0.05	0.22	0.22	0.10	<0.1	0.16	2.1	0.10	0.05	0.05	0.03	0.58	0.019	0.1	Mid range of observed
Sodium	mg/L	221	283.2	351.0	-	120	3.1	4.1	2.8	760	3.0	4.3	3.7	378	190	Mid range of observed
Nickel, dissolved	mg/L	0.20	12.8	10.0	9.7	<0.1	0.56	3.2	0.75	0.55	0.06	0.35	1.04	0.92	9.7	High end of observed
Lead, dissolved	mg/L	3.08	2.9	3.41	3.1	1.8	4.97	0.68	0.96	1.3	0.22	0.10	2.64	0.50	3.1	Mid-high range of observed
Sulfate	mg/L	860	2700	2724	-	679	300	750	480	2180	470	1460	690	1220	620	Mid range of observed
Selenium, dissolved	mg/L	<0.025	0.31	0.23	0.08	<0.1	0.39	0.10	0.13	0.01	0.02	0.05	0.042	0.098	0.08	Mid range of observed
Si	mg/L	71.9	-	-	-	-	-	-	-	-	-	-	-	-	40	limited information available; value similar to available data assumed
Strontium, dissolved	mg/L		4.5	4.4	4.4	3.2	0.32	0.70	0.22	0.62	0.43	0.58	0.67	0.76	4.4	Upper range of observed
Zinc, dissolved	mg/L	1.48	1.6	1.4	1.4	0.14	1.7	3.6	3.0	10	0.14		0.20	0.13	1.4	Mid-range of observed
P	mg/L		-	-	-	<4									4	applied limited information
Uranium	mg/L	105	586	334	338	45.2	92	217	579	145	288	328	38.1	30.8	100	Mid-low end of observed; value set as upper bound in the EIS
Vanadium, dissolved	mg/L	0.09	2.9	0.8	0.51	0.32	0.35	2.8	1.1	0.13	0.70	0.51	1.8	0.006	0.51	Low end of observed
Polonium-210	Bq/L	6.3+/-0.5	-	-	1600	-	-	-	-	-	-	-	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228	Bq/L	-	-	-	<10	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-228	Bq/L	-	-	-	<3	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-230	Bq/L	105+/-9.6	-	-	<500	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Radium-226	Bq/L	65.8+/-0.3	-	-	<200	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Lead-210	Bq/L	530+/-1.3	-	-	2400	-	-	-	-	-	-	-	-	-	-	Not modelled (transport behaviour taken into account with Pb)
Thorium-232	Bq/L	0.2+/-0.04	-	-	0.05	-	-	-	-	-	-	-	-	-	-	Not modelled
Radium-226	mg/L	1.80E-06	-	-	<5.47E-06	-	-	-	-	-	-	-	-	-	5.47E-06	Limited data, high end value <sup>b</sup>
Thorium-230	mg/L	1.38E-04	-	-	<6.55E-04	-	-	-	-	-	-	-	-	-	3.93E-06	Limited data set <sup>b</sup>

Notes

<sup>a</sup> Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS

<sup>b</sup> Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.

Limited data set meant that PFS groundwater flushing data at pH 5.8 was also considered in setting this value, with a Th-230 concentration of 2.62E-07 mg/L and a Ra-226 value of 1E-05 mg/L (see Table IR-67-10)

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response - August 18, 2023

Table 10: Groundwater Chemistry basis for Restored Solution #2

Metallurgical Test		2018 Pre-Feasibility; Restoration Phase Data			Coreflood 3C	Coreflood 3C	2021 Column, 4	2022 Column, 2b	Restored Solution #2	Notes on Value Carried Forward in Restored Solution for Model
Sample Name		RPV 38-42	RPV 42-53	RPV 54-57	D-CF3C-238-256	D-CF3C-COMBINED-1 (D-CF3C-238-256)	D-CL4-FW-3	D-CL2b-116		
Statistic		-	-	-	Average <sup>a</sup>	-	-	-		
Remediation Method		GW Flush	Neutralization (NaHCO <sub>3</sub> )	GW Flush	Bicarbonate Neutralization	Bicarbonate Neutralization	Distilled Water Flush Post NaOH Neutralization	NaOH Neutralization		
pH	pH units	5.8	8.5	8.3	6.51	Same as adjacent (D-CF3C-238-256)	7.48	6.51	6.1	Low end of Observed
Eh	mV				402		-	387	-	Set in model to reflect oxidized conditions
Pore Volumes of remediation		-	76-84	82-108	-	131-162	-	18.70	-	
Aluminum, dissolved	mg/L	0.27	1.32	4.4	<5	0.56	0.70	10	0.56	Low end of observed
Arsenic, dissolved	mg/L	0.10	0.04	0.06	0.25	0.1	<0.01	0.000259	0.1	Upper end of observed
Barium, dissolved	mg/L	<0.05	0.05	0.04	<0.1	0.05	<0.05	0.2	0.05	Mid range of observed
Total Inorganic Carbon (C(4))		mg/L	-	-	-	-	-	-	105	Assumed to be approximately equivalent to GW values and considers some bicarbonate neutralization
Calcium	mg/L	28	13	5	48.1		16	127	10	Low end of observed
Cadmium, dissolved	mg/L	0.002	<0.001	<0.001	<0.1	0.004	0.004	<0.1	0.004	Mid range of observed
Chloride	mg/L	15	2	12			6	-	50	Set to a higher value to consider potential for values closer to baseline ore zone water quality
Cobalt, dissolved	mg/L				0.11	<0.01		<0.1	0.01	Low end of observed
Chromium, dissolved	mg/L	<0.01	<0.01	<0.01	<0.1	<0.05	0.05	<0.1	0.05	Mid range of observed
Copper, dissolved	mg/L	0.04	<0.01	<0.01	0.12	<0.02	0.33	0.2	0.02	Low end of observed
Fluoride	mg/L	0.5	1.2	0.8			1.4	-	0.8	Mid range of observed
Iron, dissolved	mg/L	6.13	0.44	1.23	9.1	4.7	1.7	10	4.7	Mid range of observed
Potassium	mg/L	<1	<1	2	<8		1.2	<8	3.5	Mid range of observed
Magnesium	mg/L	<1	<1	<1	6.7		1.2	<6	3	Mid range of observed
Manganese, dissolved	mg/L	0.07	0.02	0.05	<8	0.48	0.28	<8	0.48	Mid range of observed
Molybdenum, dissolved	mg/L	0.03	0.05	<0.005	0.47	0.13	<0.01	0.4	0.13	Mid range of observed
Sodium	mg/L	36	235	87	251		351	887	90	Low range of observed
Nickel, dissolved	mg/L	0.03	<0.01	<0.01	0.10	<0.01	0.21	0.1	0.01	Low end of observed
Lead, dissolved	mg/L	2.13	0.36	0.39	0.20	0.32	0.25	10.0	0.32	Mid range of observed
Sulfate	mg/L	174	117	100	718.7		440	2480	136	Low end of observed
Selenium, dissolved	mg/L	<0.025	<0.025	0.026	0.86	<0.01	0.09	<0.1	0.01	Low end of observed
Si	mg/L	43.7	43.8	44.4				132.6	40	Mid range of observed
Strontium, dissolved	mg/L				2.0	2.4	0.20	0.7	2.4	Upper end of observed
Zinc, dissolved	mg/L	0.08	<0.01	<0.01	0.10	<0.05	0.46	0.1	0.05	Mid-range of observed
P	mg/L				<4			<5	4	applied limited information available
Uranium (mg/L)	mg/L	3.5	4.1	0.5	19.3	26.4	187	38.7	30	Upper End of Observed
Vanadium, dissolved	mg/L	<0.01	0.007	0.03	0.13	0.16	0.03	0.2	0.16	Upper end of observed
Polonium-210	Bq/L	14.9+/-0.3	1.9+/-0.1	2.7+/-0.1	-	280	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228	Bq/L	-	-	-	-	<2	-	-	-	Not modelled
Thorium-228	Bq/L	-	-	-	-	<1	-	-	-	Not modelled
Thorium-230	Bq/L	0.2+/-0.03	1.36+/-0.14	3.2+/-0.4	-	<100	-	-	-	See Below for values in mg/L
Radium-226	Bq/L	389+/-0.7	262+/-0.5	129+/-0.4	-	370	-	-	-	See Below for values in mg/L
Lead-210	Bq/L	301+/-0.7	40+/-0.3	22+/-0.2	-	660	-	-	-	Not modelled (transport behaviour taken into account with Pb modelled)
Thorium-232	Bq/L	<0.01	<0.01	<0.01	-	0.007	-	-	-	Not modelled
Radium-226	mg/L	1.06E-05	7.17E-06	3.53E-06	-	1.01E-05	-	-	1.01E-05	Limited data, high end value
Thorium-230	mg/L	2.62E-07	1.78E-06	4.19E-06	-	<1.31E-04	-	-	1.31E-06	Limited data set ; Low end of observed

Notes

Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS

Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS, but not considered in the development of Restored Solution #2 as pH was alkaline

<sup>a</sup> Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.

### 3.0. Remediation of Mining Area within the context of ALARA (Addresses Question #3 of IR-67)

Section 2.2.3 of the draft EIS presents the conceptual decommissioning plan (CDP). As part of the CDP, and as highlighted in Section 2.3.3.1.1 of the draft EIS, remediation of the mining area will continue until recovered water reaches and is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives. Such decommissioning objectives consider protection of plausible downgradient water uses. For the purpose of the assessment "plausible use" has been determined to be the protection of aquatic life in Whitefish Lake, since numeric 3D groundwater modelling has indicated that Whitefish Lake is where groundwater associated with the remediated mining area will discharge to. It is within this frame of reference therefore that the ALARA concept should be considered. That is, ALARA can be defined for the purpose of the remediation of the mining area to the extent that subsequent discharge of groundwater to Whitefish Lake does not adversely affect aquatic biota in the lake.

The metallurgical testing done to date evidences an amelioration of UBS quality post-mining with flushing using groundwater and base (hydroxide or bicarbonate) to a restored solution of pH in the range of 4.5-5.5. The intent of the remediation approach is to raise the pH consistently but incrementally, so as to avoid over-neutralizing and yielding an alkaline solution. Alkaline pH conditions favour the formation of precipitates that are not desired from a physical (clogging) or chemical standpoint (secondary solids formed in place of removal of COPCs in the dissolved-phase from the subsurface). Potential environmental effects were thus evaluated based on plausible use, as defined above, at a pH and groundwater conditions that were shown to be achievable through groundwater flushing and addition of base without the risk of over-neutralization. Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone) and was carried forward for geochemical reactive transport modelling to evaluate environmental effects.

It is noted that the freeze wall will remain in place during mining area remediation (see draft EIS Section 2.3.3.1.1), until decommissioning objectives are achieved to ensure there is no loss of tertiary control of the mining fluid (even in a diluted state). Refinement of the mining area decommissioning objectives and associated modelling will be done as the Project progresses through updates to the Decommissioning Plan; nevertheless, the objectives as they may evolve will be bound by the objectives evaluated in the EIS, which as shown are protective of aquatic biota in Whitefish Lake. The final acceptable mining area decommissioning objectives will be developed prior to initiation of groundwater remediation, as part of the Detailed Decommissioning Plan (DDP).

#### References

Denison (Denison Mines Corp), 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report dated: September 24, 2018.

Denison (Denison Mines), 2023. Feasibility Study.

## IR-20, IR-67, IR-69 Appendix A

### 2018 Column Leach Testing

Table A1: Sample Inventory for 2018 ISR Column Leach Test

Original Sample Purpose	Sample I.D.	WR Hole No.	Lithology	Est. U%	Mass (g)	Mass U (g)
Porosity/Perm.	S066906	419D1	BSMT	0.22	320	0.61
Porosity/Perm.	S066907	525D2	SDST	0.06	323	0.17
Porosity/Perm.	S066908	405D1	SDST	0.06	270	0.14
Porosity/Perm.	S066909	405D1	BSMT	0.08	299	0.21
Porosity/Perm.	S066910	525D1	BSMT	51.72	843	375
Leach Testing	S066911	525D1	SDST	0.06	282	0.17
Leach Testing Composite Sample	S066912- S066916	525D1 525D2	SDST & BSMT	29.4	1,090	276
Leach Testing Total Composite Sample	S066906- S066916	405D1 419D1 525D1 525D2	SDST & BSMT	19.03 (wet)	3,427 (wet)	652.3

Table A2: Mineralogy of the Ore Zone\*

Unit	Mineral	Ideal Formula	Major (≥2% w/w)	Minor (< 2% w/w, or, shown to be present in Petrography or core logging)
Ore Zone	Pyrite	FeS <sub>2</sub>	X	
	Galena	PbS	X	
	Chalcopyrite	CuFeS <sub>2</sub>	X	
	Quartz	SiO <sub>2</sub>	X	
	Chlorite	(Fe,Mg) <sub>2</sub> (Al,Fe <sup>3+</sup> ) <sub>3</sub> Si <sub>3</sub> AlO <sub>10</sub> (OH) <sub>8</sub>	X	
	Muscovite/Illite	KAl <sub>2</sub> (Si <sub>3</sub> Al)O <sub>10</sub> (OH,F) <sub>2</sub>	X	
	Kaolinite	Al <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub>	X	
	Fe-oxy-hydroxides	FeO(OH)·nH <sub>2</sub> O	X	
	Uraninite	UO <sub>2</sub>	X	
	UO <sub>2</sub> .33	U <sub>3</sub> O <sub>7</sub>	X	
	UO <sub>2</sub> .25	U <sub>4</sub> O <sub>9</sub>	X	
	Schoepite	UO <sub>3</sub> ·2H <sub>2</sub> O	X	
	Siderite	FeCO <sub>3</sub>	X	
	Fluorite	CaF <sub>2</sub>	X	
	Gersdorffite	NiAsS		X
	Nickeline	NiAs		X
	Dravite	NaMg <sub>3</sub> Al <sub>6</sub> (Si <sub>6</sub> O <sub>18</sub> )(BO <sub>3</sub> ) <sub>3</sub> (OH) <sub>3</sub> (OH)		X
	Pyrrhotite	Fe <sub>1-x</sub> S (x=0-0.17)		X
	Sphalerite	(Zn,Fe)S		X
	Feldspar	KAlSi <sub>3</sub> O <sub>8</sub>		X
	Calcite	CaCO <sub>3</sub>		X
	Apatite	Ca <sub>5</sub> (PO <sub>4</sub> ) <sub>3</sub> (F,Cl,OH)		X
	Corundum	Cr <sub>2</sub> O <sub>3</sub>		X
	APS Minerals	CaAl <sub>3</sub> (PO <sub>4</sub> )(PO <sub>3</sub> OH)(OH) <sub>6</sub>		X

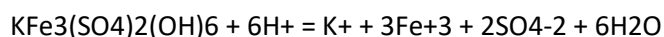
#### Notes

\*The table above is excerpted from Table 3-1 of Appendix 7-C of the draft EIS (mineralogy for other “Units” provided therein are not shown here)

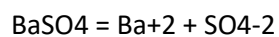
**Uraninite** **Blue bolded text** indicates dominant minerals; can be present at values exceeding 40% w/w

### Reactions forming secondary sulphate minerals

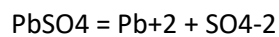
#### K-Jarosite



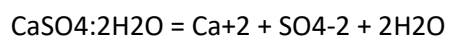
Barite



Anglesite



Gypsum





**IR-20, IR-67, IR-69 Appendix B**

**Table 3-5: Restored Solutions, UBS Composition representative of End of Mining conditions, and Representative Groundwater Composition by Hydrostratigraphic Unit**

Parameter/ Groundwater or Restored Solution	Unit	Ore Zone (GWR-032)	PWZ (GWR-031 and Cigar Lake)	Lower Sandstone Aquifer and Decalcified Zone (GWR-011)	Intermediate Sandstone Aquifer (GWR-046)	Overburden and Upper Sandstone Aquifer (GWR-036, Primarily)	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Restored Solution #1	50% Restored Solution #1	Restored Solution #2	50% Restored Solution #2
							Minimum	Maximum				
pH	unit	6.83	6.7	6.46	7.053	6.45	0.63	2.1	4.3	5.1	6.1	6.3
pe	unitless	-1.3	1.9	2.3	4.5	1.2	9.80	14.7	10	(set) 7	7.8	(set) 4
temp	°C	7	7	7	7	7	7	7	7	7	7	7
Al	mg/L	6.00E-04	3.40E-02	5.20E-02	8.00E-01	3.70E-02	6.90E+01	4.61E+03	7.00E+00	3.53E+00	5.60E-01	3.06E-01
As	mg/L	2.00E-04	5.00E-02	1.30E-03	4.75E-06	3.00E-04	<0.1	2.12E+01	6.00E-02	3.07E-02	1.00E-01	5.07E-02
Ba	mg/L	6.30E-02	3.60E-02	5.40E-02	2.41E-01	5.70E-03	<0.05	<0.5	5.00E-02	5.20E-02	5.00E-02	5.20E-02
C(4)	mg/L	1.76E+02	1.54E+02	8.66E+01	1.01E+02	3.39E+01	-	-	5.80E+01	7.23E+01	1.05E+02	9.58E+01
Ca	mg/L	5.50E+01	6.76E+00	9.78E+00	1.07E+01	2.70E+00	5.80E+01	7.23E+02	1.10E+02	6.00E+01	1.00E+01	9.89E+00
Cd	mg/L	1.00E-05	1.00E-05	1.00E-05	3.36E-05	1.00E-05	1.80E-02	1.81E+00	1.50E-02	7.52E-03	4.00E-03	2.01E-03
Cl	mg/L	1.90E+02	8.65E+01	7.20E+00	8.63E+00	6.86E+00	<10	1.22E+03	2.00E+02	1.04E+02	5.00E+01	2.86E+01
Co	mg/L	1.00E-04	1.00E-02	1.00E-04	5.84E-03	4.00E-04	5.00E-01	1.49E+01	2.00E+00	1.00E+00	1.00E-02	5.05E-03
Cr	mg/L	5.00E-04	4.50E-03	5.00E-04	1.69E-03	5.00E-04	<0.1	9.14E+00	5.00E-02	2.53E-02	5.00E-02	2.53E-02
Cu	mg/L	2.00E-04	5.00E-03	1.80E-03	6.29E-03	6.00E-04	5.16E+00	9.64E+02	1.70E-01	8.60E-02	2.00E-02	1.09E-02
F	mg/L	2.30E-01	5.30E-01	1.80E-01	5.90E-02	6.00E-02	1.00E+00	3.40E+01		9.00E-02	8.00E-01	4.90E-01
Fe	mg/L	4.20E+00	4.90E-01	8.60E-01	6.03E+00	4.05E-01	8.20E+02	4.09E+03	1.00E+02	5.05E+01	4.70E+00	2.78E+00
K	mg/L	4.60E+00	5.60E+00	2.00E+00	6.77E+00	2.80E+00	6.20E+00	1.49E+02	9.00E+00	5.51E+00	3.50E+00	2.75E+00
Mg	mg/L	1.10E+01	3.09E+00	1.60E+00	3.91E+00	1.80E+00	<10	2.40E+02	6.00E+00	3.80E+00	3.00E+00	2.30E+00
Mn	mg/L	2.20E-01	7.00E-01	3.60E-01	3.91E+00	1.40E-01	2.70E+00	4.10E+01	3.40E+00	1.88E+00	4.80E-01	4.20E-01
Mo	mg/L	3.80E-03	1.28E-02	4.20E-03	3.89E-03	7.00E-04	1.65E+00	5.96E+01	1.00E-01	5.22E-02	1.30E-01	6.71E-02
Na	mg/L	8.10E+01	7.61E+01	6.10E+00	8.96E+00	2.90E+00	6.00E+00	1.23E+04	1.90E+02	9.82E+01	9.00E+01	4.81E+01
Ni	mg/L	1.00E-03	1.50E-02	1.00E-04	4.87E-02	1.80E-03	<1	2.68E+01	9.70E+00	4.86E+00	1.00E-02	5.05E-03
Pb	mg/L	1.00E-04	1.00E-04	1.00E-04	1.57E-03	1.00E-04	2.00E-01	1.95E+01	3.10E+00	1.55E+00	3.20E-01	1.60E-01
S(6)	mg/L	1.30E+01	4.55E+00	4.70E+00	1.01E+01	1.90E+00	5.21E+03	2.09E+05	7.03E+02	3.54E+02	1.36E+02	7.04E+01
S(-2)	mg/L	1.00E-08	1.00E-09	1.00E-09	1.00E-09	1.00E-09	-	-	1.00E-09	1.00E-09	1.00E-09	1.00E-09
Se	mg/L	1.00E-04	1.00E-04	1.00E-04	3.59E-04	8.00E-04	<0.025	2.64E+01	8.00E-02	4.01E-02	1.00E-02	5.05E-03
Si	mg/L	1.33E+01	9.18E+00	2.41E+01	1.31E+01	2.62E+01	3.07E+01	1.92E+02	4.00E+01	3.21E+01	4.00E+01	3.21E+01
Sr	mg/L	1.66E+00	1.17E+00	1.20E-01	1.15E-01	1.20E-02	6.00E-01	5.19E+00	4.40E+00	2.26E+00	2.40E+00	1.26E+00
Zn	mg/L	2.62E+00	4.25E-03	1.20E-02	1.25E-02	4.40E-03	2.30E+00	3.31E+02	1.40E+00	7.07E-01	5.00E-02	3.10E-02
P	mg/L	1.00E-02	1.00E-02	1.00E-01	5.00E-02	4.00E-02	2.20E+00	7.54E+01	4.00E+00	2.05E+00	4.00E+00	2.05E+00
U	mg/L	1.10E-02	1.24E-02	7.00E-04	2.26E-02	5.00E-04	7.70E+02	3.88E+04	1.00E+02	5.01E+01	3.00E+01	1.50E+01
V	mg/L	1.00E-04	1.00E-04	1.00E-04	1.20E-03	1.00E-04	6.16E+00	1.61E+02	5.10E-01	2.55E-01	1.60E-01	8.01E-02
<sup>226</sup> Ra	mg/L	4.92E-06	5.47E-09	1.37E-08	2.54E-08	1.64E-09	6.29E-06	8.21E-05	5.47E-06	2.75E-06	1.01E-05	5.06E-06
<sup>230</sup> Th	mg/L	9.17E-06	1.00E-06	1.31E-07	2.62E-07	2.62E-08	2.75E-02	2.88E-01	3.93E-06	2.02E-06	1.31E-06	7.14E-07

## Attachment: IR-21

Number	IR-21
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.3, Project Description
Context and Rationale	<p>Context: The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p>Rationale: From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>
Information Requirement	Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.

### Response:

RESPEC (2023) memo is attached here to support the IR response provided in the table.



## EXTERNAL MEMORANDUM

**To:** Xavier Lu Dac  
Dana Harris  
Denison Mines Corporation  
230-22nd Street East  
Suite 200  
Saskatoon, SK S7K 0E9

**cc:** Project Central File 02924

**From:** Neel Gupta  
Cody Vining  
Brett Dueck  
RESPEC  
3824 Jet Drive  
Rapid City, SD 57703

**Date:** July 14, 2023

**Subject:** Results of a Geomechanical Study Investigating the Stability of the Rock Mass in Response to In Situ Recovery of Uranium-Enriched Rock for the Wheeler River Uranium Project

Denison Mines Corporation (Denison), a uranium exploration and development company, has a flagship Wheeler River Uranium project. This project is the largest undeveloped in situ recovery (ISR) uranium project in Northern Saskatchewan's eastern Athabasca Basin. The project site is located approximately 35 kilometers (km) north-northeast of the Cameco Corporation (Cameco) Key Lake operation and 35 km southwest of the Cameco McArthur River operation in the eastern Athabasca Basin. Denison proposes developing the Phoenix deposit in this region.

At the Phoenix deposit, Denison plans to drill the set of injection/recovery wells for ISR of uranium-enriched rock through leaching with a freeze wall isolating the operations from the surrounding rock mass. In response to the leaching process, the remnant ore zone may displace or fail and may no longer be able to support the overburden load while causing instability in the surrounding rock mass because of the stress redistribution. Denison, therefore, has requested a geomechanical study to analyze the geomechanical stability of the rock mass around the excavation and freeze wall from the leaching process. This memorandum documents the geomechanical study and briefly discusses the study objectives and approach, significant results, and conclusions.

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## STUDY OBJECTIVES AND APPROACH

In a recent geomechanical study [Vining et al., 2023], RESPEC Company, LLC (RESPEC) developed a three-dimensional (3D) strip model of a specific geological section where maximum ore extraction is planned to investigate the stability of the mined cavity and estimate the surface disturbance. The boundary conditions of the strip numerical model assumed an infinite array of the modeled cross-section, where ore extraction is maximum, along the length of the Phoenix deposit. Considering the boundary conditions of the strip model and presuming the average material properties of key stratigraphic layers, the numerical model predicted surface displacement of approximately 7.5 centimeters (cm) and marginal stability of the rock mass limited to the extent of 16 meters (m) from the top extent of mined excavation.

The primary objectives of the current study are evaluating the geomechanical stability of the rock mass around the excavation and proposed freeze wall in response to the in situ leaching operations in Zone A of the Phoenix deposit. To achieve the desired objectives, RESPEC modified the previously developed 3D strip model [Vining et al., 2023] to create a full-scale 3D model using the structural finite difference program *FLAC3D* [Itasca Consulting Group, Inc., 2021] while presuming the similar, average material properties of key stratigraphic layers. Considering the computational time and analysis effort, creating a numerical model that extends across the entire extent of Zone A is impractical. Because the *FLAC3D* program imposes a plane of symmetry along its boundaries, RESPEC, in consultation with Denison, simulated the half-length of Zone A, and the modeling domain encompasses the Phoenix deposit's northeast extent, as shown in Figure 1. The vertical extent of the 3D model is assumed to be 1,000 m below ground surface (bgs), and the lateral boundary is approximately 135 m away from the extent of the low-grade ore zone. The model boundaries located far away from the excavation boundaries isolated the influence of model boundaries on the excavation response. The kinematic boundary conditions of the numerical model prevent normal (horizontal) displacements along the four vertical boundaries of the model and vertical displacements of the bottom boundary. These constraints allow the interior portion of the model to move freely. In situ stress data were not available for the Phoenix deposit. The vertical stress was assumed to be lithostatic (i.e., equal to the weight of the overburden) and determined as a function of depth from the weight of the overburden. In rock mass, the horizontal stress is considered isotropic (i.e., maximum and minimum horizontal stress equal to the vertical stress). For instance, at the depth of 400 m bgs, the average in situ vertical stress is approximately 10 megapascals (MPa).

Denison provided the AutoCAD drawings of key stratigraphic layers in the Phoenix deposit, which were used to develop the 3D structural model. Table 1 summarizes these stratigraphic layers. Figure 2 presents the elevation view of the 3D model, which illustrates the continually changing elevations and thicknesses of the rock layers, for example, upper and lower clay, sandstone with sulfide, and altered basement. Except for the desilicified sandstone and sandstone with sulfide, the modeled stratigraphic units and their material properties are consistent with the 3D strip model in the previous geomechanical study [Vining et al., 2023]. In consultation with Denison, RESPEC assumed the Mohr-Coulomb property of sandstone with sulfide was similar to altered sandstone and the desilicified sandstone was similar to sand [Terzaghi and Peck, 1967].

Random rock removal was adopted to represent the in situ leaching process in the numerical model. Rock removal included the instantaneous excavation of 30 percent of rock by volume from the high-grade ore zone and 3 percent from the low-grade ore zone. According to Denison, high- and low-grade ore zones are based on the uranium grade and encompass different stratigraphic layers (e.g., upper clay, lower clay, ore zone) within the Phoenix deposit. Denison plans to adopt the freeze wall design for ISR of uranium-enriched rock; therefore, RESPEC explicitly modeled the freeze wall, which

was 20 m thick and located at a distance of 15 m from the extent of the low-grade ore zone. Figure 3 presents the vertical extent of the high- and low-grade ore zones on the vertical plane and surrounding freeze wall.

In the numerical simulation, the pressure at the excavation surface was maintained at a pressure equivalent to a wellhead pressure of 0 MPa with a freshwater gradient of 0.01 MPa/m. Considering that the overlying sandstone is fractured and permeable, and the elevation of the potentiometric surface is near the ground level, RESPEC also simulated the influence of porewater pressure on the predicted stresses and displacement, which is consistent with the previous study [Vining et al., 2023].

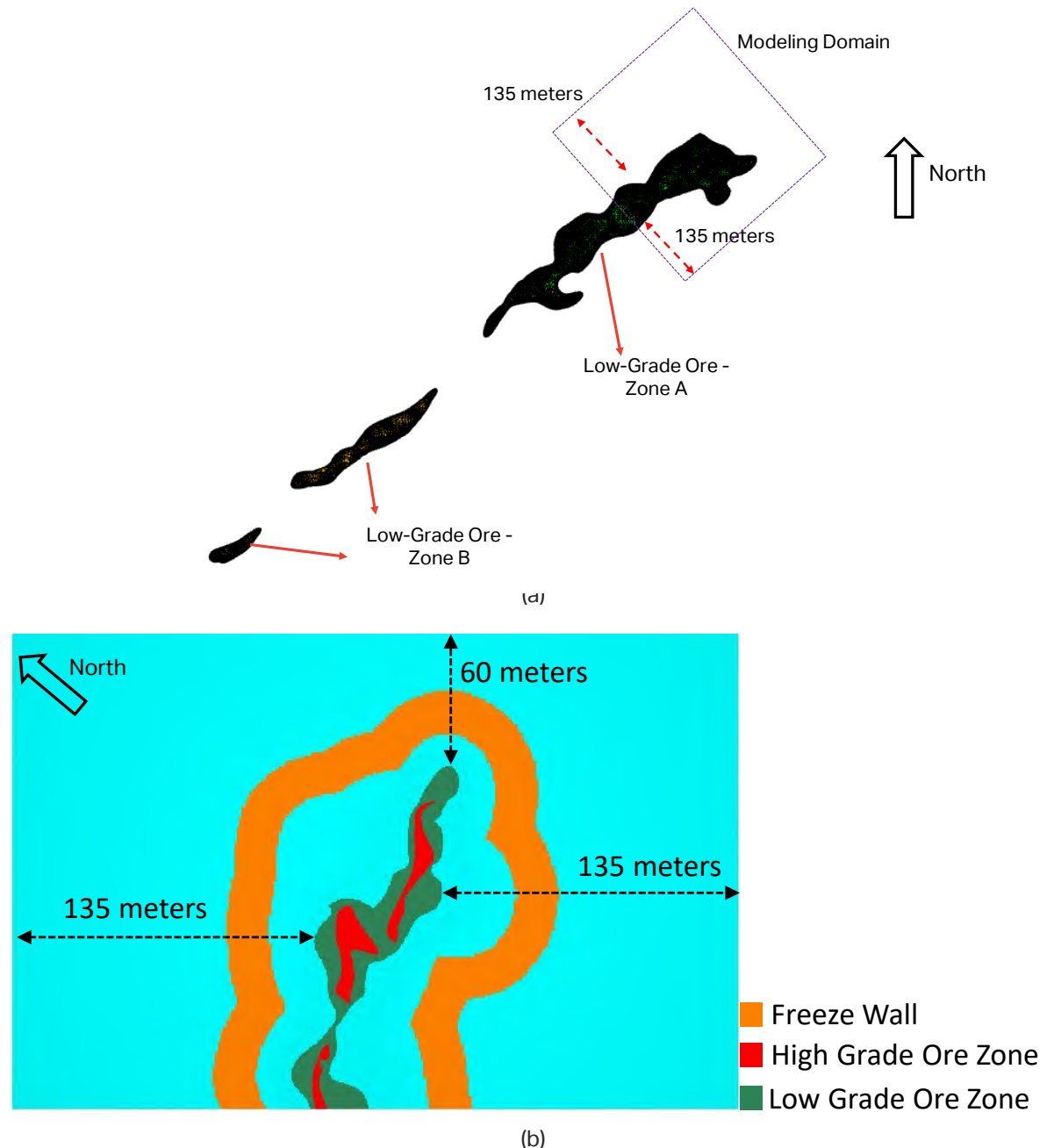


Figure 1. Plan View of the (a) Low-Grade Ore in Zone A and Zone B of the Phoenix Deposit and (b) Extent of Modeling Domain.

Table 1. Average Material Properties

Stratigraphy	Cohesion (MPa)	Friction Angle (degree)	Rock-Mass Compressive Strength (MPa)	Tensile Strength (MPa)	Rock-Mass Modulus (MPa)	Poisson's Ratio (—)	Density (g/cc)
Overburden	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Stiff Sandstone	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Altered Sandstone	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Sandstone with Sulfide	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Desilicified Sandstone	0.0	30.0	0.0	0.0	1,363.76	0.25	2.1
Upper Clay	0.03	16.6	0.12	0.20	55.17	0.28	1.7
Ore Zone	0.22	20.11	0.54	0.51	188.75	0.28	4.2
Lower Clay	0.15	18	0.48	0.20	206.43	0.28	1.7
Altered Basement	2.72	25.88	9.17	1.2	4,254.55	0.15	2.1
Stiff Basement	5.57	31.46	20.34	10.7	11,564.83	0.11	2.7

g/cc = grams per cubic centimeter

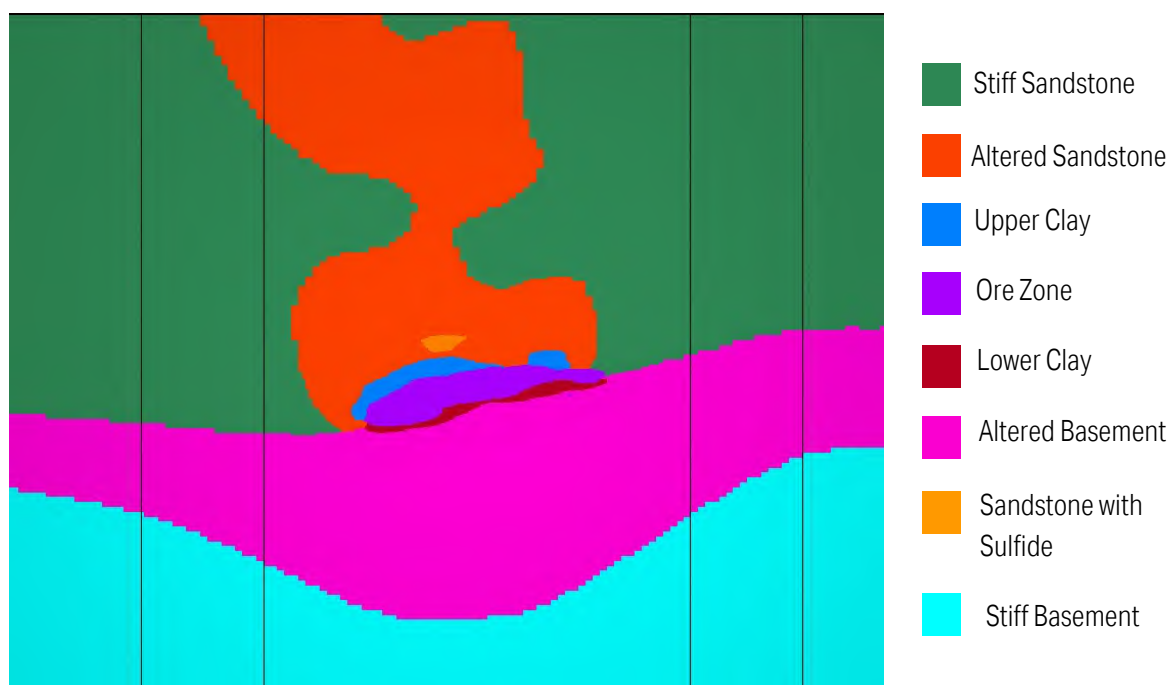


Figure 2. Elevation View of the Numerical Model Illustrating Changing Elevation of Different Stratigraphic Units Represented in the Structural Model.

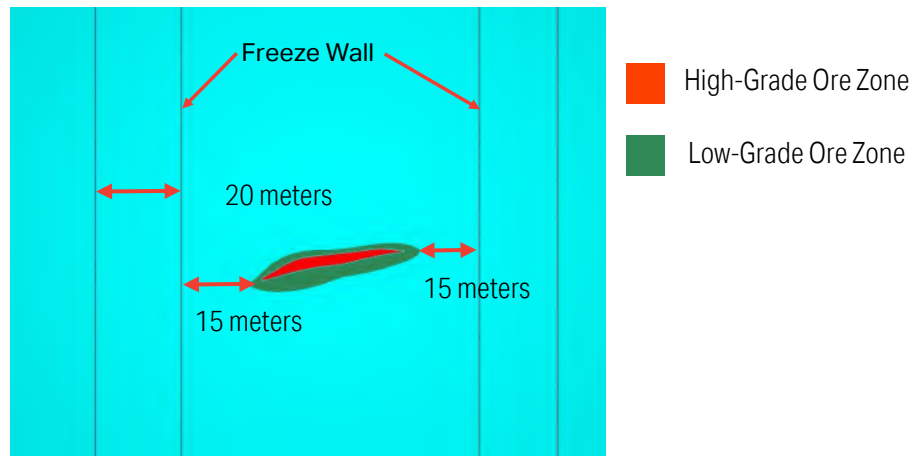


Figure 3. Elevation View of the Numerical Model Illustrating the Relative Location of the Freeze Wall to the High- and Low-Grade Ore Zones in Zone A of the Phoenix Deposit.

## RESULTS

The numerical model-predicted stresses and displacements were scrutinized to assess the surface subsidence and the stability of the remaining ore zone, surrounding rock mass, and freeze wall. The outcomes of the numerical simulation are discussed in the following subsections.

### ROCK STABILITY

RESPEC simulated the rheological behavior of rock presuming the Mohr-Coulomb constitutive model for each stratigraphic unit to analyze the stress redistribution in case of failure of the remnant rock around the excavation. In the post-simulation analysis, the Mohr-Coulomb Factor of Safety (MCFS) was determined to quantify the competency of the rock mass based on the predicted stress fields. The MCFS value greater than, equal to, or less than 1.0 quantifies the material as not failing, at failure, or failed, respectively. The potential for tensile fracturing in the rock mass was also analyzed using the least compressive principal stress (LCPS). The magnitude of LCPS will be positive at locations where a tensile stress component exists in any direction. Site-specific strength properties of the rock after freezing were unavailable at the time of the study; therefore, RESPEC took a conservative approach and assumed that the properties of the freeze wall were similar to the host rock.

Figures 4 and 5 present the MCFS contour and LCPS contour, respectively, on a horizontal plane passing through the depth of 390, 399, 406, and 413 m bgs. Figures 6 and 7 present the MCFS and LCPS contour on multiple vertical planes. MCFS contour (Figures 4 and 6) presents that the failure conditions (i.e., red contour) are limited within the close proximity (i.e., 5 to 8 m) of the low-grade ore zone, and its lateral extent varies with the depth of the ore zone below the ground surface. However, the MCFS is always greater than 2.50 within the modeled extent of the freeze wall. LCPS contour (Figures 5 and 7) presents that the marginally compressive stress conditions (i.e., yellow and red contours) are predicted within the extent of the low-grade ore zone, and compressive stresses greater than 5 MPa are predicted within the proposed extent of the freeze wall. Figure 8 quantifies the failure volume predicted within the different stratigraphic units. Within the modeled domain of Zone A, the predicted failure volume was approximately 8, 22, 41, and 26 percent of the modeled volume of sandstone with sulfide, upper clay, ore zone, and lower clay, respectively. However, the failure volume is less than 0.02 percent of the modeled volume of stiff or altered sandstone, desilicified sandstone, and altered and stiff basement rock. Additionally, 0 percent failure volume is predicted within the freeze wall.



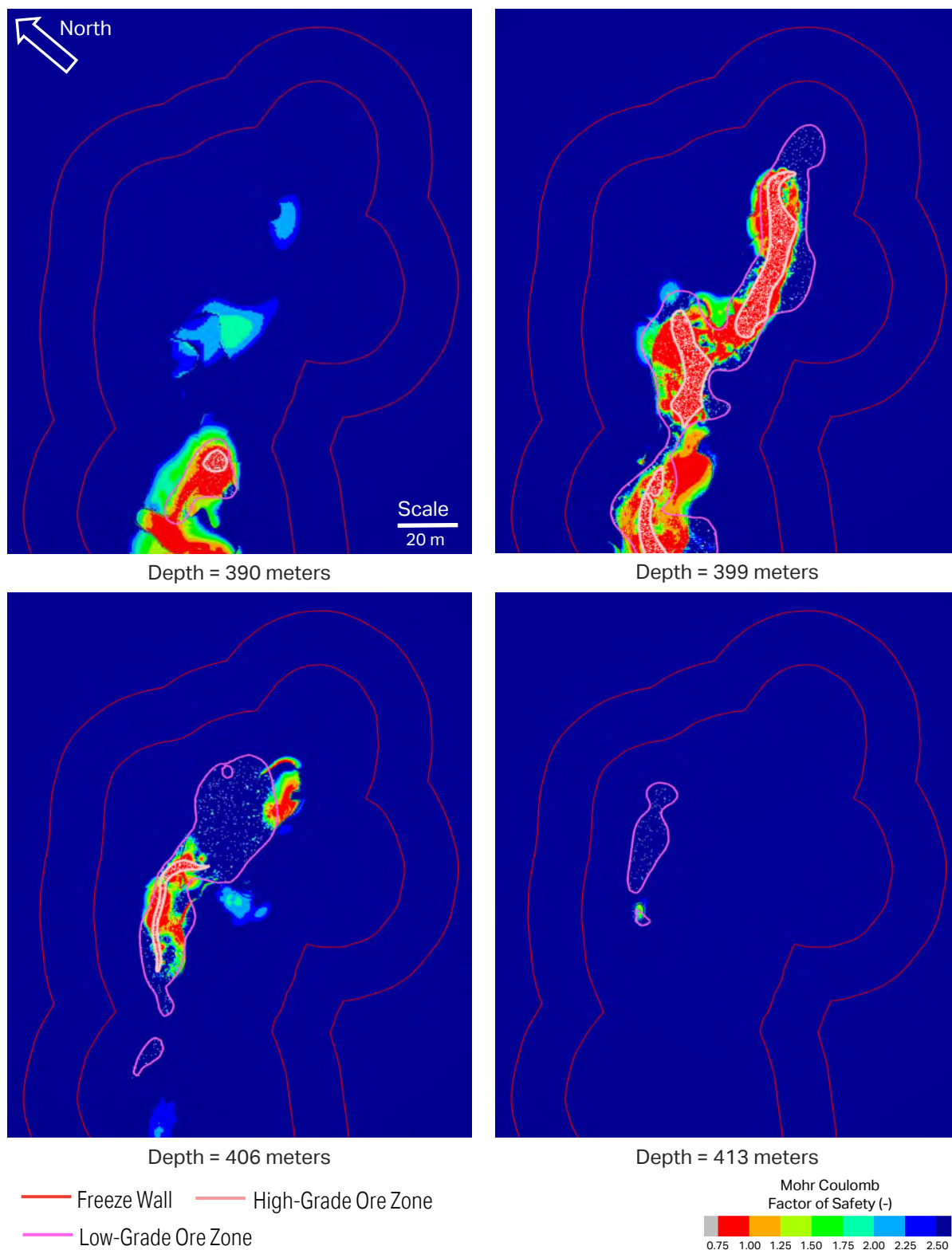


Figure 4. Plot of Mohr-Coulomb Factor of Safety Values on a Horizontal Plane Passing at a depth of 390, 399, 406, and 413 Meters Below Ground Surface.

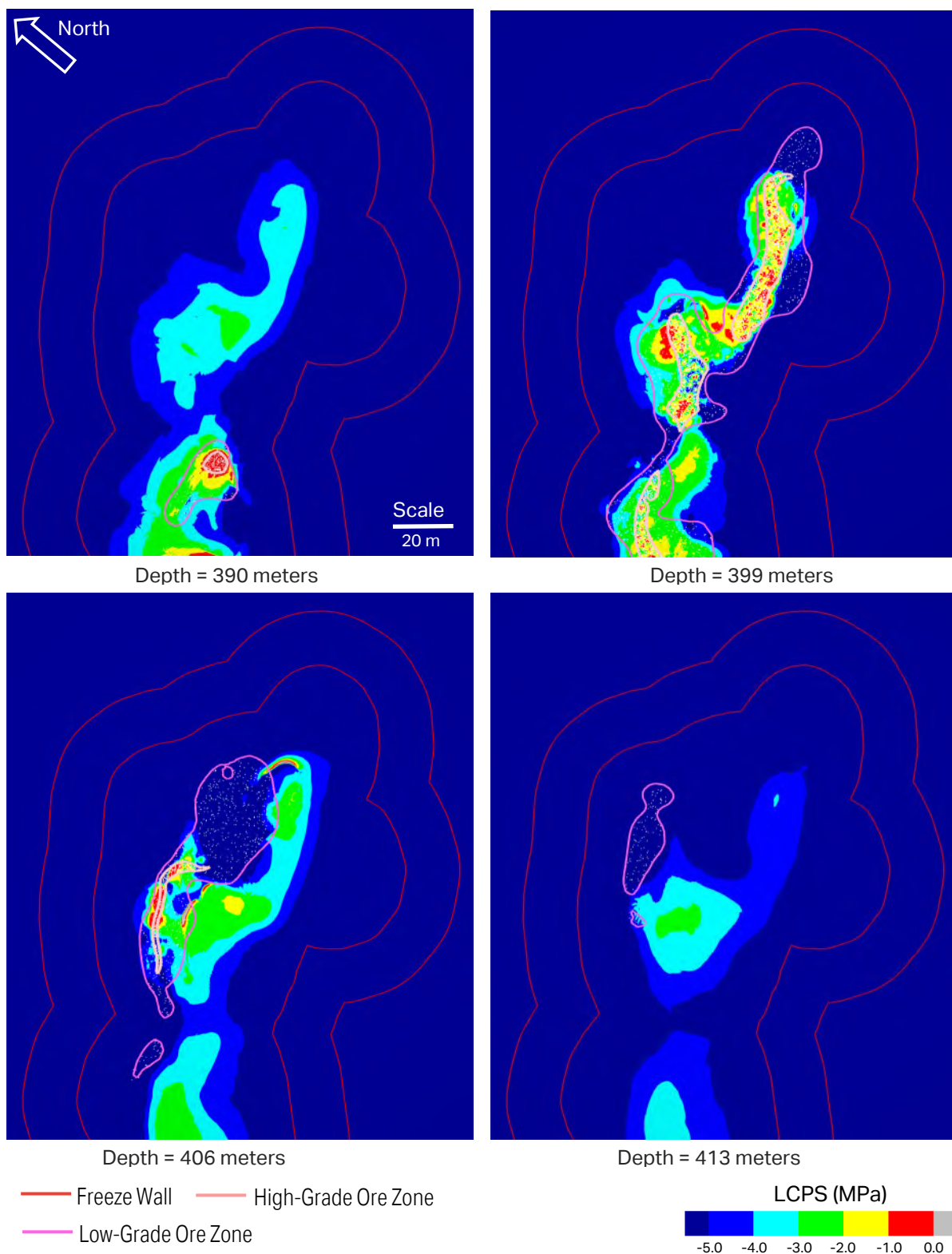


Figure 5. Plot of Least Compressive Principal Stress Values on a Horizontal Plane Passing at a Depth of 390, 399, 406, and 413 Meters Below Ground Surface.

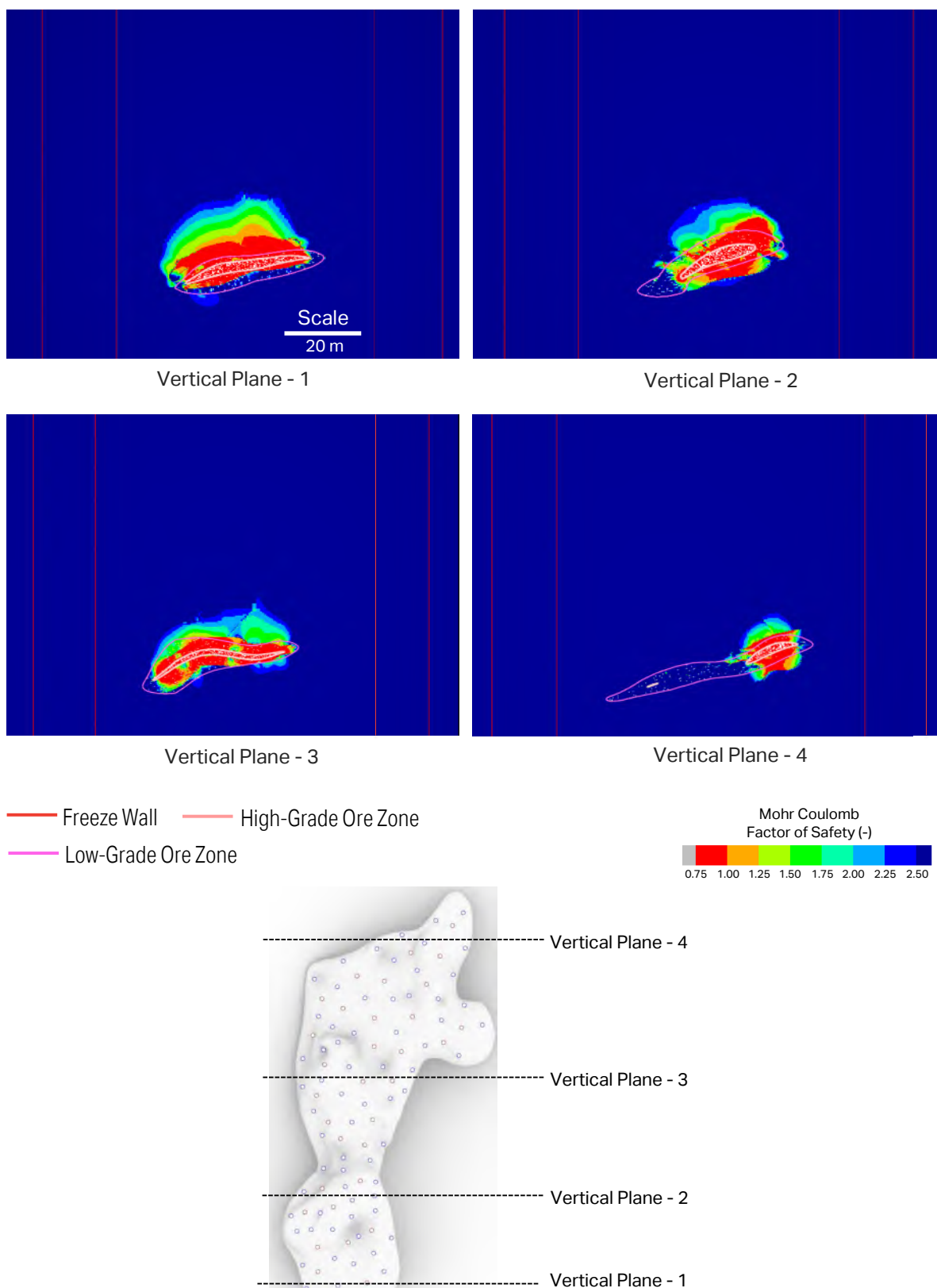


Figure 6. Plot of Mohr-Coulomb Factor of Safety Values on Multiple Vertical Planes.

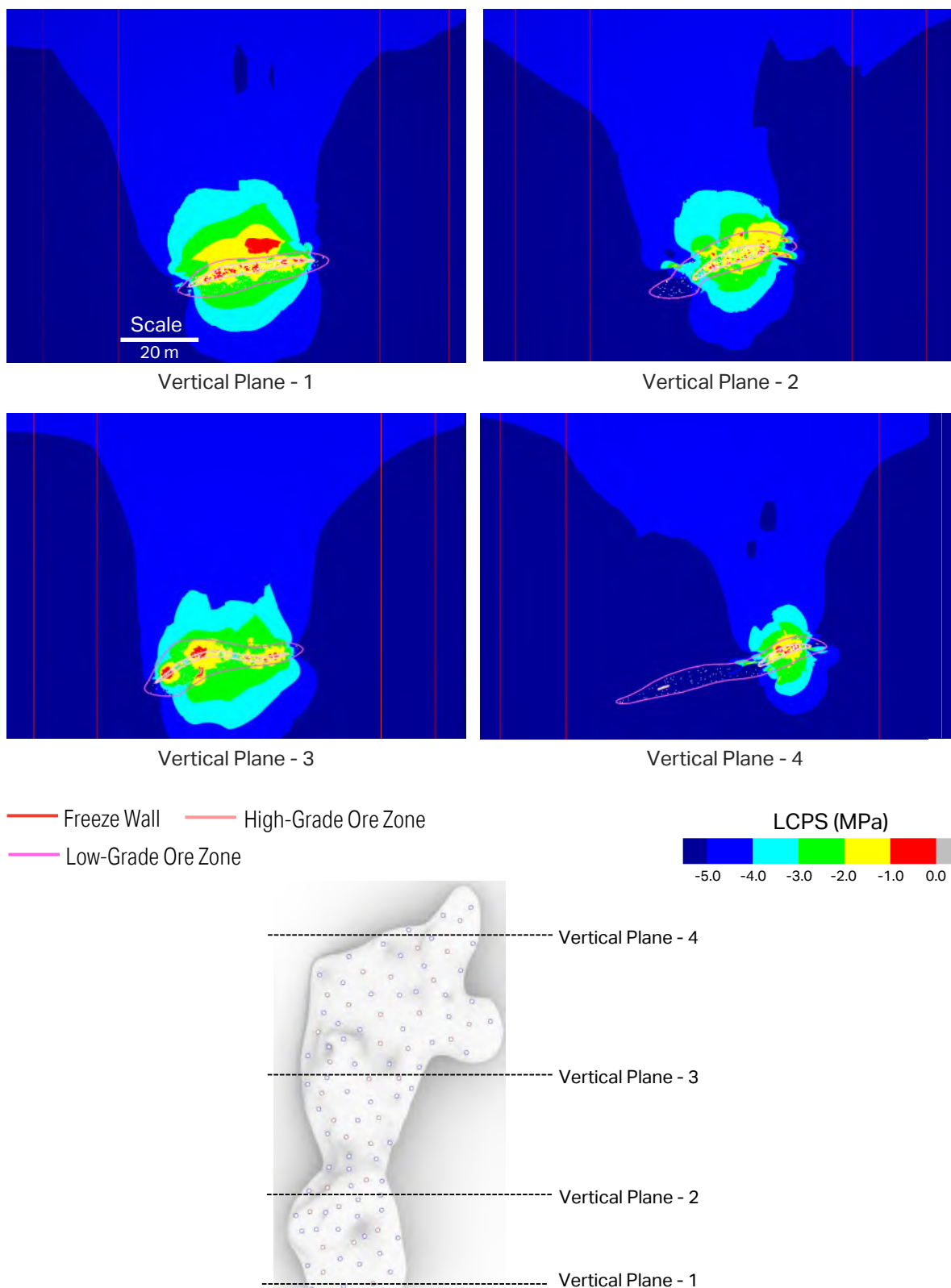


Figure 7. Plot of Least Compressive Principal Stress Values on Multiple Vertical Planes.

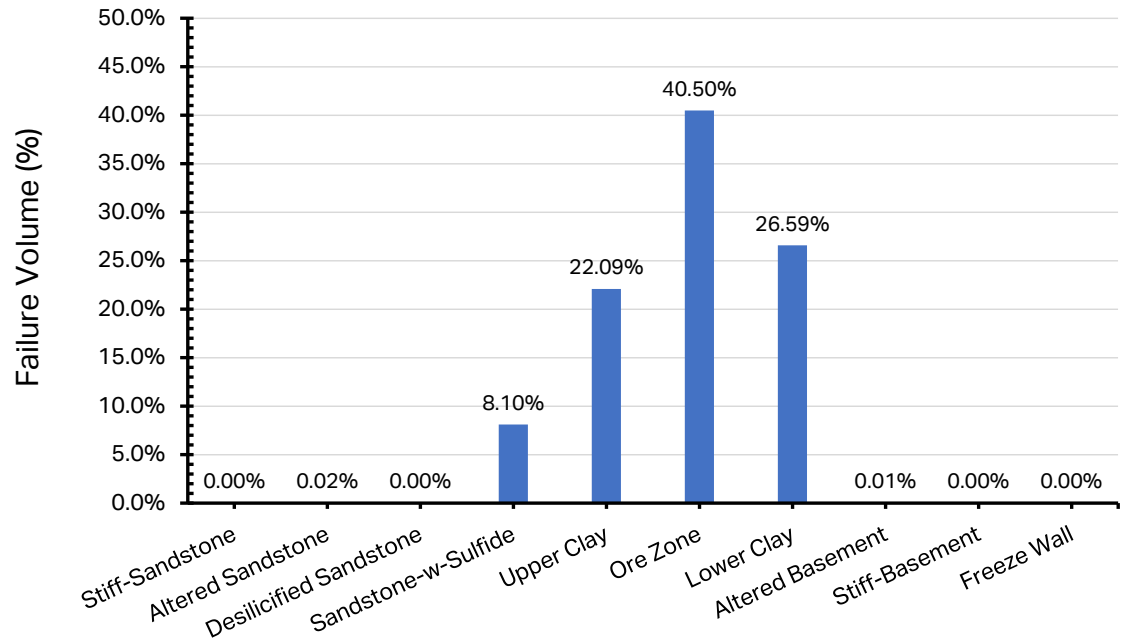


Figure 8. Failure Volume in Different Stratigraphic Units.

### SURFACE SUBSIDENCE

In response to the proposed leaching process, the surrounding host rock will displace into the mined cavity, which manifests as subsidence at the ground surface. The numerical model predicted the negligible vertical displacement of approximately 2.5 millimeters (mm) on the ground surface. Figure 9 presents the contours of vertical displacement predicted on a vertical plane passing through the modeling domain's southern boundary. The contour on the vertical plane presents that the vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm and quickly reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. The current study's numerical model-predicted surface subsidence is significantly smaller than the surface subsidence of 7.5 cm predicted in the previous geomechanical study [Vining et al., 2023], which is likely attributed to the difference in the modeling domain and boundary conditions between the two models. In the previous study, the 3D strip model presumed an infinite array of modeled cross sections and corresponding excavation of uranium-enriched rock; in the current study, the full-scale model included the representative extent of Zone A at the Phoenix deposit.



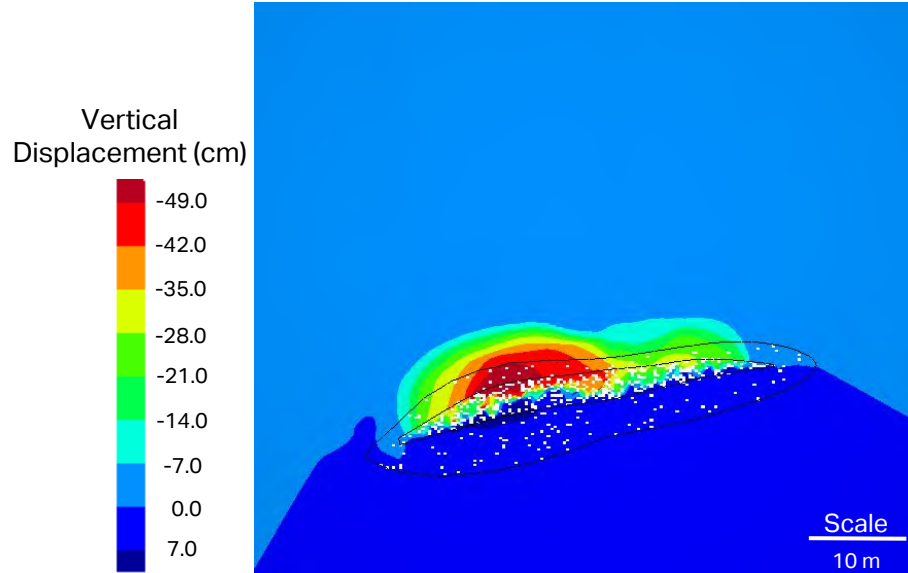


Figure 9. Contour of Vertical Displacement After the Proposed Volumetric Extraction on a Vertical Plane Passing Through the Modeling Domain's Southern Boundary.

## CONCLUSIONS

The study objective was to better understand the anticipated response of the surrounding rock mass, particularly the freeze wall, after proposed volumetric rock extraction from the high- and low-grade ore zone. The significant outcomes from this study are as follows:

- / **The geomechanical numerical model predicted stability against shear or tensile failure within the proposed extent of the freeze wall.** Considering the average estimate of the material properties of modeled stratigraphic layers, the predicted failure conditions in the rock mass are limited to 5 to 8 m of the extent of the low-grade ore zone. Within the proposed extent of the freeze wall, the MCFS values are greater than 2.50, and the magnitude of LCPS is greater than 5 MPa in compression, indicating the limited potential of instability in the freeze wall.
- / **The numerical model predicted vertical displacement at the surface in response to the proposed volumetric extraction is negligible.** The vertical displacement of the rock mass near the modeling domain's southern extent is at a maximum immediately above the low-grade ore zone, ranging between 42 and 49 cm, which reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. At the ground surface, the average vertical displacement is approximately 2.5 mm.

## REFERENCES

Itasca Consulting Group, Inc., 2021. *FLAC3D: Fast Lagrangian Analysis of Continua in 3 Dimensions*, 7<sup>th</sup> Edition (Version 7.00.154), Minneapolis, MN.

Terzaghi, K., and R. B. Peck, 1967. *Soil Mechanics in Engineering Practice*, 2<sup>nd</sup> Ed., John Wiley & Sons, New York, NY.

Vining, C. A., N. Gupta, and J. Nopola, 2023. *Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 2)*, RSI(RCO)-2924/5-21/14, prepared by RESPEC, Rapid City, SD, for X. Lu Dac and D. Harris, Denison Mines Corporation, Saskatoon, SK, February 9.

## Attachment: IR-24

Number	IR-24
Dept.	CNSC
Project effects link	Alternative Means
Reference to EIS, appendices, or supporting documentation	Section 2.10.2 Alternative Means
Context and Rationale	<p>Context: While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Rationale: As noted in the Agency’s Operational Policy Statement on Addressing “Purpose of” and “Alternative Means” under the CEAA 2012: “If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice.”</p>
Information Requirement	<p>Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Note: In addition to the adding text to summarize, Table 6 in Appendix 2-C could be useful to understanding table 2.10.1 in the EIS.</p>

### Response:

*Revised text for final EIS, Section 2.10.2.*

#### **2.10.2 Alternatives Means Assessment**

Denison first evaluated production potential from the Project in 2010. Since that time, the Project has undergone significant design and review stages and has naturally evolved into the Project described and assessed in this EIS. Appendix 2-C provides details related to the alternative means assessment framework employed and the results of the alternatives assessment for key Project components and activities; this section of the EIS provides a summary of Appendix 2-C.



Alternative means are the various ways Denison considered to implement Project components and activities. During the planning process, it is common to consider various means by which to fulfill a specific aspect of the Project.

A systematic assessment of these alternatives was used to select preferred alternatives that are carried forward as Project design elements in a manner consistent with Canadian Environmental Assessment Agency's operational policy statement (Canadian Environmental Assessment Agency 2015). These preferred alternatives ultimately become the basis upon which potential Project-related effects are evaluated in the EIS. The preferred alternatives have been presented in the preceding section of this Project Description. The documentation of this systematic alternative assessment provides transparency and traceability with respect to decision making on Project design. It also documents how input received by Indigenous groups and other Interested Parties has been considered in the design/planning process.

The alternative means assessment has been carried out in a stepwise fashion as follows (Figure 2.10-1):

1. Identification of Alternative Means: Project components for which alternate means were considered are identified;
2. Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors: the technical and economic feasibility of these alternate means is considered along with a specific screening for land use intensity and importance. Only alternate means that are deemed technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.
3. Potential Residual Effects Associated the Alternative Means: the potential residual effects of each alternative, in consideration of mitigation, are described; and,
4. Evaluation of Alternative Means: a comparative evaluation of alternative means that considers the potential residual effects for each alternative relative to various assessment criteria and indicators.

A description of the above four steps along with an example from Appendix 2-C (for Mining - Method) is provided in the following sections.

#### **2.10.2.1 Identification of Alternative Means**

Several Project components and activities had alternate means or options considered:

- Mining
  - Method
  - Freeze design for tertiary containment of mining solution
  - Permeability enhancement

- Mining solution
- Processing
  - Location of processing
  - On-site processing method
- Water management
  - Freshwater supply
  - Drinking water
  - Treated effluent discharge location
  - Treated effluent discharge location to surface water
- Waste management
  - Organic waste disposal
  - Process precipitate management
  - Domestic waste disposal
- Access and transportation
  - Access road alignment
  - Stream crossing structures
  - Worker transportation
- Power
  - Primary power supply
- Support facilities
  - Camp location optimization

For each Project component or activities listed above, a variety of options were considered. For example, the options considered under Mining – Method included:

- Option 1: Open pit
- Option 2: Jet boring
- Option 3: Surface boring
- Option 4: Micro tunnel boring
- Option 5: ISR

#### **2.10.2.2 Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors**

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015).

Denison integrated an additional category at this early stage in the alternative means assessment framework: land use screening. Although technical feasibility can include land use considerations, Denison opted to include land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by interested parties. In conjunction with screening for technical and economic feasibility, an initial evaluation was conducted to review Indigenous and other land use in the area to identify alternative means that may interact with areas of high land use intensity or areas of cultural importance (e.g., known gravesites). Consideration was given to information made available to Denison in the early stages of project planning. Note that subsequent, additional consideration of engagement information, including Indigenous and other land and resource use is completed at later stages in the alternatives means assessment framework (Section 2.10.2.4). The purpose of considering land use information at this stage was to identify land use that could compromise the feasibility of the Project and screen an alternative means out from additional evaluation.

For each Project component or activity, a consideration of the technical, economic, and land use characteristics of each alternative was considered. The purpose of this step in the alternative means assessment framework is to identify feasible alternatives for further assessment and to eliminate those alternative means that are not considered to be feasible from a technical, economic, or land use lens. Only those alternatives that are deemed technically and/or economically feasible and avoided interaction with areas of high intensity or high importance land use, are carried forward for further assessment.

For example, at this step in the alternative means assessment framework Option 1 Open pit mining (under Mining – Method) was screened out due to economic factors. For Mining – Methods, the remaining four options were carried forward for further assessment.

#### **2.10.2.3 Potential Residual Effects Associated the Alternative Means**

For all alternative means carried forward from the previous step, the expected residual effects following application of mitigation measures were considered. This step in the alternative means assessment framework identifies the potential residual effects which are then brought forward to the evaluation of alternative means. Again, as an example, the information related to Mining - Method (from Appendix 2-C, Table 4) is summarized here in **Table 2.10-1**.

#### **2.10.2.4 Evaluation of Alternative Means**

Detailed comparative evaluations of alternative means is presented in Appendix 2-C, Table 6 to Table 22. These evaluations considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in **Table 2.10-2** (same as Table 5 from Appendix 2-C), following the application of mitigation measures (described in Appendix 2-C Table 4).

By way of example (refer to Appendix 2-C for details), a detailed evaluation of Mining – Method from Appendix 2-C has been provided here as **Table 2.10-3**.

Based on the above alternative means assessment process, a preferred alternative means for each respective Project component or activity evaluated was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided in Appendix 2-C including input received by Indigenous groups and other Interested Parties.

For reference, the alternative means assessment is conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives. The preferred alternative(s) was selected and evaluated in much greater detail in the EA. A summary of the alternative means carried forward into the EA is provided in **Table 2.10-4**.

### **2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment**

As described above, Indigenous Knowledge, local knowledge, and engagement has influenced the alternative means assessment, specifically in step 2 (Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors) and step 4 (Evaluation of Alternative Means) of the alternative means assessment framework.

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015). Denison opted to integrate an additional category at this early stage in the alternative means assessment framework: land use screening. Denison included land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by Interested Parties. At this step in the alternative means assessment framework, an option for treated effluent discharge location was eliminated due to land use screening in conjunction with technical considerations.

Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement sessions, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. The comparative evaluation of alternative means includes specific input received from

Indigenous groups and other Interested Parties that contributed to the selection of the preferred option, when applicable. Refer to the row titled *Input received from Interested Parties* in **Table 2.10-3** below for an example of how engagement influenced the selection of mining method.

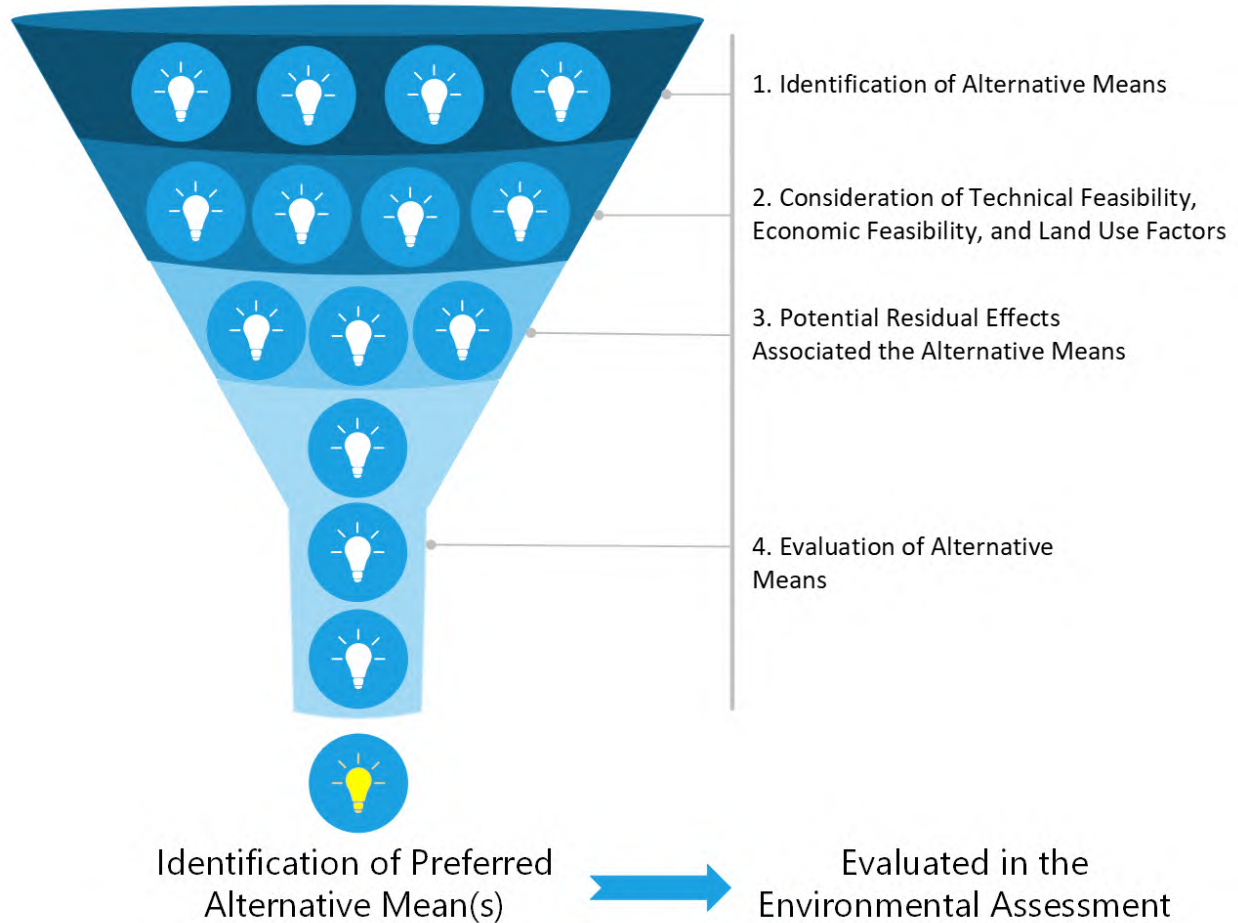


Figure 2.10-1: Alternative Means Assessment Framework for the Project

**Table 2.10-1: Mitigation Measures and Residual Effects for Mining - Method (Excerpt from Appendix 2-C Table 4)**

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
Mining	Method	Option 2: Jet Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features
		Option 3: Surface Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features
		Option 4: Micro Tunnel Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
			Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to surface water quality and surface water-related receptors whereby mine water is released to local surface water features
		Option 5: ISR	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of ISR mining area  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support ISR mining  Effects on groundwater quantity and flow paths based on development of ISR wellfield (injection and recovery well systems)  Effects on groundwater quality by introduction of ISR mining solutions to the mining area  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features



**Table 2.10-2: Detailed Alternatives Means Assessment Evaluation Criteria and Metrics (same as Table 5 in Appendix 2-C)**

Criteria	Section	Valued Component	Indicator	Metric
Biophysical Environment	Atmospheric and Acoustic Environment	Air quality	Changes in air quality, including concentrations of dust, combustion products, uranium, metals and/or radionuclides	Alternatives that minimize changes in air quality and effects on ecological and human receptors are preferred.
		Noise	Changes in sound levels	Alternatives that minimize the increase in sound levels, and subsequent effects on wildlife and human receptors, are preferred.
	Geology and Groundwater	Geology	Changes in geology	Alternatives that avoid or minimize effects on geology are preferred
		Groundwater quantity	Changes in groundwater levels, groundwater flow patterns, and discharge rates to local surface water bodies	Alternatives that minimize interaction with groundwater quantity are preferred.
		Groundwater quality	Changes in concentrations of physical and chemical parameters in groundwater with consideration of discharge to local surface water bodies	Alternatives that minimize changes in groundwater quality, in the context of groundwater discharge to surface water bodies, are preferred.
	Aquatic Environment	Surface Water Quantity	Changes in surface water quantity through water taking, surface water discharge, and project overprinting of drainage areas (footprints)	Alternatives that minimize Project footprint, as well as surface water intake and release to surface water bodies, are preferred.
		Surface Water Quality	Changes in physical and chemical parameters of surface water quality can result from discharge of treated effluent to surface water bodies and land disturbance and clearing can mobilize solids into the aquatic environment	Alternatives that minimize Project footprint and changes in surface water quality and effects on fish, and other ecological receptors, are preferred.
		Fish and Fish Habitat	Changes in fish and fish habitat may develop from Project overprinting of fish habitat (habitat alteration or loss), changes in surface water quantity, surface water quality (physical and chemical parameters), sediment quality, or benthic invertebrates	Alternatives that minimize interaction with fish and fish habitat are preferred.
		Sediment Quality	Changes in sediment quality mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on sediment quality are preferred.
		Benthic Invertebrates	Changes in benthic invertebrate communities and quality from uptake of chemical parameters	Alternatives that minimize effects on benthic invertebrates are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
		Fish Health	Changes in fish health mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on fish health are preferred.
	Terrestrial Environment	Terrain	Changes to terrain	Alternatives that minimize interaction with terrain are preferred.
		Soil	Changes in soil quantity or quality	Alternatives that minimize loss or alteration of soil quantity, and minimize changes in soil quality, are preferred.
		Organic matter/peat	Loss of organic matter/peat	Alternatives that minimize loss or alteration of organic matter/peat are preferred.
		Vegetation and Ecosystems	Change in areal extent of vegetation habitat types and ecosystems	Alternatives that minimize loss vegetation and ecosystems are preferred.
		Listed Plant Species	Change in number of listed plant species	Alternatives that minimize direct and indirect effects on listed plant species are preferred.
		Wetlands	Change in areal extent of wetlands	Alternatives that minimize loss or alteration of wetlands are preferred.
		Ungulates	Changes in ungulate habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize ungulate habitat loss or alteration and minimize ungulate mortality are preferred.
		Furbearers	Changes in furbearer habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize furbearer habitat loss or alteration and minimize furbearer mortality are preferred.
		Woodland caribou	Changes in woodland caribou habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize woodland caribou habitat loss or alteration and minimize woodland caribou mortality are preferred.
		Raptors	Changes in raptor habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize raptor habitat loss or alteration and minimize raptor mortality are preferred.
		Migratory breeding birds	Changes in migratory breeding bird habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize migratory breeding bird habitat loss or alteration and minimize migratory breeding bird mortality are preferred.
		Bird species at risk	Changes in bird species at risk habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize bird species at risk habitat loss or alteration and minimize bird species at risk mortality are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
Human Environment	Human Health	Human Health	Changes in human health from exposure to non-radiological and radiological constituents in air, water, and food	Alternatives that minimize negative changes in human health are preferred.
		Worker Health	Worker conventional health and safety and radiation exposure	Alternatives that reduce conventional health and safety risks and radiation exposure are preferred.
	Land and Resource Use	Indigenous Land and Resource Use	Changes in the area of land available for Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in Indigenous land and resource use are preferred.
		Other Land and Resource Use	Changes in the area of land available for non-Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in other land and resource use are preferred.
		Heritage Resources	Change in the number of known archaeological resources	Alternatives that minimize direct or indirect alteration or loss of archaeological resources are preferred
	Quality of Life	Cultural Expression	Changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet	Alternatives that minimize direct or indirect adverse effects on cultural expression are preferred.
		Community Well-being	Change in income of local workers and community cohesion	Alternatives that minimize direct or indirect adverse effects on community well-being are preferred.
		Infrastructure and Services	Changes in traffic, community infrastructure and services	Alternatives that minimize direct or indirect adverse effects on infrastructure and services are preferred.
	Economics	Economy	Changes in participation in the traditional economy	Alternatives that minimize direct or indirect adverse effects on economy are preferred.
Other Evaluation Factors				
Criteria			Metric	
Technical Factors	Complexity of design, construction, operation, and decommissioning		Simple or straightforward designs, construction techniques, and operational procedures based on tested and proven technologies are preferred. Alternatives that are more amenable to decommissioning and/or reclamation are preferred.	
Cost Factors	Capital, operating, and decommissioning costs		Lower capital costs are preferred to reduce the pre-production costs and influence the project economic viability. Lower operational costs are preferred to maintain project economics. Lower decommissioning costs are preferred to reduce long term liabilities	

**Table 2.10-3: Mining – Methods - Alternative Means Assessment (same as Table 6 in Appendix 2-C)**

Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Biophysical	Atmospheric and Acoustic Environment	Air quality	Less preferred option. Air quality on surface would be influenced by slurry handling, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock. Air quality in the mine workings would be managed with ventilation.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 5. Changes in concentrations of radon in air from well development would be similar to option 5.	Less preferred option. Air quality in the mine workings would be managed with ventilation. Air quality on surface would be influenced by hoisted cuttings or slurry, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 3. Changes in concentrations of radon in air from well development would be similar to option 3.
		Noise	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 4.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from production drilling from surface includes compressors and mobile equipment would be continual.	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 2.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from surface drilling equipment includes compressors and mobile equipment would be intermittent as drilling is done only as required.
	Geology and Groundwater	Geology	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.
		Groundwater quantity	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Preferred option with smallest interaction on groundwater quantity compared to options 2, 4 and 5.	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Less preferred compared to option 3. Use of ground freezing temporarily interacts with groundwater flow during operations.
		Groundwater quality	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Mining area remediation during decommissioning would mitigate effects on groundwater quality.

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
	Aquatic Environment	Surface Water Quantity	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.
		Surface Water Quality				
		Fish and Fish Habitat				
		Sediment Quality				
		Benthic Invertebrates				
		Fish Health				
	Terrestrial Environment	Terrain	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 4 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the second lowest of the four options. This option is more preferred than option 2 and 4, similar to option 5 with regard to potential effects on the terrestrial environment.	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 2 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the lowest of the four options. This option is more preferred than option 2 and 4, similar to option 3 with regard to potential effects on the terrestrial environment.
		Soil				
		Organic matter/peat				
		Vegetation and Ecosystems				
		Listed Plant Species				
		Wetlands				
		Ungulates				
		Furbearers				
		Woodland caribou				
		Raptors				
		Migratory breeding birds				
		Bird species at risk				
Human Environment	Human Health	Human Health	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine rock,	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			rock, slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.		slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.	
		Worker Health	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Surface operation with specialized surface equipment to drill horizontal cavities at ore depth. Physical ore cuttings will need to be rehandled on surface to either slurry for wet transport or dewater for dry transport increasing dose relative to Option 5 (which has a fraction of the drill cuttings to handle). Good conventional H&S as there is minimal mobile surface equipment.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, this option has potentially the highest dose as workers will have greater potential exposure to radiation while servicing equipment that is working within the ore zone. Underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Lowest dose of the four mining options evaluated in terms of dose associated with drill cuttings. The main contributor to worker dose would be radon associated with drilling the ISR wells. Surface piping of UBS, pumphouses, and well maintenance will also be a source of dose during pipeline repairs and inspection of equipment.
	Land and Resource Use	Indigenous Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Other Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Heritage Resources	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.
	Quality of Life	Cultural Expression	No appreciable difference was identified between alternatives for changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet.			
		Community Well-being	No appreciable difference was identified between alternatives for change in income of local workers and community cohesion.			
		Infrastructure and Services	No appreciable difference was identified between alternatives for changes in traffic, community infrastructure and services.			
	Economics	Economy	No appreciable difference was identified between alternatives for changes in participation in the traditional economy.			



Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Technical Factors	Complexity of design, construction, operation, and decommissioning	<p>Potential advantages: technology currently in use in Canadian uranium industry; mine layouts do not require development at or above the unconformity; remote system – safe for radiological risks.</p> <p>Potential technical weaknesses: Long duration development timeline; low production rate with limited ability to increase; currently used at only one mine with limited experience outside of that operation; may require extensive research and development; high technical risk including underground operating risks, inflow risk, design and operating risk; may require bulk freezing approach versus perimeter freeze design as assumed in the PEA. This would increase freeze cost and time significantly.</p>	<p>Potential advantages: technology in widespread use in oil and gas industry; reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (weeks); good production rate with scalability; similar technique under evaluation in Canadian uranium industry (Orano’s SABRE mining method).</p> <p>Potential technical weaknesses: Drilling accuracy is paramount and needs additional testing; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in civil / municipal applications; remote system – safe for radiological risks under normal operating conditions; self-supported tunnels, thus risk of ground failure or inflow in tunnels reduced; simple concept and operation, variety of knowledgeable contractors/personnel; moderate production rate (approximately 4M lbs/yr per machine); ability to apply multiple units (scalability).</p> <p>Potential technical weaknesses: Recovery of ore may be limited to 90% at best due to configuration of the tunnels; congested working space in the launch stations; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in international uranium operations (USA, Kazakhstan, Australia); reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (months); reduced technical risk with majority of remaining risks tested during feasibility stage; toll milling not required.</p> <p>Potential technical weaknesses: Not currently in use in Canadian uranium industry; mining solution permeability requires additional testing to increase confidence; low production rate – based on production rate at US operations (future testing may allow for higher production rates).</p>

Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Cost Factors	Capital, operating, and decommissioning costs	Option 2 has high operating cost relative to the grade of the ore body, high capital costs and long duration development timeline, although the technology is in use at an existing uranium operation in Canada.	Option 3 has low capital and operating costs compared to jet boring.	Option 4 has the lowest ore recovery and high capital costs and long duration development timeline. Technology is commonly used in civil engineering.	Option 5 has low capital and operating costs. The technology is in widespread use at international uranium operations. ISR mining operations often have comparatively low capital and operating costs, as well as shorter timelines to first production and greater flexibility to allow production to be scaled to meet market demands.
<p>Input received from Interested Parties:</p> <p>Denison discussed potential mining methods early in the engagement process. As part of the engagement program for the Project, Denison organized a series of in-person workshops with Indigenous and non-Indigenous communities of interest (COI) and other Interested Parties in 2018. The workshops gathered community and student input in relation to potential mining methods for the Phoenix deposit. Given the history of uranium mining in the Athabasca Basin, there is a wealth of knowledge on various mining methods, and Denison sought input for which method would be best suited to efficiently and safety mining the Phoenix deposit.</p> <p>The following mining methods were evaluated for effectiveness in mining the Phoenix deposit at the Project: Jet Boring, Surface Boring, Micro Tunnel Boring and In Situ Recovery. There was no specific engagement data collected related to surface boring or micro tunnel boring. Workshop participants noted that while jet boring was a relatively well-known method of mining, the high economic costs may make it undesirable for the Phoenix deposit (18-EN-VPL-2.38) (18-EN-ERFN-5.44). ISR mining is new to northern Saskatchewan and Canada. Some workshop participants were unsure how to evaluate the potential benefits and/or drawbacks of this mining method (18-EN-VILX-3.69), however other participants were confident in the method, saying they know it works in other locations, there are minimal waste streams, and method is more economically feasible than other methods (18-EN-VILX-3.68). A participant in the Village of Beauval workshop preferred the small footprint and lesser environmental impacts of ISR and viewed this method as a new opportunity for northern Saskatchewan (18-EN-VB-4.51). New opportunities are welcomed in the area, as they can support local businesses, provide training and learning opportunities, and keep money within the local economy (16-EN-MLA-109.26).</p>					
<p>Selected alternative for mining method = Option 5: ISR</p> <p>Rationale: Mining methods were evaluated through an increasingly rigorous process and considered factors such as: safety, environment, production rates, capital costs, operating costs, schedule, operational flexibility, and risk. The top four mining methods considered for the Phoenix deposit were: jet boring, surface boring, micro tunnel boring, and ISR. Independent preliminary economic assessment or class 5 level assessments were completed on each of these four options in 2017. The parameters evaluated included safety, environmental impacts, radiological safety, capital cost, operating cost, development timeframe, production rate, economic results (net present value, internal rate of return), regulatory risk, technology risk, equipment and contractor availability, and operating flexibility; this information has been summarized above in the alternatives means assessment cells. In addition, workshops were held in local Indigenous and non-Indigenous communities to capture community input into the selection of a preferred mining method once the options were narrowed down. Ultimately, based on the alternatives evaluated and feedback from Communities of Interest, Denison included the ISR method in the prefeasibility study (PFS; Denison 2018) and this mining method was selected as the basis for the EA.</p>					

Less Preferred

Neutral

More preferred

**Table 2.10-4: Summary of Alternative Means Carried Forward into the Environmental Assessment**

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Mining	Method	Table 6	<del>Open-pit</del>	Jet Boring	Surface Boring	Micro Tunnel Boring	ISR		
	Freeze design for tertiary containment of mining solution	Table 7	Freeze dome	Freeze wall					
	Permeability enhancement	Table 8	Hydraulics	Propellant	Mechanical				
	Mining solution	Not applicable. Option 1 basic solution was deemed not technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.	<del>Basic solution</del>	Acidic solution					
Processing	Location of processing	Table 9	Off-site processing at an existing mill	On-site processing in purpose built processing plant					
	On-site processing method	Table 10	Ion exchange	Solvent extraction	Direct precipitation				
Water management	Freshwater supply	Table 11	Groundwater	Surface water					
	Drinking water	Table 12	Truck drinking water to site	Generate drinking water on site with a potable water treatment plant					

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
	Treated effluent discharge location	Table 13	To groundwater	<b>To surface water</b>					
	Treated effluent discharge locations for surface water	Table 14	Kratchkowsky Lake (LA-7)	Whitefish Lake north (LA-6)	<b>Whitefish Lake south (LA-5)</b>	McGowan Lake (LA-1)	Russell Lake	<del>Mardoc Lake (LA-4)</del>	<del>Williams Lake-LB-3</del>
Waste management	Organic waste disposal	Table 15	On-site disposal using an incinerator	On-site disposal in domestic landfill	<b>On-site composting</b>				
	Process precipitate disposal	Table 16	On-site permanent disposal	<b>Off-site reprocessing and final disposal</b>					
	Domestic waste disposal	Table 17	Collection and disposal off site by a third-party contractor	<b>Collection and disposal in an on-site domestic landfill</b>					
Access and transportation	Access road alignment	Table 18	Direct route	Direct route to reduce cut volumes	<b>Follows part of the existing exploration access road</b>				
	Stream crossing structures	Table 19	Culverts	<b>Clear span bridges</b>					
	Worker transportation	Table 20	Ground transport	<b>Air transport to existing airstrip at nearby Cameco operations</b>	<b>Air transport to new airstrip constructed and operated by Denison</b>				
Power	Primary power supply	Table 21	Liquefied natural gas power plant	<del>Solar photovoltaic power plant</del>	Diesel generators	<b>Provincial power grid</b>			

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Support facilities	Camp location optimization	Table 22	First location - Prefeasibility	Second location – Reduce fill volumes	Third location - Southwest from second location				

**Selected alternative**

~~Strike through~~ option was eliminated at an earlier step due to technical, economic, or land use factors (see Appendix 2-C)

## Attachment: IR-28

Number	IR-28
Dept.	CNSC
Project effects link	Current use of lands and resources for traditional purposes
Reference to EIS, appendices, or supporting documentation	<p>Section 4, IER and engagement appendices, including:</p> <ul style="list-style-type: none"> <li>• Appendix 2-A</li> <li>• Appendix 6-B</li> <li>• Appendix 7-B</li> <li>• Appendix 8-A</li> <li>• Appendix 9-A</li> <li>• Appendix 10-B</li> <li>• Appendix 11-A</li> <li>• Appendix 12-A</li> <li>• Appendix 13-A</li> <li>• Appendix 14-B</li> </ul>
Context and Rationale	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>
Information Requirement	<p>1) Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p>

	<p>2) Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3) Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>4) Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>
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Response:

This response has broken up information into two sections – the information requirement in relation to Section 4 and the associated related sections in the Indigenous Engagement Report (IER), and the engagement appendices that are associated with various sections of the EIS.

**Section 4 and the IER: Context**

Engagement with Indigenous and non-Indigenous Communities of Interest and Other Communities has been ongoing since 2016 and has evolved over time. Some changes have occurred from the beginning of engagement activities in 2016 to today, such as:

- early engagement occurring with the Northern Village of Pinehouse Lake, to the current state where Kineepik Métis Local #9 (KML) now generally represents the interests of the Métis citizens of the Northern Village of Pinehouse Lake together, along with general non-Indigenous residents;
- the Duty to Consult delegated to the Métis Nation – Saskatchewan from the A La Baie Métis Local #21, the Sipishik Métis Local #37, Patuanak Métis Local #82, and the Sled Lake / Dore Lake Métis Local #67; and
- interest expressed in the Project by Peter Ballantyne Cree Nation, who had not been previously identified by Denison, the CNSC nor the Province of Saskatchewan as having potential interests in the Project.

**Section 4 and the IER: Interests, Issues and Concerns**

Denison has worked to adapt to the changes as they have arisen. As such, we recognize that some of the *Interests, Issues and Concerns* tables (“Issues Tables”) can be further updated with new information



about potential issues that have arisen in relation to the Project, of which both the issue and Denison's response to the issue will be further subject to validation by the Indigenous Nation or community.

It is important to note that not all issue or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response—but mitigation and monitoring measures will be included where it makes sense to do so.

In respect of understanding and enhancing the identification of issues by an Indigenous nation or community, we can advise the CNSC that presently we have:

- 1) reviewed each Issues Table to determine any engagement data gaps evident as presented in the draft EIS, which may have occurred due to the changing nature of engagement over time as specified above;
- 2) updated each Issues Table with the key issues raised by the Indigenous Nation and community as a result of comments made on the draft EIS;
- 3) have developed a plan for validation and positive resolution of the Issues Table with each Indigenous Nation and community and are presently seeking confirmation with each group accordingly; and
- 4) (in the near future) seek confirmation on acceptable path forward in relation to validation of issues and/or resolution, where it is mutually agreed upon. Where it is not mutually agreed upon, Denison will identify a proposed rationale for potential next steps.

As an important note on this, Denison received permission to use three Indigenous Knowledge reports in the EIS, to provide additional comprehensive information in relation to the relationship to the land and connection to the environment from the Indigenous nations who shared this information. Information from these reports was used accordingly in the draft EIS to inform the environmental assessment and methodology. At the request of these Indigenous nations, these reports have been provided to the regulators under confidential cover. Denison did not carry forward items into the draft EIS that were outside the scope of the agreed-upon nature of the information exchange between Denison and the Indigenous nation. As such, at the time, Denison did not bring forward concerns raised in these reports through to Section 4 of the draft EIS.

Each of the Indigenous nation for whom these reports were prepared has now provided publicly available comments on the draft EIS where they have summarized their own issues and concerns about the Project, *some* of which arise from the confidential materials they have provided to the regulator. As such, Denison can now confidently update the Issues Table with these comments provided on the public record, which will enable a transparent accounting of issues from the worldview.

#### **Section 4 and the IER: Clear Documentation in Issues Tables**

Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached.

We can advise that the steps identified above have been successfully achieved with KML, and as such, Appendix A to this submission includes the Issues Table that will be inserted into the final EIS for KML (Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 [and corresponding table in the IER])

and serves as an example of the Issues Table that will be generated for all the other Indigenous nations and communities.

In this table Denison has added additional information in relation to *How Comment was Addressed / Considered in the Draft EIS* as requested by the CNSC, including any specific mitigation and/or monitoring measures pertinent if appropriate. Additionally, the *Status* column includes whether the issue is complete or ongoing, and the *Justification of Status* column now includes the evidence to support the status conclusion, and if necessary, additional details are provided in the *Ongoing Resolution of Concerns (if Required)* column. The *Ongoing Resolution of Concerns* column will outline the planned process to be followed with the Indigenous nation or community in respect of validation and/or resolution of the issue.

It is Denison's objective to successfully validate and resolve concerns with Indigenous nations and communities prior to the finalization of the EIS. As per Denison's outlined engagement strategy, a focussed approach will occur, first with respect to Indigenous and non-Indigenous Communities of Interest, and then with other Interested Parties.

Where Denison is unable to demonstrate that positive validation and resolution have been attained, clear information will be provided in the relevant table for the Indigenous nation or community in Section 4 of the final EIS (and if required, the IER) outlining the efforts undertaken to do so, planned next steps, or clear rationale for why a positive resolution has not been found to date.

#### **Section 4 and the IER: Planned Engagement and Next Steps**

Denison understands the importance of outlining to the CNSC the planned engagement activities to occur with Indigenous nations and communities. As identified above, part of engagement activities is in relation to positive validation and resolution of key issues. Additionally, Denison will be undertaking additional engagement activities that are outlined as follows as of June 30, 2023.

#### **English River First Nation ("ERFN")**

##### **Interests, Issues and Concerns:**

- 1) Denison has reviewed ERFN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with ERFN regarding a process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators will be included as part of this process.
- 4) Status of successful validation by ERFN of Denison responses to Issues Table—in progress.

##### **Engagement activities**

- 1) Site tour is planned for summer 2023 with ERFN Leadership, Technical team and Members.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - a. mitigation, monitoring and residual effects
  - b. forthcoming licensing actions

##### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the EIS and the associated section in the IER.

### **Kineepik Métis Local #9 (“KML”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed KML comments provided on the draft EIS.
- 2) Issues, Interests and Concerns table from Section 4 of draft EIS was revised according to Appendix A of this IR to be updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions actively occurring with KML regarding process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators were included as part of this process.
- 4) On June 10, 2023, Denison received positive validation that Denison's responses to KML issues, as described in the Issues Table, were acceptable to KML.
- 5) Status of successful validation by KML of Denison responses to KML Issues Table—**complete**.

**\*\*It is important to note that KML and the Northern Village of Pinehouse are working on the above matters together as a collective\*\***

#### **Engagement activities**

- 1) Site tour is planned for summer 2023 with KML Leadership, Technical team and Citizens.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - c. mitigation, monitoring and residual effects
  - d. forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Ya'thi Nene Lands and Resources Office (“YNLR”) (Representing the Athabasca Basin First Nations and the Athabasca Basin Communities)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed YNLR comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with YNLR regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) Status of successful validation by YNLR of Denison responses to YNLR Issues, Interests and Concerns—**in progress**.

#### **Engagement activities**

- 1) Undertook in-person community meetings in January 2023 in coordination with the YNLR in Black Lake, Fond du Lac, Hatchet Lake and Uranium City.
- 2) Coordinating process for additional engagement with YNLR for fall 2023 as they deem appropriate to discuss:
  - a) mitigation, monitoring and residual effects
  - b) forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Métis Nation – Saskatchewan (“MN-S”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed MN-S comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.

- 3) Denison has offered to meet to discuss the process toward resolution of draft EIS comments with MN-S as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) MN-S and Denison met on June 12, 2023, to provide a status update on completion of deliverables with respect to Capacity Funding Agreement, and in particular, the Métis Knowledge Study. MN-S outlined steps being followed in respect of this work. Denison indicated its willingness to meet regularly to support the efforts of MN-S in this regard. A tentative meeting has been set for the week of June 26-29, 2023.
- 5) Status of successful validation by MN-S of Denison responses to MN-S Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Undertook in-person community NR1 and NR3 meetings in February 2023, as coordinated and led by MN-S.
- 2) Will take direction from MN-S about coordinating additional meetings with MN-S as they deem appropriate to discuss matters of interest.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Birch Narrows Dene Nation (“BNDN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed BNDN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested the BNDN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project, as indicated by BNDN as existing. To facilitate this, Denison has shared a proposed confidentiality agreement with BNDN to facilitate the sharing of such information.
- 4) Discussions are actively occurring with BNDN regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 5) Status of successful validation by BNDN of Denison responses to BNDN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.
- 2) On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.
- 3) On May 10, 2023, Denison met with BNDN, to discuss the process going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison's access to data BNDN has referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to additional funding from Denison to BNDN. Denison continued to request the available site-specific information to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN to potentially adjust engagement approaches with BNDN.

- 4) On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided additional information from BNDN that BNDN would connect with Denison in the future to determine next steps together.
- 5) On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.
- 6) Subject to process set between Denison and BNDN as identified above, engagement process to be determined.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Peter Ballantyne Cree Nation (“PBCN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed PBCN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested PBCN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project.
- 4) To facilitate this, PBCN has directed Denison to access the traditional territory map in a confidential fashion from the CNSC.
- 5) On May 30, 2023, Denison has made this request of the CNSC.
- 6) Per below, Denison intends to provide materials to PBCN responding to the concerns raised in the EIS.
- 7) Status of successful validation by PBCN of Denison responses to PBCN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with PBCN on May 16, 2023, to provide an overview of the Wheeler River Project. During the meeting, PBCN indicated they would share a traditional territory map and had land and occupancy information in relation to the Wheeler River Project. PBCN indicated they desired another meeting to discuss their interests in the Wheeler River Project further. During this meeting Denison and PBCN acknowledged the challenges of meeting immediately, but committed to doing so.
- 2) As of June 30, 2023, Denison and PBCN have not met, but have intent to do so. Generally, the purpose of the next meeting would be for PBCN to provide more detail on their interests in the Wheeler River Project, and Denison would provide responses to the high-level issues raised by PBCN in their draft EIS comments.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Lac La Ronge Indian Band (“LLRIB”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS:
  - a) Denison has confirmed that the Wheeler River Project is not located within the Lac La Ronge Indian Band Traditionally Occupied Territory as described in <https://pubsaskdev.blob.core.windows.net/pubsask-prod/86730/86730-English.pdf> (page 84) (email to Ty Roberts, LLRIB - date February 14, 2023).

- b) Denison has confirmed that the Trapping furblock in which the Wheeler River Project is located is N-18 (ERFN) (email to Ty Roberts, LLRIB - date February 14, 2023).
- 3) Per below, Denison is providing materials to LLRIB responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by LLRIB of Denison responses to LLRIB Issues, Interests and Concerns–**in progress**

**Engagement activities**

- 1) Denison will send correspondence to LLRIB regarding the issues raised in the letter sent to the CNSC on the draft EIS in the coming months. In this correspondence, Denison will reiterate its interest in participating in a meeting of the LLRIB Land and Resources Board at a time that is mutually convenient. Denison has also requested the information from the LLRIB that indicates there is some trapping activity near the Project, to better understand the nature of these activities in relation to the Project.
- 2) As of June 30, 2023, Denison and LLRIB have not met, but have intent to do so at a mutually convenient time.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Prince Albert Grand Council (“PAGC”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments–for the final EIS.
- 3) Per below, Denison is providing materials to PAGC responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by PAGC of Denison responses to PAGC Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Denison will be sending correspondence to PAGC regarding the issues raised in the draft EIS with a response to issues raised by PAGC.
- 2) Based on the outcome of the effort above, Denison will undertake next steps accordingly.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Northern Village of Beauval & Northern Village of Ile a la Crosse (“NVB” & “NVILX”)**

**Interests, Issues and Concerns:**

- 1) No comments were received on the draft EIS by these Interested Parties.
- 2) The format of the Issues Tables for NVB and NVILX will be formatted according to Appendix A of this IR–for the final EIS.
- 3) Denison will develop a process with NVB and NVILX in relation to the Issues Tables for each of these Interested Parties to seek successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns.
- 4) Status of successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Community and Leadership engagement–planned for fall 2023 to discuss:
  - a) mitigation, monitoring and residual effects

b) forthcoming licensing actions

**\*\*NVILX subject to discussions with MN-S\*\***

**Future Documentation in updated EIS and updated IER**

1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Section 4 and the IER: Updates Planned for the Final EIS**

The following will be updated for the final EIS:

- Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices
- Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)
- Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)
- Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)
- Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)
- Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)
- Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)
- Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)
- Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)
- Table 4.3-10: Key Issues and Concerns from Ya'thi Néné Lands and Resources Office (and corresponding table in the IER)
- Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse
- Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval
- Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse

A new table will also be included for Peter Ballantyne Cree Nation in the final EIS and in the IER.



### **Engagement Database Summary Tables in Various Appendices: Context**

Denison's overall approach to respecting the information shared with Denison, as a result of engagement interactions from 2016 onwards, was to aspire to interweave the data outcomes throughout the entire assessment, rather than providing a single summary chapter in the draft EIS. To do this, Denison's Subject Matter Experts reviewed the over 2,000 lines of engagement data collected from 2016 onwards, and determined what and which information could meaningfully inform their assessment approach. This resulted in engagement data being reflected throughout the entire draft EIS, informing almost all aspects of the assessment. To make sure the reviewer could reasonably understand the context in which the engagement data was collected, Denison created an Engagement Database Summary Table as an Appendix item for each section of the draft EIS where engagement data were used. Each Engagement Database Summary Table identifies the *Unique ID* referenced in the chapter, the *Record of Contact* ("ROC") number that can be used to look up the original source materials in the EIS Appendix 4-A: Supporting Materials, the *Event Type*, the *Date*, the *Event Summary*, the *Interested Parties* with which the engagement occurred, the *Comment* made, and the *Response* from Denison. Denison has now added a final column called *Context*, which provides specifics about how the comment was used in the section.

It is important to note that not all issues or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response, but mitigation and monitoring measures will be included where it makes sense to do so.

It is also important to note that these engagement data are not intended to be representative of the Indigenous nation or community perspective, as the comment may have been made by an individual from the Indigenous nation or community, and not specifically by the leadership. The Issues Tables (as discussed in this IR) are those Tables that summarize the collective interests, issues and concerns by the leadership, which Denison has identified will be subject to the validation process as outlined above. These appendices are simply intended to provide transparency around the engagement data points that had been used in the draft EIS in some manner, and are, therefore, not part of the validation process designed for Indigenous nations and communities.

### **Engagement Database Summary Tables in Various Appendices: Updates Planned for the Final EIS**

Please see Appendix B to this IR for an example of the new format for the Engagement Appendices. The following in the EIS will be updated:

- Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description
- Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description
- Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater
- Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment
- Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment
- Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health

- Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use
- Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life
- Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics
- Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions
- Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
<b>Monitoring</b>	<p>Interest in information and direct participation in monitoring baseline and effects.</p> <p>Concern that project should have independent monitoring for the Project and that information from this be shared with communities.</p>	ROC 2 ROC 105 ROC 444	<p>An Environmental Protection Program will be established to provide an overarching framework for key environmental monitoring and management plans and to ensure a means to demonstrate compliance with applicable environmental regulatory requirements and other performance targets that Denison may set. The program would be developed in a manner that aligns with the ISO 14001 EMS Standard. Aspects of the Environmental Protection Plan will include:</p> <ul style="list-style-type: none"> <li>-Management and Monitoring of Emissions</li> <li>-Liquid Effluent Monitoring Plan</li> <li>- Air Emissions Monitoring Plan</li> <li>- Groundwater Monitoring Plan</li> <li>- Environmental Monitoring Plan</li> <li>- Woodland Caribou Management Plan</li> </ul> <p>As the Indigenous Community of Interest with a residential community most proximal to the Project, Denison has committed to collaborating with Kineepik Métis Local on a community specific monitoring regime, suited to their interests and needs in order to provide transparent information to discourage avoidance of the area and alleviate perceived concerns about potential impacts. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>See Section 16 for a summary of monitoring and follow-up programs.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Economics</b>	Concern and interest in economic opportunities associated with Project and education and training to facilitate access and participation by community members.	ROC 62 ROC 105 ROC 388 ROC 444 ROC 620 ROC 623	Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Mitigation and enhancement measures will be implemented by Denison to enhance the positive effects of the Project on employment and training, income, traditional economy, and business opportunities and minimize adverse effects including:</p> <ul style="list-style-type: none"> <li>-A Human Resource Development Plan to initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities;</li> <li>-Establishment of a procurement approach through all phases of the Project, focusing on businesses based within the LSA communities, followed by Indigenous and / or businesses in the RSA;</li> <li>-Negotiation with the Province of Saskatchewan to develop the Project's Surface Lease Agreement and Human Resource Development Agreement.</li> </ul> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including in relation to ongoing education and training as deemed appropriate by KML.</p> <p>See Section 13 for a summary on local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p> <p>See Section 13 for information regarding employment, employment opportunities, and career growth for community members.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Economics</b>	Interest with potential contracts and business opportunities for northern Indigenous companies.	ROC 105 ROC 114 ROC 118 ROC 444	The Project will create employment and business opportunities and increase income for workers and businesses in the LSA, RSA, and beyond the RSA during all phases of the Project. Denison has estimated a workforce during the two-year Construction period of 300 people and during the Operation phase 180 people are expected to be employed to operate the ISR wellfield and processing plant, including	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>supporting activities. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA will be given first priority for employment and training and business opportunities, followed by Indigenous and / or other communities in the RSA.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including business opportunities as deemed appropriate by KML.</p> <p>See Section 13 for a summary of local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Engagement</b>	<p>Interest in implementation of appropriate engagement process activities.</p> <p>Concern was raised over the approach to consultation with others (other communities) and questions raised on whether a Collaborative Agreement was possible during operations.</p>	ROC 106 ROC 114 ROC 118 ROC 135 ROC 388 ROC 444	<p>Denison has identified key objectives respecting Indigenous engagement associated with the Project:</p> <ul style="list-style-type: none"> <li>-Build and maintain authentic relationships based on a foundation of trust, good faith, and transparency.</li> <li>-Create a respectful dialogue process that promotes communication and collaboration among Denison and Indigenous communities, in a timely and accurate fashion.</li> <li>-Understand how the proposed development of the Project may affect the interests of Indigenous peoples (including Indigenous and/or Treaty Rights), and work with Indigenous peoples to avoid, mitigate, or otherwise address effects, while also collaborating to maximize potential positive effects.</li> </ul> <p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML and continues to engage with KML and NVP with respect to the Wheeler River Project.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>The Agreement negotiated between Denison and KML is demonstrative of Denison's responsiveness to the request from KML for such an agreement.</p> <p>See Section 4 for additional information on the consultation process.</p>			
<b>Cumulative Effects</b>	Concern was expressed over cumulative effects in the region.	ROC 105	<p>Denison conducted a cumulative effects assessment, which included the Highway 914 extension project, on categories:</p> <ul style="list-style-type: none"> <li>-The Atmospheric and Acoustic Environment.</li> <li>-Geology and Groundwater.</li> <li>-The Aquatic Environment.</li> <li>-The Terrestrial Environment.</li> <li>-Human Health.</li> <li>-Land and Resource Use.</li> <li>-Quality of Life.</li> <li>-Economics.</li> </ul> <p>Denison respects and understands KML's concern about the cumulative effects in the region, particularly in relation to access to traditional lands and resources in correlation with industrial and mining developments. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the ILRU RSA, resulting in potential cumulative effects to Indigenous land use activity in the area. This is largely due to the proposed Highway 914 extension project.</p> <p>See Section 16 for a summary of the cumulative effects assessments for each category above.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest in information about current market conditions and overall viability of the Project.	ROC 105	Denison has identified that there is current and future market demand for uranium, the primary raw material for nuclear fuel generation. The Project can address gaps in annual global uranium supply and the use of uranium in nuclear power plants can contribute to net-zero goals, and this can be achieved while making a meaningful contribution to the Canadian economy. The Project was considered in relation to technical feasibility, economic feasibility, and land use criteria to determine viability of the Project.	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			See Section 2 for information about Project components and purpose.		validation by KML received by email on <b>June 10, 2023</b>	
<b>Project Description</b>	<p>Feedback on mining options and technical questions were asked on the different methods of mining.</p> <p>The community provided comments on the different on-site road options.</p>	ROC 2	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>Through an alternative means assessment, Denison considered options in relation to access and transportation. The access road alignment will follow part of the existing exploration access road, stream crossing structures will use clear span bridges, and worker transportation will be air transport to a) nearby Cameco operations or, b) a new airstrip constructed and operated by Denison.</p> <p>Denison incorporated the feedback provided on road options select the <b>current</b> road alignment for the Project.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest for information about type and how chemicals and other hazardous products would be transported, and whether an emergency response team would be ready to respond.	ROC 444	<p>Denison will establish a Transportation of Dangerous Good Program, intended to provide for the safe transport of goods by conforming to all applicable laws, regulations, company policies, and procedures. The Transportation of Dangerous Goods Program applies to all modes of transport and all locations where Denison assumes care and control of the materials.</p> <p>Denison will establish an Emergency Preparedness and Response Program to identify how the Project will prepare for and addresses emergencies that may affect the health and safety of persons, the environment, and the protection of property. Emergency</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue



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			<p>Preparedness and Response Program would be developed consistent with guidance provided by CNSC in REGDOC-2.10.1, Nuclear Emergency Preparedness and Response (CNSC 2016).</p> <p>Increased pressure on emergency services is most likely to stem from an accident or malfunction on Highways 914 or 165. The extent to which these changes could affect any given community would depend on the nature of the accident or malfunction. Accidents and malfunctions for the Project were determined to (generally) have a highly unlikely to unlikely probability of occurrence, with an overall risk rating of low to moderate; however, the severity of accidents and malfunctions was determined to be minor to major. If such an event were to occur, local resources may be called upon to provide support, which may result in a call to fire, RCMP, or ambulance services depending on the nature of the event. Denison will provide any necessary training and/or equipment to local first responders to make sure they are sufficiently prepared to deal with an unlikely accident or malfunction.</p> <p>Denison's objective is to utilize existing emergency response teams from other operations prior to drawing on community-based resources. In the unlikely event that this were to occur, and KML resources were drawn upon, the Agreement negotiated between provides the foundation for discussions in respect of such incidents.</p> <p>See Section 2 for information pertaining to the above programs.</p>		email on <b>June 10, 2023</b>	
<b>Land and Resource Use</b>	Russell Lake was noted of particular importance for recreational/commercial fishing.	ROC 2 ROC 620	<p>Denison noted the importance of Russell Lake and considered Russell Lake in the LSA in terms of recreational/commercial fishing.</p> <p>Negligible aquatic habitat loss is predicted in LA-5 (also known as Whitefish Lake) due to the installation of a discharge pipeline and diffuser configuration. The total area of the lake substrate that would be overprinted by the pipeline is expected to be approximately 135 m<sup>2</sup>, which will constitute less than 0.05% of the lake's surface area. No other alteration, disruption, or destruction of aquatic habitat in the aquatic environment LSA is expected. Project-induced changes to the</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>abundance and distribution of fish is, therefore, not expected. The effect, if any, is expected to undetectable to fishers.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in environmental monitoring associated with the Project, including the potential for monitoring fish species harvested by and important to, KML.</p> <p>See Section 11 for information on how the Project will interact with land and resources including how potential effects will be mitigated.</p>		email on <b>June 10, 2023</b>	
<b>Indigenous and Local Knowledge</b>	The community has pre-existing Indigenous Knowledge and will work with Denison on this.	ROC 106	<p>In 2018, KML approached Denison to support a land use mapping initiative in the Project area. The 2018 study builds on existing land use maps, completed in 2011. A verification meeting was held in late 2018 to make sure no geographic data gaps existed and that the results speak for the whole community. In 2022, KML prepared a document to voice their perspectives on Project VCs and to provide a record for EIS development. Based on 12 community engagement sessions and review of the land use maps, KML explained their unique social, cultural, and historical context, expressed a general consensus of support for the Project, and described issues and concerns.</p> <p>See Section 3 for information on IK and LK and how this information was integrated throughout the EIS.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Questions and clarifications on ISR mining methodology, including freeze wall technology and Project power requirements.	ROC 62 ROC 604 ROC 620 ROC 623	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML continues to engage with KML and NVP with respect to the Wheeler River Project.</p> <p>See Section 4 for additional information on the consultation process.</p>		<b>June 10, 2023</b>	
<b>Economics and Local Capacity Building</b>	Expressed a need for building capacity locally in terms of training and education, emergency response, waste management, and additionally expressed a want of local procurement and industry supporting infrastructure.	Draft EIS Comments	<p>As outlined in Denison's Indigenous Peoples Policy, Denison recognizes the critical necessity of advancing reconciliation with Indigenous peoples in Canada and the important role of Canadian business in the reconciliation process. Denison is committed to providing Indigenous people and businesses with sustainable economic opportunities and benefits and sharing the economic benefits of Denison's business activities.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including commitments for ongoing education and training as deemed appropriate by KML, support to the vision of local industry supporting infrastructure.</p> <p>In terms of building capacity locally for emergency response and waste management, Denison supports KML's vision on these items where it makes sense and is possible. The Agreement provides a framework for future possibilities such as these.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Access and Transport</b>	Expressed a need for industrial grade improvements between Highway 2 and the Key Lake Gate to support the increase in heavy traffic.	Draft EIS Comments	<p>Highway improvements are not within Denison's jurisdiction and are not considered in the EIS for the Wheeler River Project. However, Denison notes KML's perspective of increased traffic volumes and subsequent desire for highway improvements.</p> <p>On Highway 914 between Key Lake and Pinehouse, Denison anticipated that road users would see an increase between 16% and</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>40% over the life of the mine. Trucks travelling on this section of highway will increase from 35 to 53 at peak operational times.</p> <p>Denison's vision in respect of this concern is that Denison and KML work together as partners in discussions about highways with the Provincial Government.</p> <p>However, in respect of actions Denison can undertake regarding traffic along the road at times important for the undertaking of cultural activities, Denison commits to:</p> <ol style="list-style-type: none"> <li>1) Assisting KML with the clear identification of the forthcoming culture camp along highway 914 (clear signage</li> <li>2) Having Project vehicle slow down to 40km/hr from mid-August to mid-October, during the times when KML members may be using the portion of the road near the culture camp. To be specific, this includes 2.5km before the entry into the culture camp, and 2.5km after the entry into the culture camp.</li> </ol> <p>See Section 2, Appendix 2-B for more detail pertaining to traffic volumes.</p>		KML received by email on <b>June 10, 2023</b>	

## Appendix B

### Section 9: Engagement Database Summary Table – Vegetation and Ecosystems

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-VILX-3.32	3	Workshop	2018-01-17	As part of the engagement program for the Wheeler River Project, Denison organized a workshop in Ile a la Crosse for community and A La Baie Métis members to attend. The workshop gathered community and student input in relation to road alignment options, treated effluent discharge locations, and mining methods.	Village of Ile a la Crosse	Need to understand impact on groundwater and lakes.	<p>Denison considered this in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in Areal Extent of Habitat Types, Number of Listed Plants, and Areal Extent of Wetlands</p> <p>And in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in the Concentrations of Constituents of Potential Concern in Vegetation</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from an individual who attended workshop in Ile a la Crosse in the year 2018, which reiterates the importance of groundwater and lakes, thereby providing further validity to the inclusion of water quality and water quantity as a potential pathway of influence in terms of areal extent of habitat types, number of listed plants, the areal extent of wetlands, and changes in the concentrations of constituents of potential concern in vegetation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Groundwater impacts were assessed in Section 7 titled Geology and Groundwater. Impacts to lakes were assessed in Section 9 titled Aquatic Environment. Section 7 and 9 provide details to support the conclusion that there is no significant impact in terms of groundwater or lakes.</p>
20-LK-LEASESUR-267.67	267	Survey	2020-02-01	Denison sent all known local cabin and lodge leaseholders a survey in the mail to be completed regarding their interests in Wheeler River. Denison received 6 responses from the survey, which has informed it's understanding of leaseholder uses in the area and interests regarding elements to be assessed as part of the environmental assessment.	Leaseholder, Wheeler River Lodge	Concerns over fishing and hunting pressure [from the mine and people accessing the area].	<p>Denison considered this in section:</p> <p>Cumulative Effects, Potential Cumulative Effects</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from a leaseholder who completed a survey in in the year 2020, which reiterates the importance of land use activities, thereby providing further validity to the inclusion of increased access to the terrestrial RSA as a potential pathway for cumulative effects in terms of invasive plant introduction and increased dust deposition.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Both fishing and hunting were assessed in Section 11 titled Land and Resource Use. The assessment considers both terrestrial and aquatic resource availability, as well as the health and abundance of resource, in terms of both Indigenous Land and Resource Use and Other Land and Resource Use. The assessment in Section 11 additionally incorporates increased access owing to the extension of highway 914 as part of the cumulative effects assessment while existing projects were captured and assessed within baseline conditions. Section 11 provides details to support the conclusion that there is no significant impact in terms of fishing and hunting.</p>

## Appendix B

### Section 11: Engagement Database Summary Table – Indigenous Land and Resource Use

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-ERFN-5.1	5	Workshop	2018-05-03	<p>As part of the engagement program for the Wheeler River Project, Denison organized a workshop for ERFN at their Patuanak Reserve location for ERFN and Patuanak members to attend. The workshop aimed to gather community input in relation to road alignment options, treated effluent</p> <p>discharge locations, and mining methods. The meeting had been delayed many times, and was held in the Health Clinic because there was a regional power outage.</p>	English River First Nation	<p>I always come from the elders' perspective. Since 1906, the area where you're working has been Treaty 10 land. Those lands were the primary area of ERFN and contain burial sites and birth sites of ERFN members. The Dené name of the Wheeler River, Russell Lake and Cree Lake all come from the Denésuliné of English River. The elders have always expressed that it's a primary area of ERFN. One of our late elders was born north of there in 1922. Our traditional gathering place is there.</p>	<p>Denison considered this in section:</p> <p>Existing Environment, Contemporary Indigenous Land and Resource Use in the Region, English River / Patuanak</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the land and resource use section of the EIS serves as a local perspective, documented as coming from a member of English River First Nation who attended a workshop in the year 2018. Existing conditions are based on available information and are accompanied by supporting information including available IK, LK, and results of engagement activities of specific relevance to the particular VC/KI. As such, the direct quote was incorporated into the characterization of the existing environment as it relates to occupancy, cultural sites, and navigation pertinent to English River First Nation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>English River First Nation is categorized as an Indigenous Community of Interest. Detail on Indigenous COI criteria is provided in detail in EIS Section 4 titled Engagement. Consideration of ERFN territory, as well as ERFN perspectives, has been interwoven throughout the EIS wherever pertinent.</p> <p>Potential impacts to heritage resources were assessed in Section 11 in the subsection titled Heritage Resources. Section 11 provides details to support the conclusion that there is no significant impact in terms of heritage resources. This section also provides detail on the Heritage Resource Management Plan.</p>

## Appendix B

### Section 13: Engagement Database Summary Table – Economics

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
21-EN-VPL-444.16	444	Virtual Meeting	2021-02-11	Denison hosted a virtual meeting for the municipality of Pinehouse Lake. The public meetings were focused on the Project generally, and did not seek input or comments on the distinct interests of the Métis in respect of the Project or Métis land use. This was expressly stated at the outset of each of the public meetings. Included in the discussion was an overview on the Valued Components for the Wheeler River Project, with a request to provide feedback to Denison via an online survey with specific questions pertaining to Valued Components.	Village of Pinehouse Lake	Will there be opportunities for people from Pinehouse to be employed?	<p>Denison considered this in section:</p> <p>Existing Environment, Key Indicator: Employment and Training, Employment Rate</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the economics section of the EIS serves as a local perspective, documented as coming from a resident of Pinehouse Lake who attended a virtual meeting in the year 2021, which reiterates the importance of employment, thereby providing further validity to the inclusion of employment and training as a key indicator and additionally providing substance to the characterization of local perspectives on the existing environment as it relates to an emphasis on employment.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Employment was assessed in Section 13 which provides detail related to all facets of the Economic assessments including detail on how the Project will create employment opportunities and increase income for workers and businesses in the LSA, RSA and beyond the RSA during all phases of the Project.</p>



## Attachment: IR-35

Number	IR-35
Dept.	CNSC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6, Chemicals of Potential Concern
Context and Rationale	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>
Information Requirement	Please consider acrolein in the assessment or provide a rationale for its exclusion.

### Response:

The air quality assessment in the draft EIS considered combustion emissions (i.e., NO<sub>x</sub>, SO<sub>2</sub>, CO, and fine particulate matter) from diesel-powered equipment/vehicles and the standby diesel generators. While acrolein is a component of diesel exhaust, it was not identified as a contaminant of potential concern (COPC) given that the use of diesel equipment/vehicles and generators at the Wheeler River Project will be limited. To demonstrate this, a quantitative screening level assessment of acrolein emissions from diesel combustion was carried out here to address this IR. Because there is no acrolein criterion or standard in Saskatchewan, Ambient Air Quality Criteria (AAQC) from Ontario were used. These criteria have also been adopted in Alberta. The screening level assessment is described in the following text.

Using the nitrogen oxide (NO<sub>x</sub>) results from the air quality modelling assessment in Appendix 6-A, 1-hour and 24-hour dispersion factors (i.e., µg/m<sup>3</sup> per g/s emitted) were calculated for each assessment scenario. A dispersion factor was calculated for both the worker camp receptor, and the off-property receptor with the highest predicted NO<sub>x</sub> concentration. These dispersion factors were then applied to estimates of acrolein emissions to predict 1-hour and 24-hour concentrations of acrolein at both locations. The acrolein emission rate from the standby diesel generators were estimated using fuel flow

rates from manufacturer’s specifications and emission factors from Chapters 3.3 and 3.4 of the U.S. EPA AP-42 Compilation of Emission Factors, depending on the generator size. For mobile equipment and vehicles, a ratio of acrolein to non-methane hydrocarbons (NMHC) was applied to the total HC emission factors (see Section A.9 and A.10 of Appendix 6-A), conservatively assuming total HC equals NMHC. The ratio of acrolein to NMHC was obtained from the U.S. EPA document “*Speciation Profiles and Toxic Emission Factors for Non-road Engines in MOVES3*” (2022) and assumed Tier II engines. The site-wide emission rates for acrolein were estimated to be 1.89E-03 g/s for Construction, 1.04E-03 g/s for Operation, and 1.53E-03 g/s for Decommissioning. In all scenarios, the generators were assumed to operate 24-hours per day and increased equipment usage during Construction and Decommissioning resulted in higher acrolein emissions compared to the Operation scenario.

The results of the screening level assessment are outlined in the table below. Calculated acrolein concentrations are compared against Ontario AAQC, which are based on health as the limiting effect. As can be seen in the table, acrolein concentrations are expected to be well below the applicable criteria for all scenarios. The highest estimated concentrations will occur for the Decommissioning scenario and are 6.7% of the 24-hour AAQC, and 1.8% of the 1-hour AAQC at the worker camp. At the maximum off-property receptor, the estimated acrolein concentrations for Decommissioning are predicted to be 0.9% and 2.0% of the 1-hour and 24-hour AAQC, respectively.

Based on the results of the screening level assessment, acrolein is not considered a COPC.

#### Calculated Dispersion Factors and Resulting Acrolein Concentrations

Scenario	Averaging Period	Ontario AAQC (µg/m³)	Emission Rate (g/s)	Dispersion Factor <sup>[1]</sup> (µg/m³ per g/s)		Concentration <sup>[2]</sup> (µg/m³)		% of Ontario AAQC	
				Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor
Construction	1-hour	4.5	1.89E-03	25.5	24.9	4.84E-02	4.71E-02	1.1%	1.0%
	24-hour	0.4		9.2	5.0	1.75E-02	9.56E-03	4.4%	2.4%
Operations	1-hour	4.5	1.04E-03	37.5	23.6	3.91E-02	2.47E-02	0.9%	0.5%
	24-hour	0.4		12.9	5.3	1.35E-02	5.55E-03	3.4%	1.4%
Decomm.	1-hour	4.5	1.53E-03	54.1	26.2	8.29E-02	4.01E-02	1.8%	0.9%
	24-hour	0.4		17.4	5.2	2.66E-02	8.02E-03	6.7%	2.0%

**Notes:**

[1] Based on the incremental NOx predictions at the worker camp receptor and the off-property receptor where maximum NOx concentrations were predicted.

[2] Concentrations are incremental and do not include the addition of a background. Background is expected to be negligible.

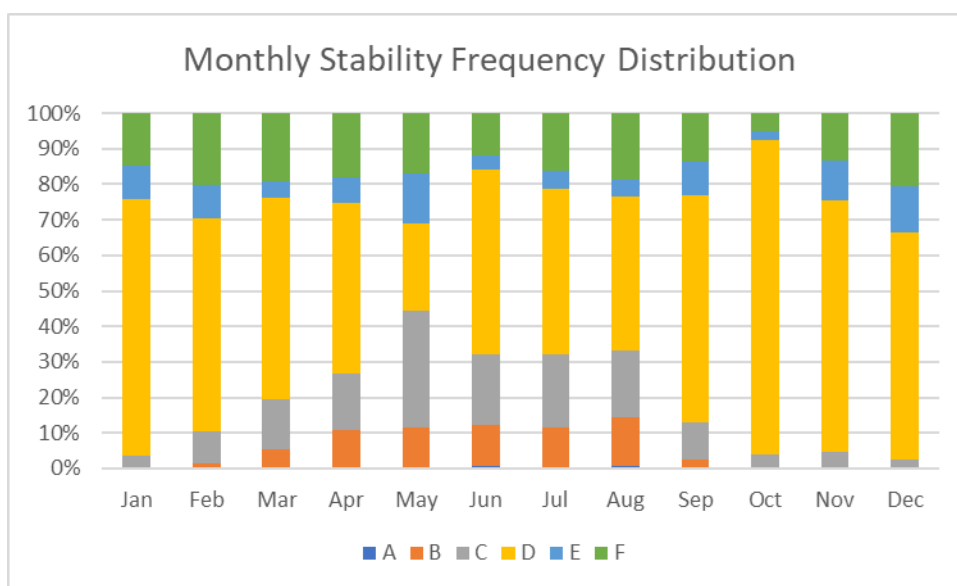
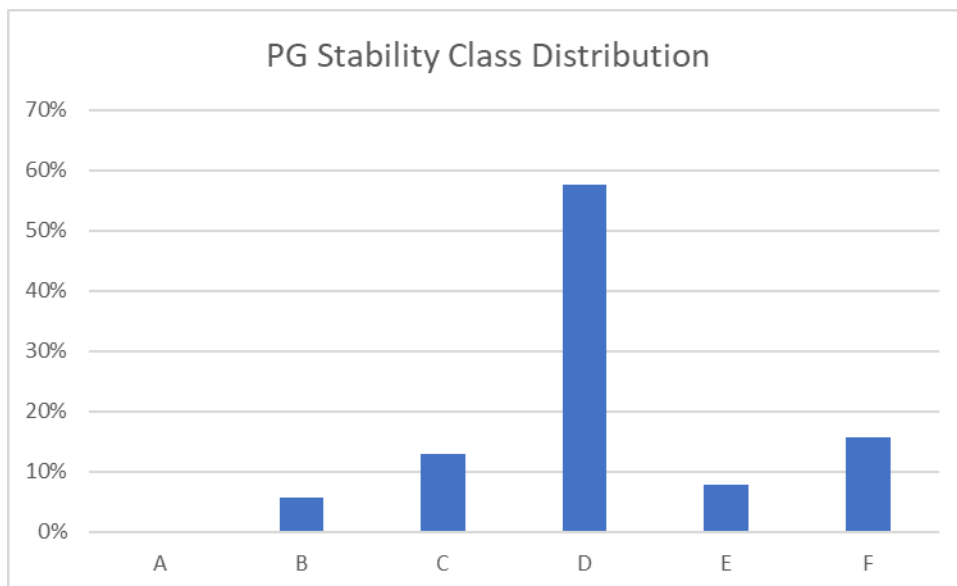
## Attachment: IR-39

Number	IR-39
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6.1.4.2, Potential Project- Related Effects
Context and Rationale	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent’s CALPUFF model runs indicated exceedances for 24- hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>
Information Requirement	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.

### Response:

The draft EIS aggregated the total number of exceedances predicted over the one-year CALMET data set to determine the maximum frequency of exceedances. While information on diurnal and seasonal patterns of exceedances is useful for developing air emissions management and monitoring plans, the total number of exceedances was required to identify and evaluate potential residual effects in the EIS.

Information regarding the presence of inversions in the CALMET data set was presented during the Meteorology Technical Meeting held on January 27, 2023. As shown in the figures below, stable conditions (PG stability class categories E and F) occur about 24% of the time and are most prominent during December (33% of the time).

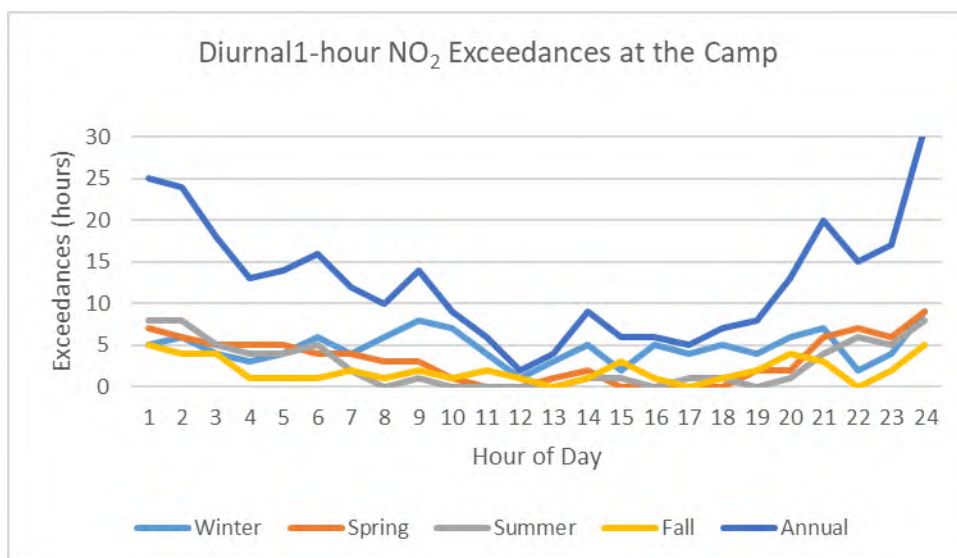
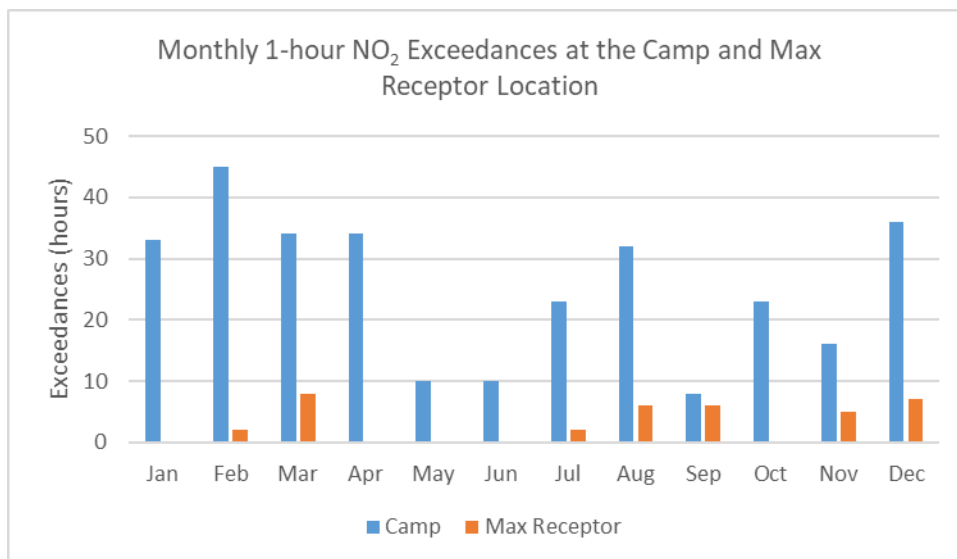


In addition to the previous information, the temporal patterns of the predicted exceedances for 1-hour NO<sub>2</sub>, and 24-hour TSP, PM<sub>10</sub>, and uranium for each of the assessment scenarios have been evaluated at the camp receptor and at the receptor with the maximum predicted concentration. The results of this analysis are presented in a series of figures below. While NO<sub>2</sub> exceedances are limited (i.e., < 5% of the time), some temporal patterns do emerge. Namely, 1-hour NO<sub>2</sub> exceedances are primarily expected to occur during the coldest months (January, February, and December) and during the morning and overnight hours when inversions are more likely to occur. For 24-hour TSP and PM<sub>10</sub>, exceedances are predicted to be most frequent during the May to October period, corresponding to higher emission rates compared to the November to April period (see Section 4.0 of Appendix 6-A). Being that there are so few 24-hour uranium exceedances, no obvious temporal pattern was identified, but the months with the highest number of exceedances at the camp receptor are expected to be April, October, and

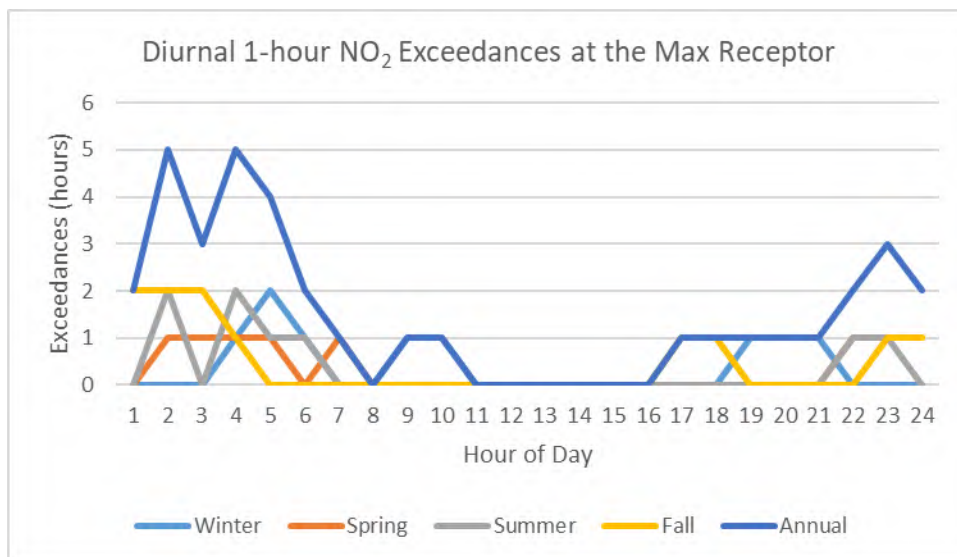
December and only one exceedance is predicted from May to September. This suggests that exceedances of the 24-hour uranium criteria are more likely to occur during the colder months, possibly due to the increased presence of inversions.

The aforementioned information will be considered as mitigation and monitoring plans are developed.

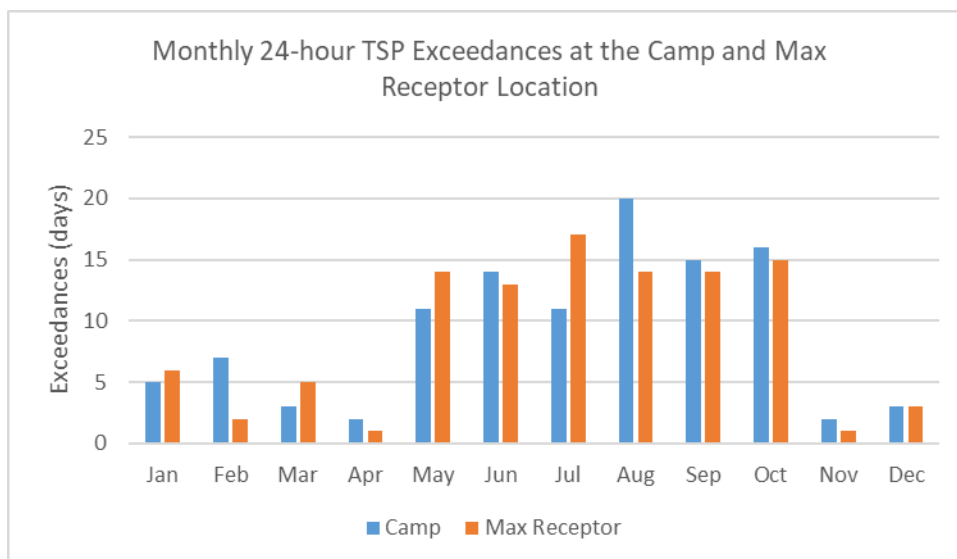
*Figures for Construction Exceedances*

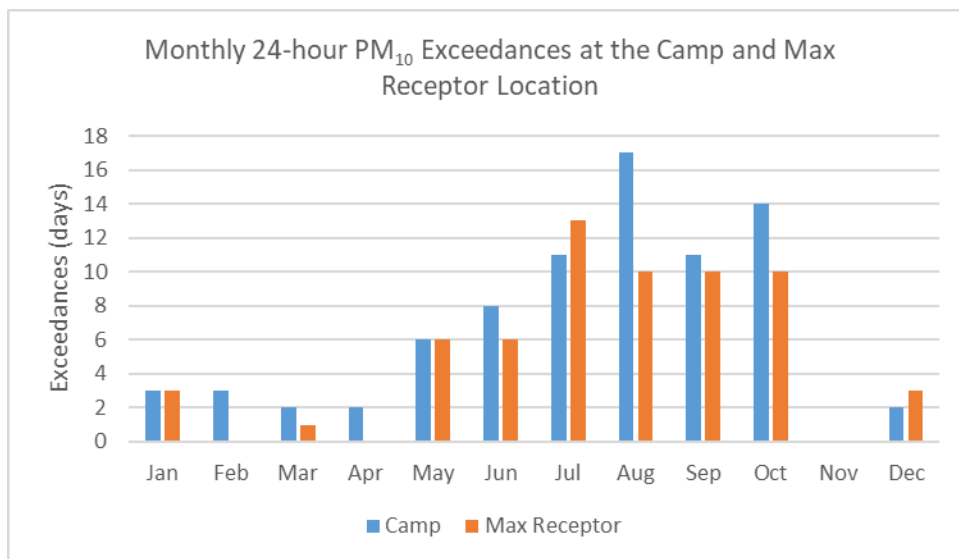


Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov

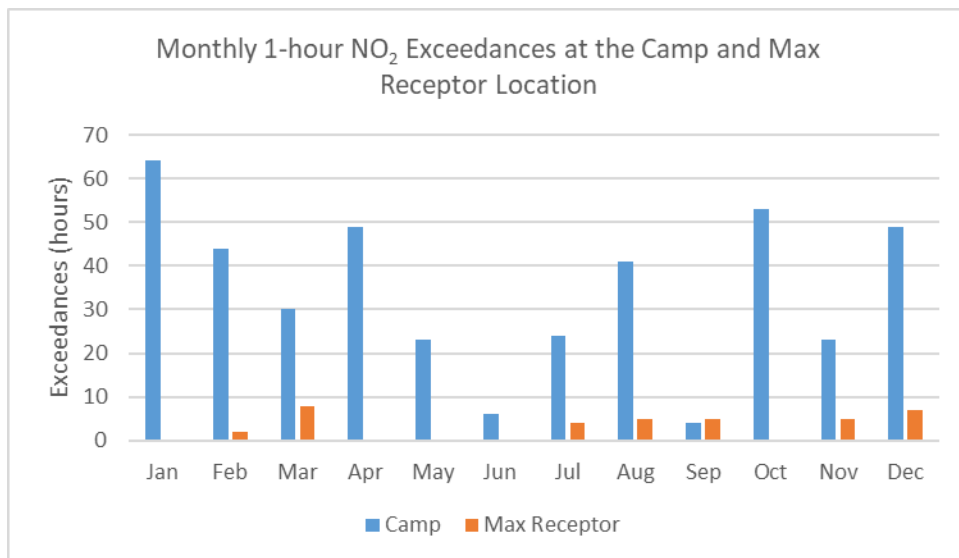


Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov

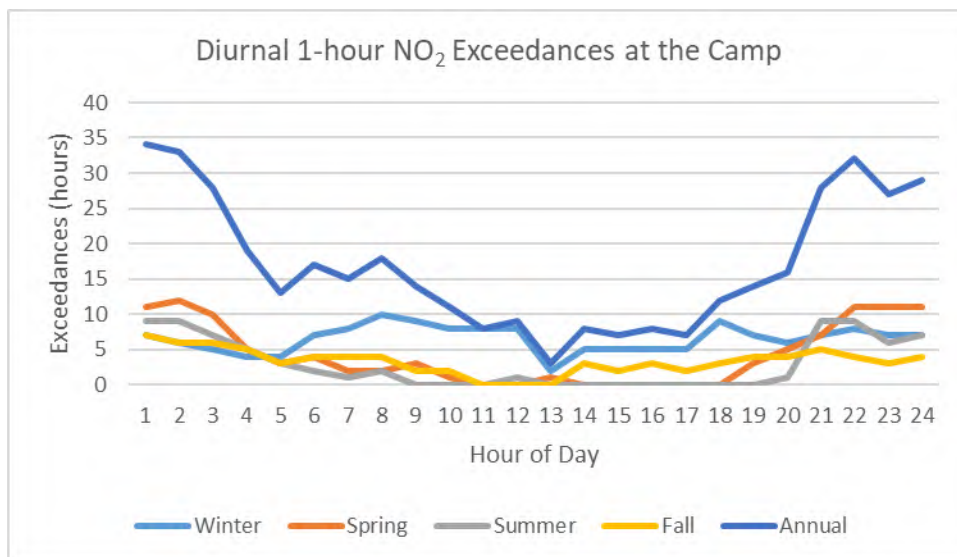




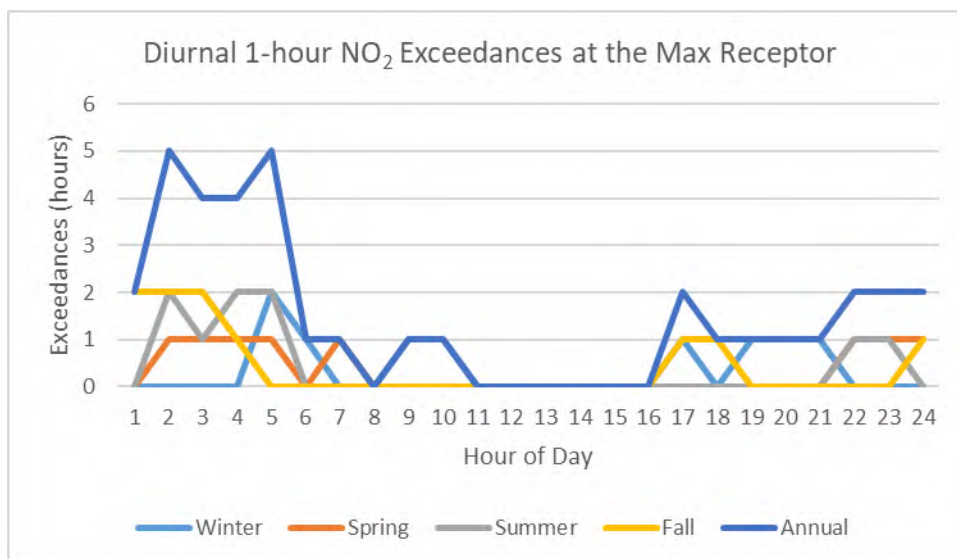
*Figure for Operation Exceedances*



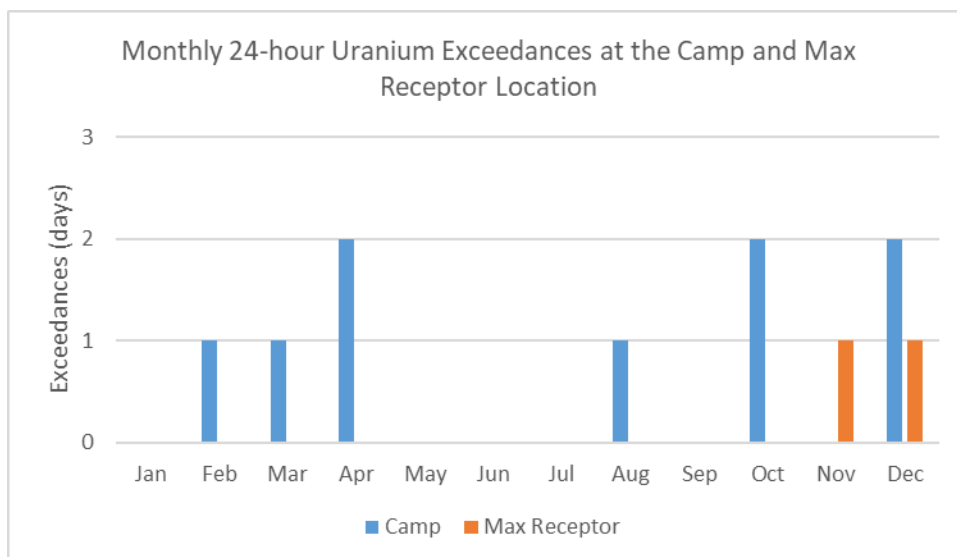
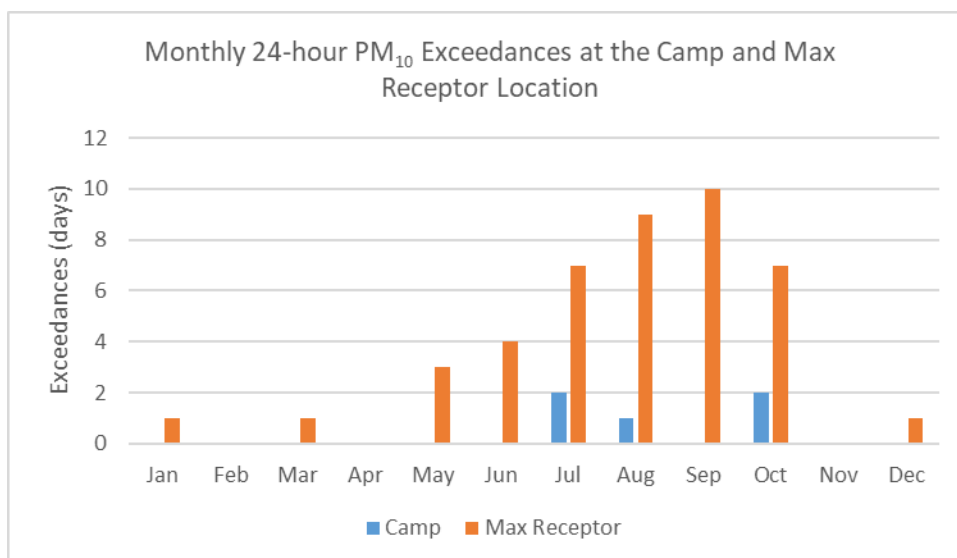
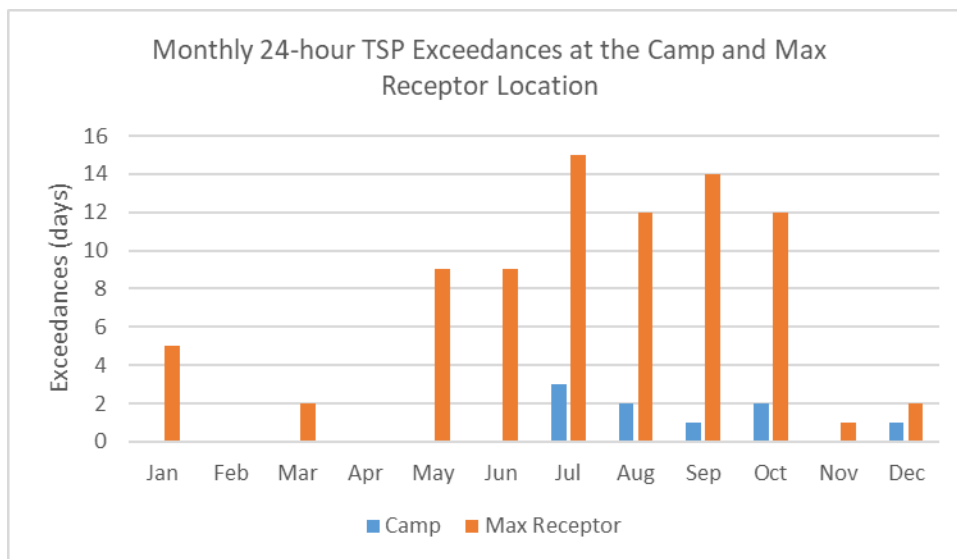




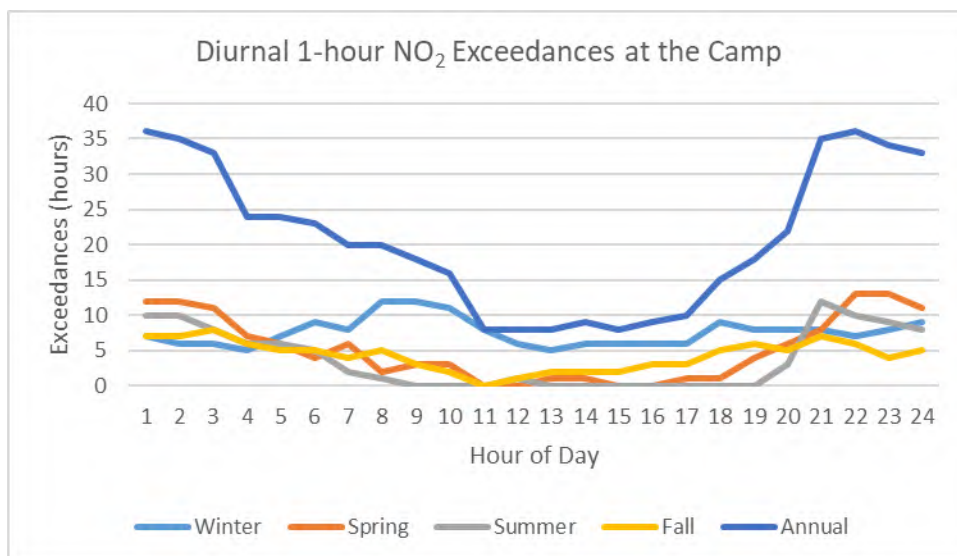
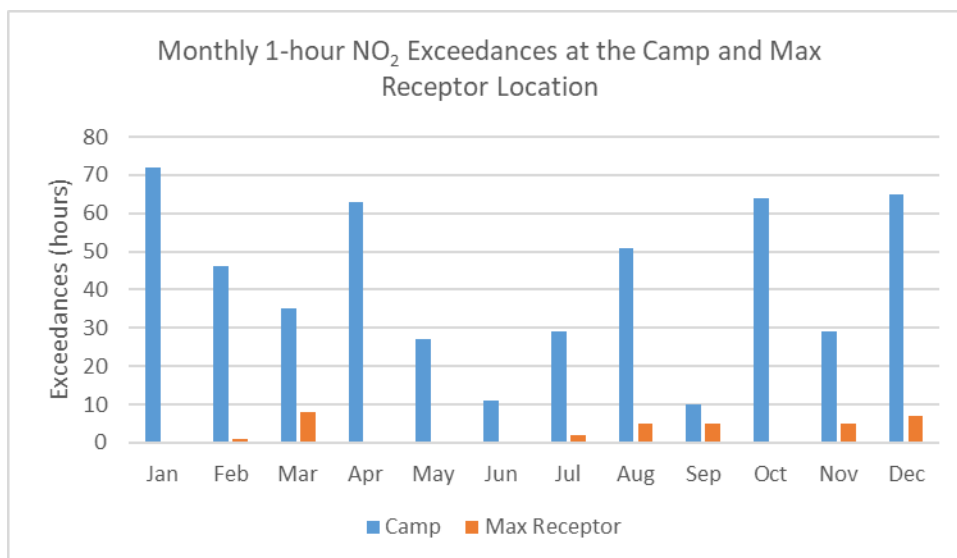
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



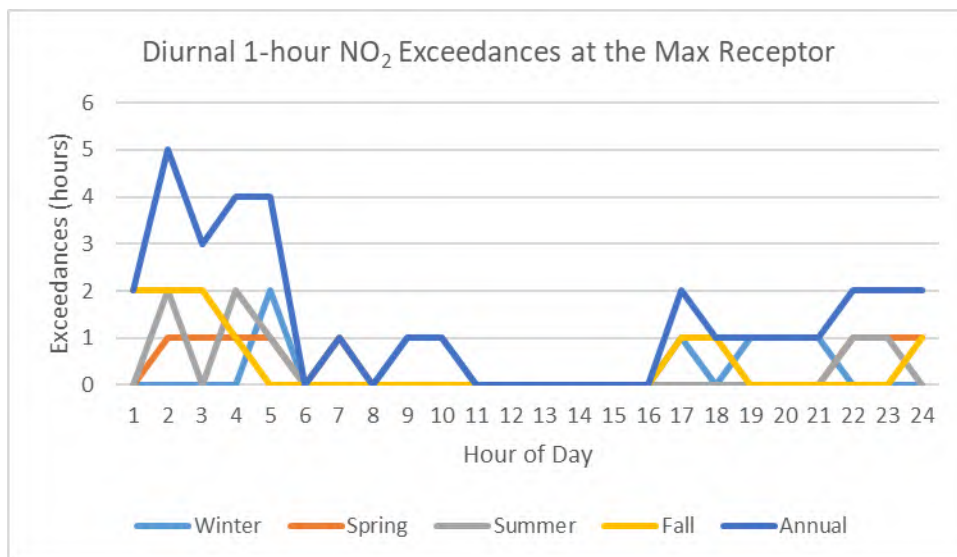
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



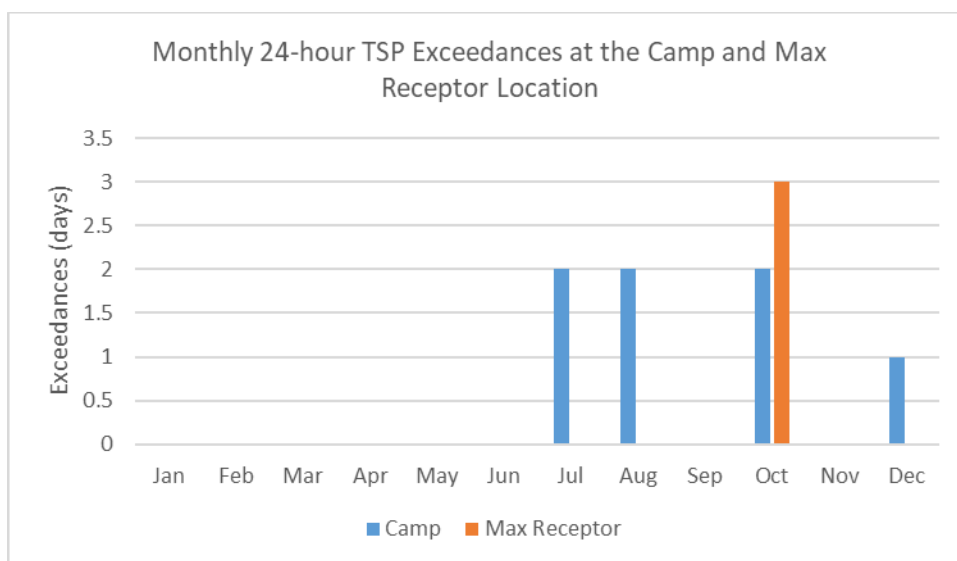
*Figures for Decommissioning Exceedances*

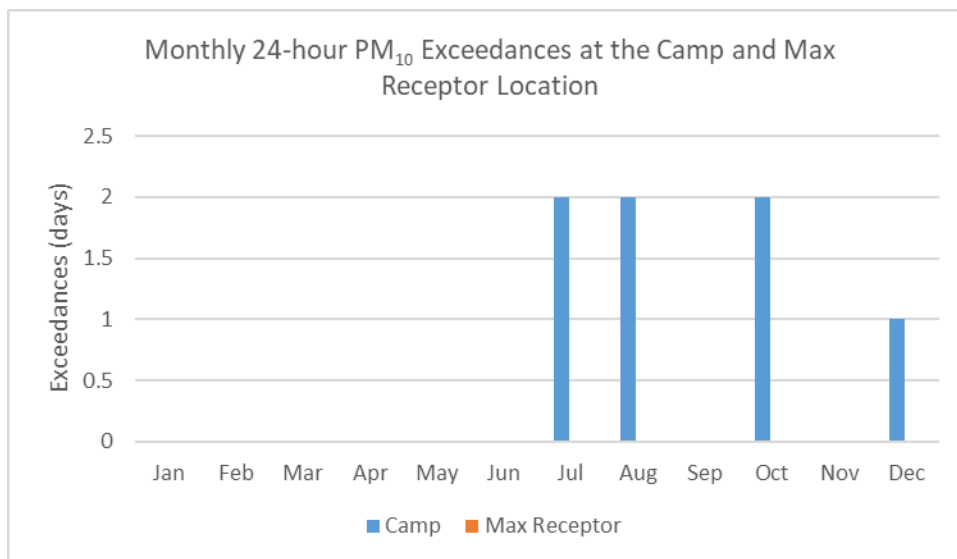


Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov





Note: There were no exceedances predicted at the maximum off-property receptor in the Decommissioning Scenario

## Attachment: IR-45

Number	IR-45
Dept.	HC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6 Air Quality Technical Supporting Document Section 6.3.1
Context and Rationale	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p>Context: Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: "concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel". However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p>Rationale: Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p>References:</p> <p>[1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p> <p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>

Information Requirement	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table.[i]
	[i] Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation
	Health Canada, Water and Air Quality Bureau, October 2022
	Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m³ increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \mu\text{g}/\text{m}^3$
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = 1.127$
	$\beta \times 10 \mu\text{g}/\text{m}^3 = \ln 1.127$
	$\beta = (\ln 1.127)/(10 \mu\text{g}/\text{m}^3) \text{ ,}$
	$\beta = 0.01196$
	The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):
	$ALCM = \left[ \frac{(e^{\beta \cdot \text{Exposure}} - 1)}{e^{\beta \cdot \text{Exposure}}} \right] \cdot \text{Baseline rate} \cdot \text{Years}$

ALCM = additional lung cancer mortality cases per 100,000 population
β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))
Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)
Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation
Years = years of project or project phase
Sample calculation:



	<p>Project estimates an exposure from relevant source(s) of 0.067 µg/m<sup>3</sup> over 50 years of operation</p> $ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$ $ALCM = \left[ \frac{(e^{0.01196 \cdot 0.067} - 1)}{e^{0.01196 \cdot 0.067}} \right] \cdot 45.5 \cdot 50$ <p>ALCM = 1.8 additional lung cancer mortality cases per 100,000</p> <p><b>References:</b></p> <p>[1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: <a href="https://cancer.ca/Canadian-Cancer-Statistics-2021-EN">cancer.ca/Canadian-Cancer-Statistics-2021-EN</a></p> <p>[2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <a href="https://doi.org/10.1186/s12889-020-08771-w">https://doi.org/10.1186/s12889-020-08771-w</a></p> <p>[3] Health Canada. Lung cancer and ambient PM<sub>2.5</sub> in Canada: a systematic review and meta-analysis.</p> <p>[4] Health Canada, 2022. Available online at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>
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Response:

#### **Sources of Diesel Emissions from the Project**

The Project-related atmospheric releases considered in the Environmental Risk Assessment (ERA) in the draft EIS Appendix 10-A were consistent with the air emissions inventory detailed in the Air Quality Assessment (draft EIS Section 6 and Appendix 6-A). The emissions will vary over time based on the schedule of Project activities and the air quality assessment scenarios were developed based on the year with the maximum activity occurring in each Project phase. There are several combustion sources at the site, which would be expected to contribute diesel emissions during the relevant phases of the Project. Combustion sources at the site include:

- diesel generators;
- propane heaters; and
- diesel and gasoline combustion associated with construction equipment and vehicles utilizing the on-site roads.

These combustion sources would contribute particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), NO<sub>x</sub>, SO<sub>2</sub> and CO to the atmospheric environment. Concentrations of these parameters were predicted in the Air Quality TSD

(Appendix 6-A) at several receptor locations within the Local Study Area and were used as surrogates for diesel emissions from the Project. It is important to note that scoping of the air quality assessment followed a conservative approach. For instance, and of relevance to this IR, although Denison expects the site will be powered by the provincial grid during Operations, the air quality assessment conservatively assumed that the back-up diesel generators would run continuously (24/7) during Operation and Decommissioning in order to predict worst-case concentrations and bound the evaluation of Project residual effects.

#### **Assessment of Diesel Emissions in the ERA**

Particulate matter, of which diesel particulate matter would be a subset and in particular a subset of or associated with the PM<sub>2.5</sub> fraction, was assessed in the ERA in Appendix 10-A based upon predicted concentrations at receptor locations as documented in the Air Quality Assessment (EIS Section 6 and Appendix 6-A). As discussed in Section 3.2.1.3.2 of the ERA (Appendix 10-A), predicted concentrations of particulate matter (including TSP and PM<sub>2.5</sub>) during Construction, Operation, and Decommissioning all met their respective annual screening values of 60 µg/m<sup>3</sup> for TSP and 8.8 µg/m<sup>3</sup> for PM<sub>2.5</sub>. Exceedances were predicted for TSP and PM<sub>10</sub> of the 24 hour screening values in all Project Phases, attributable to fugitive dust from earthworks and unpaved roads and not operation of generators. There were, however, no exceedances of the 24 hour screening value for PM<sub>2.5</sub>, the fraction of particulate matter most likely to be associated with diesel emissions.

#### **Assessment of Diesel Emissions using HC New Approach**

The method recommended by HC in this IR was used to calculate the additional lung cancer mortality (ALCM) over the baseline rate from PM<sub>2.5</sub> using the predicted PM<sub>2.5</sub> concentrations presented in the EIS. The same human receptor locations assessed in the ERA (Risk2 through Risk5, Table 3-7 in Appendix 10-A) were considered including the residency times for each receptor type consistent with Table 4-2 in Appendix 10-A, and shown in Table IR45-1 below.

**Table IR45-1: Summary of Human Receptor Locations and Residency Assumptions**

Receptor ID	Receptor Location Description	Receptor Type	Residency Assumption
Risk2	Human Location Trapper	Fisher/Trapper	50% at Risk2, 50% at Risk5
Risk3	Human Location Camp Worker	Camp Worker	50% at Risk3, 50% at Risk5
Risk4	Human Location Seasonal Resident	Seasonal Resident	30% at Risk2, 70% at Risk5

Baseline concentrations for PM<sub>2.5</sub> are 3.1 µg/m<sup>3</sup>. The following equation (Greco et al., 2020) was used to calculate the ALCM.

$$ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$$

Where  $\beta = 0.01196$

Exposure = estimated PM<sub>2.5</sub> exposure concentration with background removed

Baseline rate = 45.5 per 100,000

Years = years of project or project phase (construction = 2 years, operation = 15 years, decommissioning = 5 years)

The exposure concentrations for PM<sub>2.5</sub> were scaled to consider the fraction attributable to diesel sources, consistent with Section 4.0 in Appendix 6-A (Construction = 22.8%, Operation = 26.8%, and Decommissioning = 36.2%). Considering these assumptions, the following table provides the ALCM for each project phase:

**Table IR45-2: Summary of Additional Lung Cancer Mortality Rates at Human Receptor Locations**

Receptor ID	Construction	Operation	Decommissioning
Risk2	0	0	0
Risk3	0	0	0
Risk4	0	0	0

Note: Results are interpreted per 100,000 people.

As shown above, the risks for the general public at Risk2, Risk 3 and Risk4 demonstrate that no additional lung cancer mortality cases are expected per 100,000 population as a result of exposure to diesel particulate matter (using PM<sub>2.5</sub> as a surrogate) due to the Project. Therefore, there is unlikely to be an increased incidence of lung cancer mortality due to exposure to diesel particulate matter generated by the Project activities.

#### **Mitigation measures to limit diesel emissions and exposure**

Various mitigation measures will be implemented to control or reduce the impacts to the atmospheric environment from the Project. These include administrative and physical controls based on best industry practices, as listed below and outlined in the draft EIS Section 6 and Appendix 6-A and in IR responses:

##### **Administrative controls**

- Create and implement a dust management plan, including the application of water and/or chemical suppressant to control fugitive dust, in addition to other operational strategies to assist in dust control;
- Planning vehicle and equipment routes to minimize travel distances, where possible; and
- Employ standard operating procedures and complete regular inspections of equipment machinery to ensure it is in good working order.
- Vehicles and equipment will be equipped with Tier 4 engines where feasible (IR-139).

##### **Physical controls**

- Avoid dust-generating activities (e.g., earthworks, material handling) during dry or high wind conditions;
- Avoid dropping material from height;

- Ensure all exhausts (e.g., mobile equipment, generators) are in good working condition;
- Turn off vehicles and equipment when not being used;
- Minimize or reduce vehicle and equipment speed by enforcing speed limits;
- Apply water at least twice per day to unpaved roads and surfaces; and
- Maintain unpaved road surfaces via grading or other maintenance practices to reduce the amount of silt (i.e., fines) present in the roadbed material.

### Conclusions

Considering PM<sub>2.5</sub> as a surrogate for diesel particulate matter, the modelled concentrations of PM<sub>2.5</sub> are not expected to result in any additional lung cancer mortality cases per 100,000 at the receptor locations that are relevant for members of the public (i.e., hunters, trappers, fishers, recreational users, seasonal residents) and the camp worker. The overall risk is expected to be negligible; however, monitoring of particulate matter will be carried out throughout the Project and compared to risk-based criteria. Therefore, no further Project controls beyond those identified are proposed for the protection of human health due to diesel particulate matter.

### References

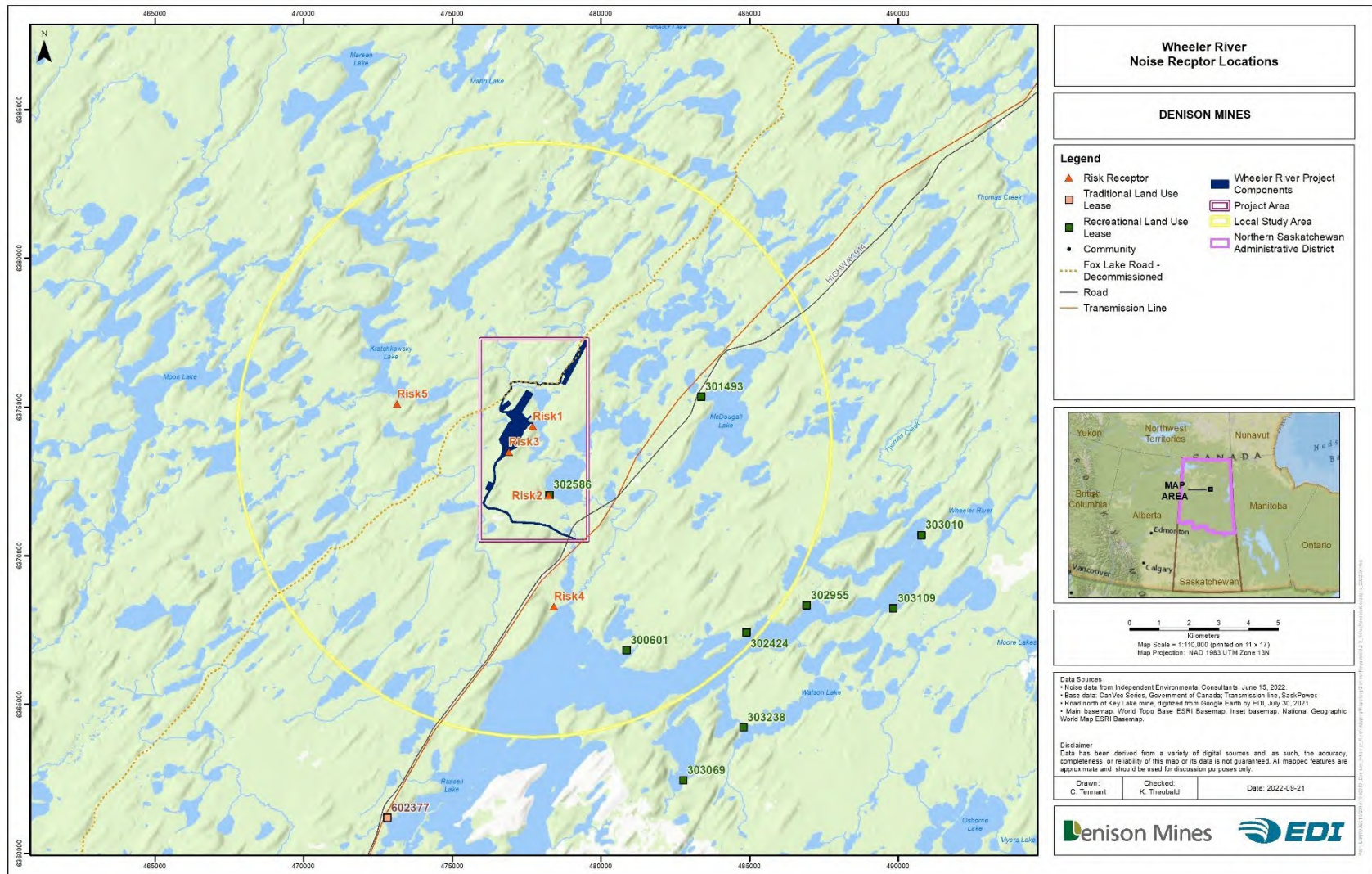
CCME (Canadian Council of Ministers of the Environment). 2023. Canadian Ambient Air Quality Standards. Last accessed online 2023/06/27 from <https://ccme.ca/en/air-quality-report>.

Greco, S.L., MacIntyre, E., Young, S. et al. 2020. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017

## Attachment: IR-48

Number	IR-48
Dept.	HC
Project effects link	Physical stressors (noise and vibration)
Reference to EIS, appendices, or supporting documentation	Appendix 6-E, Figure 6.2.3, p. 6-57
Context and Rationale	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p>Context: Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p>Rationale: The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>
Information Requirement	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.

Supporting figure to the response provided in IR table:

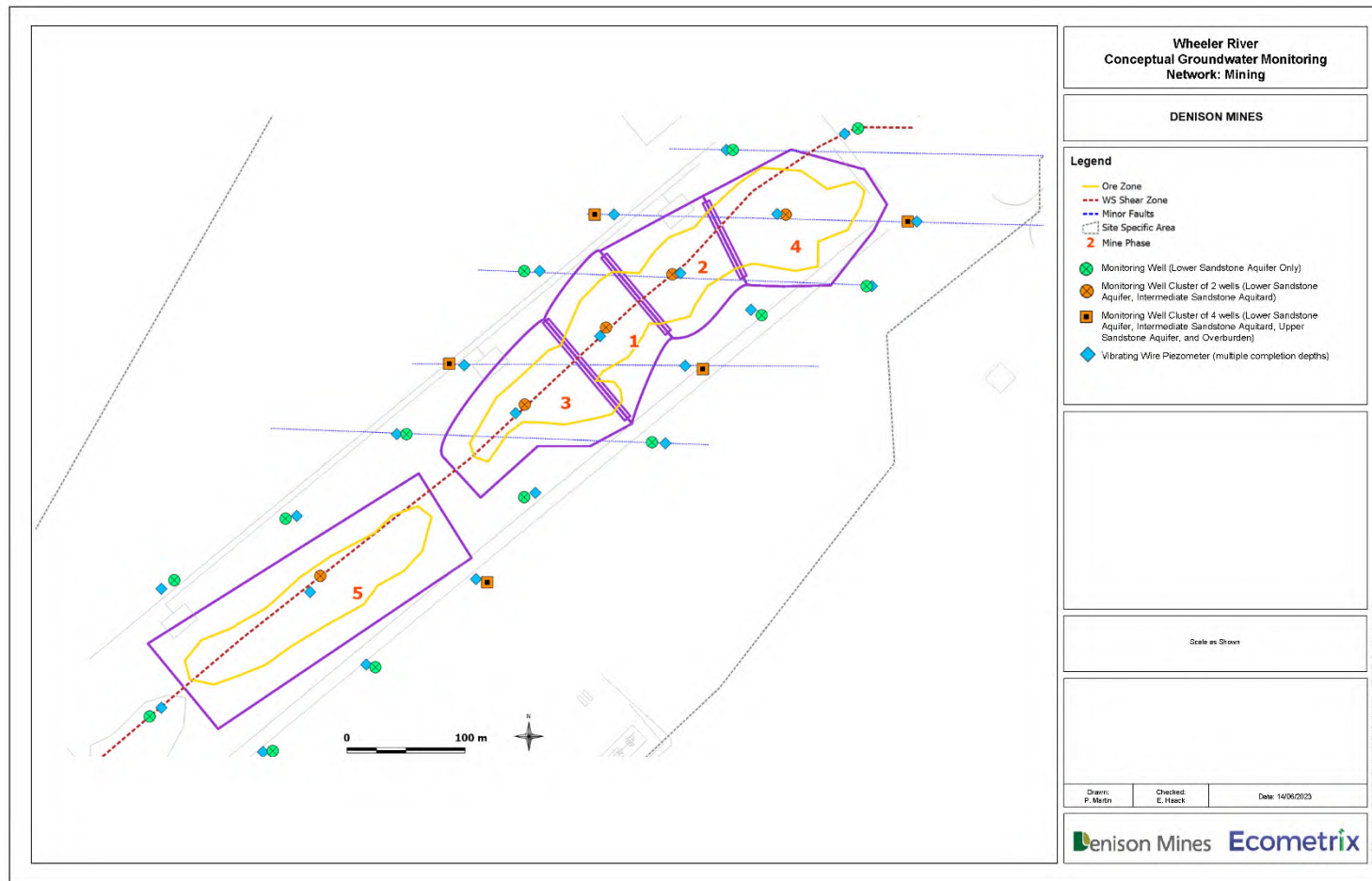


## Attachment: IR-51

Number	IR-51
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Section 7, Figure 7.8-1  Appendix 7-C
Context and Rationale	<p><b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.</p> <p><b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?</p>
Information Requirement	<p>Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).</p> <p>Please clarify how the establishment of a continuous freeze wall will be monitored.</p>



Supporting figure to the response provided in table:



## Attachment: IR-57

Number	IR-57
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.3.3.2 Appendix 7-A, Sections 3.1.2 and 3.7, Appendix 7-C, section 2.5.2
Context and Rationale	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCAN's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>
Information Requirement	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).

### **Response:**

Vertical gradients are presented in Table 3-5, Section 3.7 of Appendix 7-A, while Table 3-1 presents water levels observed at individual groundwater monitoring wells. Discussion of

vertical gradients is limited to groups of wells which are close together (e.g., GWR-036 and GWR-037 which are approximately 10 m apart) rather than clusters of wells which are further apart (e.g., the upgradient cluster, where wells are approximately 400 m apart).

Vertical gradients are implicitly calculated as water levels from all observation wells are incorporated as calibration targets using their coordinates in 3D space. Recognizing that all water level observations are subject to human error, and as such values that are very close to one another (e.g., as observed at GWR-008 and GWR-009) are treated as essentially the same value.

As requested, the table below presents observed and simulated vertical gradients at the well clusters presented in Table 3-1, Appendix 7-A. Observed static water levels are presented as there were issues with the barometric pressure correction for transient water levels.

Cluster	Well	Unit	Observed Water Level (static)	Simulated Water Level	Screen mid-point Elevation	Observed Gradient	Simulated Gradient	Notes
<b>NW</b>	GWR-003	OVB	503.97	503.87	467.8			
	GWR-027	ISA	500.91	501.00	246.3	0.0065	0.0061	
	GWR-025	LSA	502.34	502.40	146.3	-0.0058	-0.0057	
<b>SE</b>	GWR-007	OVB	514.12	503.48	515.2			perched aquifer at GWR-007 impacts gradient calculation
	GWR-009	ISA	502.20	502.57	285.5	0.0231	0.0018	
	GWR-008	LSA	502.40	502.37	166.2	-0.0007	0.0007	
<b>Up-gradient</b>	GWR-006	OVB	514.70	515.81	504.75			
	GWR-028	ISA	511.00	510.40	241	0.0073	0.0107	
	GWR-029	LSA	514.80	515.07	172.25	-0.0158	-0.0194	
<b>Down-gradient</b>	GWR-005	OVB	501.99	500.94	382.55			
	GWR-014	ISA	501.60	501.21	348.05	0.0010	-0.0007	
	GWR-012	LSA	501.27	501.40	166.5	0.0009	-0.0005	

As indicated in this table, the model provides an excellent representation of the observed gradients estimated using these monitoring well clusters.

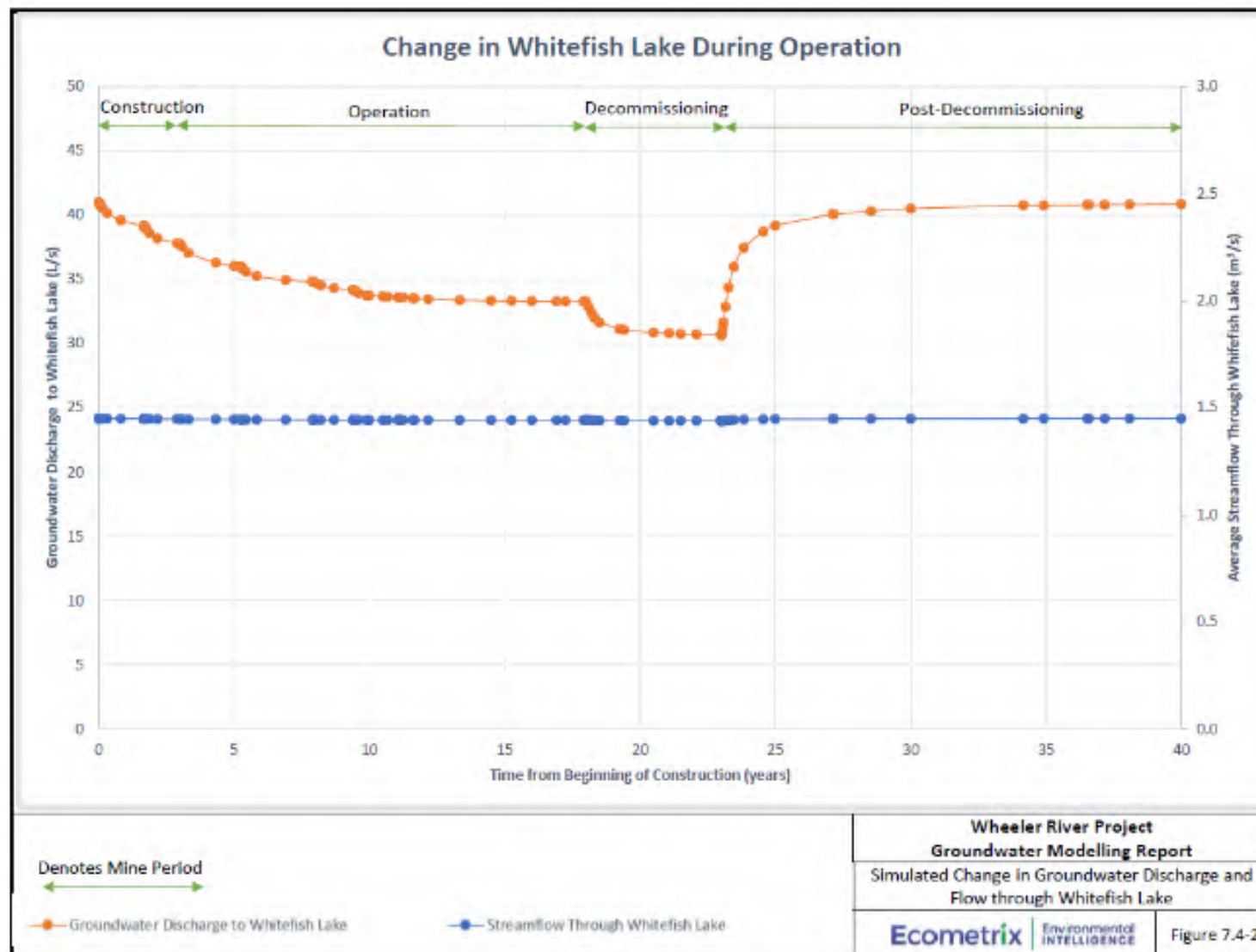
- At the northwest (NW) cluster, the observed and simulated gradients are virtually identical.
- At the southeast (SE) cluster, the gradient from the shallow overburden (OVB) to the intermediate sandstone aquitard (ISA) is under-estimated in the model, however the water level at GWR-007 is believed to be perched above the regional water table, and therefore not a good representation of vertical gradients; regardless both the model and observed data indicate a downward vertical gradient. The gradient between the ISA and the lower sandstone aquifer (LSA) is negligible, which is replicated by the model.
- At the up-gradient cluster, the observed are very well represented by the simulated gradients, including the flow directions.

- At the down-gradient cluster, the gradient between the ISA and the LSA is negligible, which is replicated by the model. The gradient between the OVB and ISA is observed to be downward but given the location of GWR-005 at the shore of Whitefish Lake, the natural hydraulic gradient is expected to generally be upward, as simulated.

## Attachment: IR-59

Number	IR-59
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)
Context and Rationale	<p><b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.</p> <p><b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.</p>
Information Requirement	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.

Supporting figure to the response provided in table:



## Attachment: IR-63

Number	IR-63
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning; Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations
Context and Rationale	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>
Information Requirement	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.

### Response:

The impact of the freeze wall on the local and semi-regional groundwater flow regimes is minor. The footprint of the freeze walled area represents < 0.04% of the area of the regional groundwater flow model, and as such the freeze walled area is a relatively small disruption to the regional groundwater flow system.

The effect of the freeze wall was simulated using the regional groundwater flow model, with results shown below. Hydraulic conductivity of the freeze wall was simulated as a reduction of the baseline hydraulic conductivity by four (4) orders of magnitude, which was consistent with expected hydraulic conductivity changes as reported by



Newmans (2020). The recharge reduction on top of the ore zone was estimated at 50% of the pre-development recharge based on the expected regrading and surface drainage at the site to accommodate all of the surficial operations. The simulated effect of the active freeze walls is illustrated through Figures 1 and 2, which illustrate the change in groundwater flow paths resulting from the freeze wall and operational groundwater pumping.

Figure 1 illustrates the pre-mining (and pre-pumping) groundwater flow paths toward Whitefish Lake. The particle traces shown were released at Whitefish Lake and tracked backward in time / space to their recharge area. The provide an understanding of the west-east groundwater flow toward Whitefish Lake, with local recharge creating the driving force for that groundwater flow. On this figure, the groundwater level contours are shown in black, while the flowlines (particle traces) are shown in blue. Note the flowlines closest to the pumping wells (red circles) and the ore body (light brown outline). The colours in the background reflect the shallow hydraulic conductivity zones, which help to explain inflections in the hydraulic head contours and flowlines.

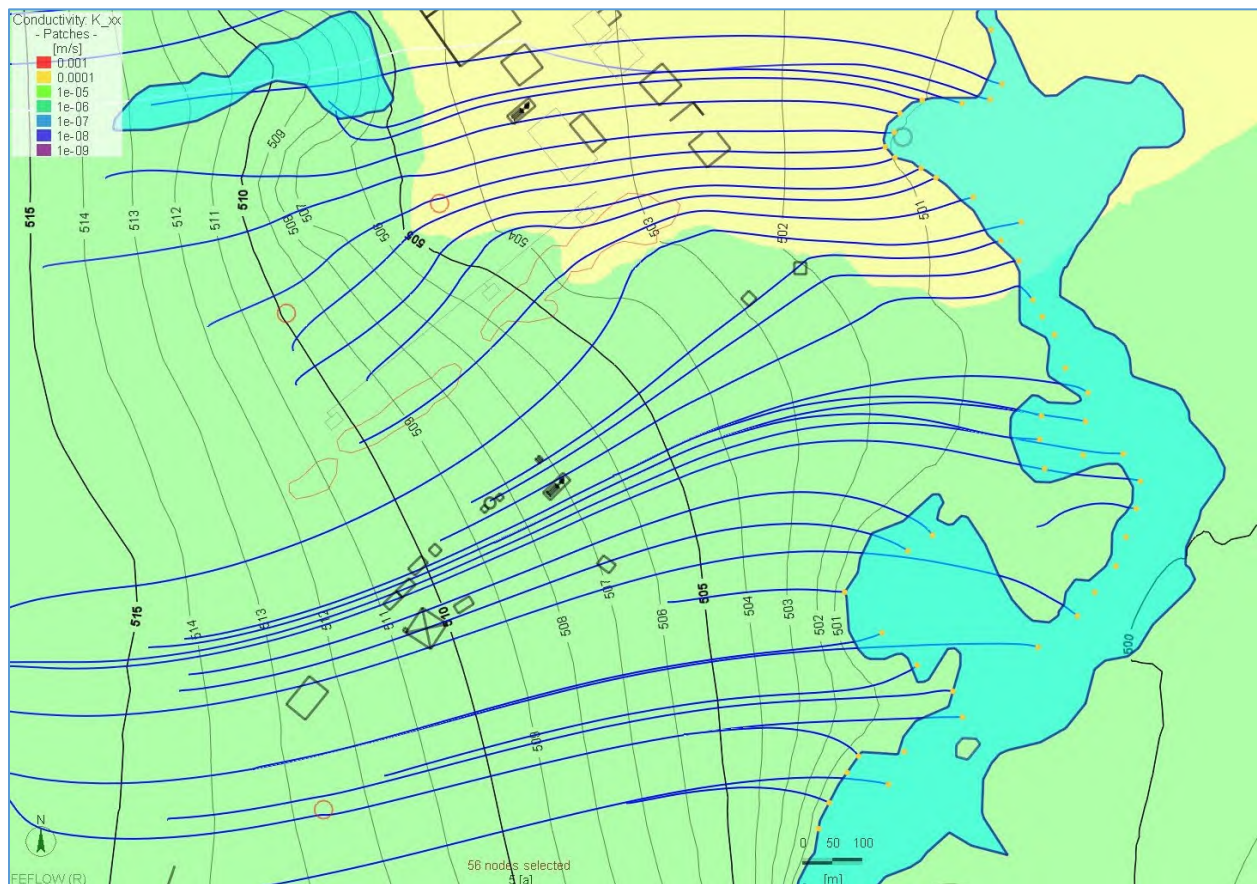


Figure 1: Groundwater Flow Paths Pre-Mining

Figure 2 illustrates the same groundwater flow paths toward Whitefish Lake during mining operations, while pumping was occurring (at red circles) and the freeze walls for phases 1 through 5 are in place. From this figure, the effect of the freeze walls can be seen to be limited to the immediate area around the freeze walls. The addition of the freeze walls creates a cluster of water level contours consistent with the freeze wall locations, representing the change in water levels between the area inside and outside of the freeze wall. Note that the water levels outside the freeze wall are simulated to be relatively unchanged during freeze wall operations.

Also evident on this figure are the water level drawdown contours, which deflect around the pumping wells (3 red circles). Note the additional level of drawdown experienced at wells simulated to pump from the lower hydraulic conductivity zone (i.e., green area, as opposed to the yellow area).

The flowlines in Figure 2 indicate how the groundwater flow patterns will change due to the addition of the freeze wall and the onsite pumping. Flowlines are noted to travel around the freeze wall and in between the pumping wells to discharge at the lake. The pumping wells will capture water flowing from the west which would otherwise discharge to Whitefish Lake.

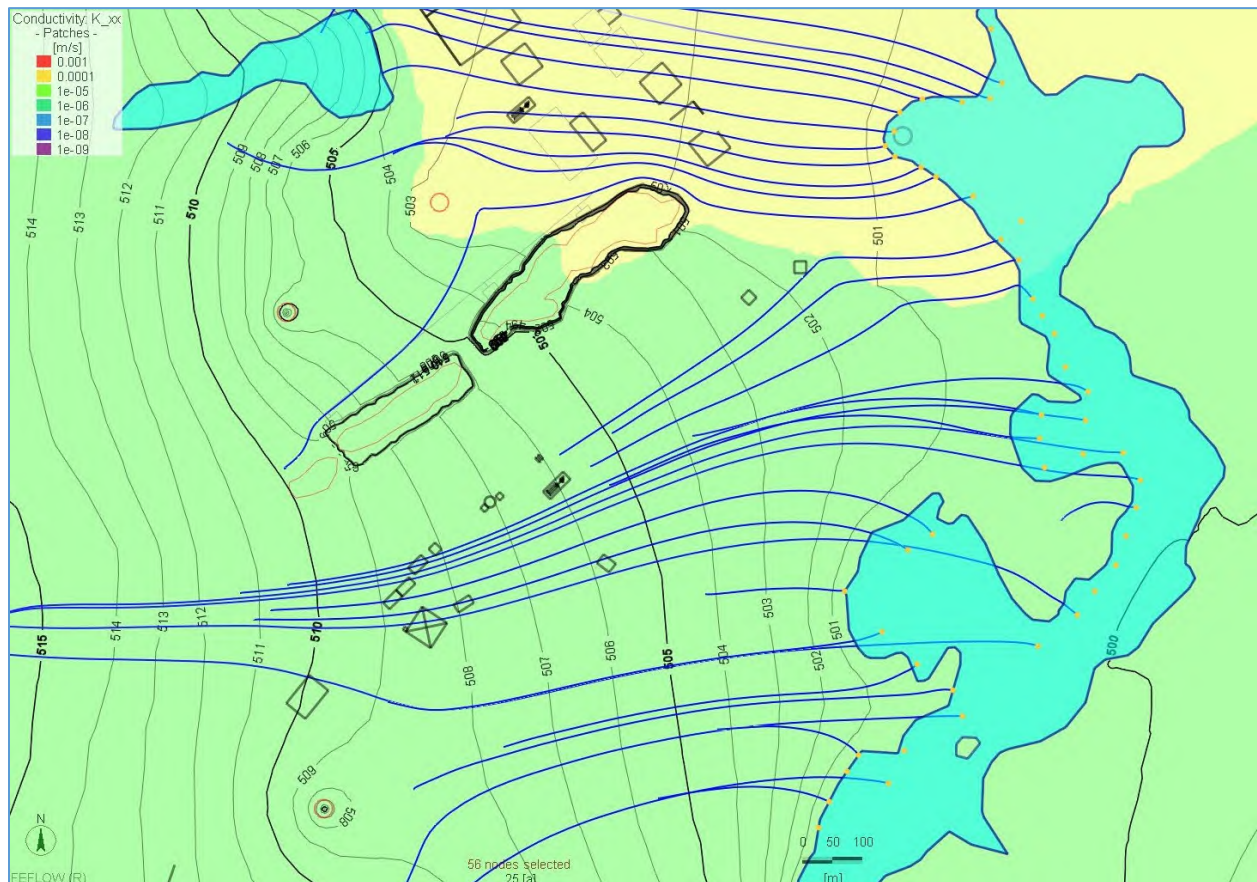


Figure 2: Groundwater Flow Paths During-Mining

Post mining, the groundwater flow path patterns would return to a condition similar to that simulated for pre-mining.

## **References**

Newmans Geotechnique Inc. (2020). Wheeler River In-Situ Leach Surface Freezing Option Pre-Feasibility. Report to Denison Mines Ltd. August 2020.

## Attachment: IR-68, IR-94, IR-97

Number	IR-68
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3 Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7
Context and Rationale	Context: Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone. Rationale: In NRCAN's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCAN notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCAN's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.
Information Requirement	NRCAN requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.

Number	IR-94
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated
Context and Rationale	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H<sup>+</sup> sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining</p>

	area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.
Information Requirement	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.

Number	IR-97
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b
Context and Rationale	<p>Context: Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.</p> <p>It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.</p> <p>Rationale: The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain and clarify if mining operations will mobilize contaminants beyond operations?</li> <li>2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?</li> <li>3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.</li> </ol>

#### **Response IR-68, IR-94 and Questions 1-3 for IR-97:**

In general, the ISR mining process will be sufficiently aggressive, chemically and through permeability enhancement, to access and remove most dissolvable mineral phases within the ore deposit during the mining operation. Metallurgical testing indicates that the mineralogy of the ore zone post-remediation (see IR-67 response) is made up of clay minerals, unreacted sulfide minerals (including pyrite, galena and chalcopyrite) and a small number of secondary mineral phases, discussed further below.

The decision made in the EIS to model geochemical reactive transport of the restored solution in the pore water of the mining zone post-remediation (i.e., initial conditions) and not a long-term contributions of COPCs from the ore zone for the following reasons:

- Uraninite that is not accessible to the mining process will represent residuals in very low permeability zones that will, likewise, have limited contact with groundwater in the future.

- As was discussed in the draft EIS (page 3.30 of Appendix 7-C), groundwater from the Athabasca sandstone that will flow through the ore zone following removal of the freeze wall will not be oxidizing (groundwater is anoxic and free of oxidants (e.g., O<sub>2</sub>, Fe<sup>3+</sup>), and thus, further oxidative dissolution of the reduced, low-solubility uraninite and sulphide minerals is not expected.
- Diffusion of UBS (containing U, Se and other COPCs), and lixiviant into the rock matrix may occur. However, the process of diffusion into the matrix will be limited over the relatively short timespan of mining in each zone (<10 years). Back-diffusion from the matrix of COPCs will be a slow process and will have a low mass flux rate.

The use of initial conditions in the model continues to be considered as sufficiently bounding for evaluation of potential effects in the EIS.

#### Secondary Minerals – Response to IR-68

The metallurgical testing to date suggests that secondary minerals may form in the ore zone during the operation, including jarosite (KFe<sub>3</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>6</sub>), gypsum (CaCO<sub>3</sub>•2H<sub>2</sub>O), barite (BaSO<sub>4</sub>; which could be Ra-bearing) and anglesite (PbSO<sub>4</sub>), with XRD evidence for these mineral phases in metallurgical testing at the end of the leaching period, and being flushed out of the mining areas as particulates in the UBS (see details in response to IR-67). Jarosite, gypsum and barite, however, were not identified in a QEMSCAN quantitative analysis on similar materials in the 2022 column leach tests that were designed to inform the understanding of mineralogy and solution composition in the mining area with remediation. Anglesite was present in quantifiable concentrations as mineral phase in the solid-phase residuals of those column tests.

Dissolution of anglesite has the potential to be a longer-term source of Pb from the ore zone, post-decommissioning. Testwork is ongoing to refine understanding of expected concentrations and distribution of Pb phases – meaning anglesite and galena – post-mining and post-remediation. Information from that test work will then be used to direct testing and monitoring during the operational phases.

Beyond the bounding scenario presented in the EIS, additional modelling of a Pb source over the long-term is not considered warranted at this time, for the following reasons:

1. Pb has a high affinity to sorb to clay minerals and iron oxide phases along the transport path. The assimilative capacity of the system, as modelled, will mitigate against maximum Pb concentrations at Whitefish Lake above those modelled in the EIS scenario.
2. Without further understanding of the reactivity of the anglesite – meaning, kinetic factors that may affect dissolution to solubility limits, modelling anglesite dissolution to thermodynamic equilibrium is expected to be overly conservative.
3. Mineral phases in the ore zone, including clay minerals and Fe oxides have the potential to sorb Pb mobilized from anglesite dissolution. Ongoing analysis of the results of the metallurgical testing and further test work will support refinement of that sorptive capacity and understanding of the potential for a long-term source of Pb from the remediated ore zone.



## Attachment: IR-80

Number	IR-80
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	Context: This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model. Rationale: The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO <sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO <sub>3</sub> or Ca-SO <sub>4</sub> /Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.
Information Requirement	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.

### Response to #1

Figure 26 of the draft EIS was presented as two panels (panel “a” and panel “b”) in Appendix 7-A to the EIS. To support visual clarity and additional interpretation, Figure 26 has been split into two figures:

Figure 26: Hydrochemical Type: Groundwaters for the Wheeler River Project

Figure 27: Hydrochemical Type: Groundwaters for the Wheeler River, Cigar Lake and Millennium Projects

The figure numbering in Appendix 7-A of the draft EIS will be updated accordingly.

The revised Figures 26 and 27 are provided below. The figures have been updated to include visual support on the Piper plots to the interpretations of groundwater chemistry that are detailed in Section 4.3.3 of Appendix 7-A of the EIS. In addition, the text in Section 4.3.3. of Appendix 7-A of the ESI will be updated to provide additional clarity on the interpretations shown in the Piper plots. The new text is provided herebelow with additions shown in blue. .

On page 4-21... The Lower Sandstone Aquifer is characterized by two distinct hydrochemical types. The first is groundwater with low mineralization. The second groundwater type is much more highly

mineralized water that has Cl<sup>-</sup> as a dominant anion. The distinct nature of the two groundwater types is shown in Figure 25 through comparison of Stiff diagrams for GWR-029 and GWR-012. The mineralization at GWR-012 is much higher than that at GWR-029, and Cl<sup>-</sup>, versus HCO<sub>3</sub><sup>-</sup>, is the dominant anion. The mineralization and groundwater major ion composition of GWR-029 is much more similar to overburden well GWR-006 (shown in Figure 24) than to GWR-012. In the Piper plot shown in Figure 26, the distinct geochemical types are evidenced by:

- clustering of groundwater for 3 wells in the Lower Sandstone aquifer with samples from the Intermediate Sandstone Aquitard and local groundwater flow system. This hydrochemical type (dominantly in the Ca/Mg-HCO<sub>3</sub> quadrant of the central diamond of the Piper Plot) is shown within the purple circle; versus
- the other three wells from Lower Sandstone Aquifer, that show a higher relative dominance of Cl<sup>-</sup> as an anion. This shifts the hydrochemical type of the groundwater to the upper portion of the central diamond in the Piper plot, as shown by the purple arrows in Figures 26. This represents the contribution of leaching of halide salts into the groundwater as it moves along the flow path.

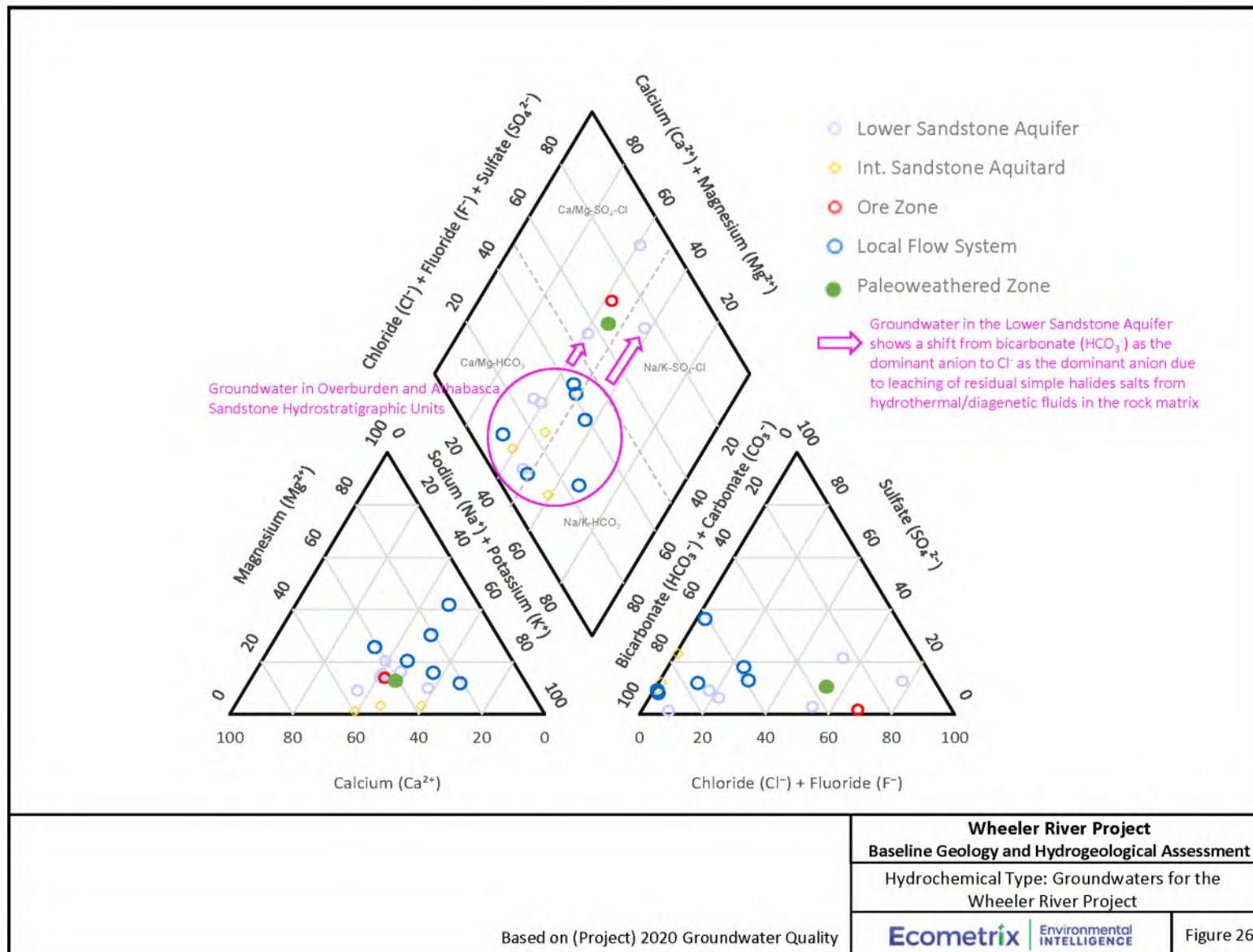
These same two distinct hydrochemical types were also observed in the MFa at Cigar Lake.

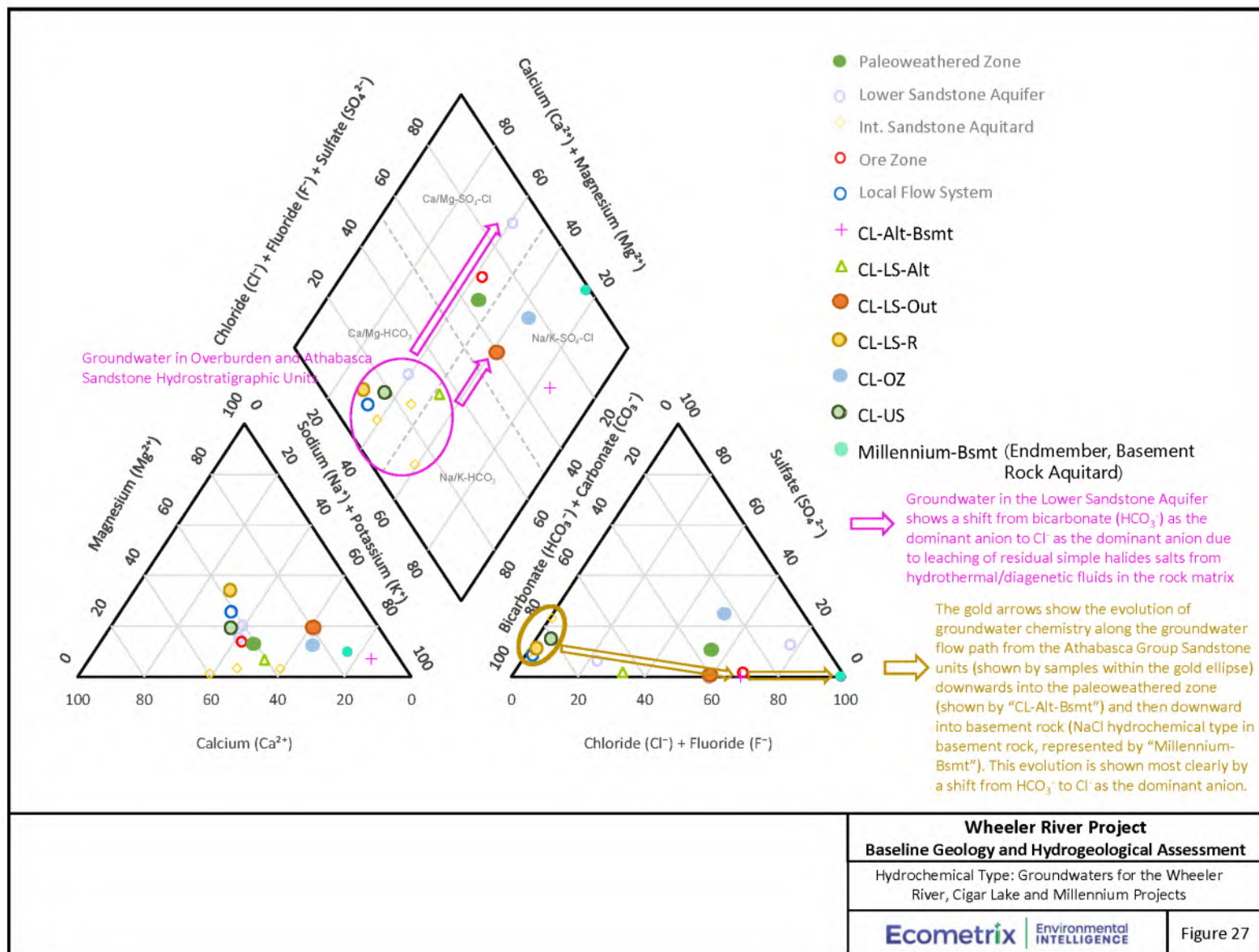
**On page 4.18 - 4.19....** The higher mineralization groundwater with Cl<sup>-</sup> as the dominant anion was observed at Cigar Lake in groundwater collected from a monitoring well located within the zone of thermal alteration and in the inferred downgradient direction of the ore zone. This sample is shown in Figure 27 as “CL-LS-Out” and is of Na-Cl-HCO<sub>3</sub> type. The reasons for the hydrochemical type observed in that monitoring well, and specifically for the source of chloride to the water, was evaluated in some detail in the Cigar Lake studies. One possible explanation explored was that the groundwater reflected mixing of groundwater in the MFa with groundwater from the basement rock. Groundwater in the basement rock is known to be of Na-Cl type, and this is shown in Figure 27 by samples collected from monitoring wells installed in the Basement at Millennium (“Millennium-Bsmt”). This sample represents one endmember hydrochemical type for the basement rock of Na-Cl type. However, the potential for the relatively elevated chloride proportion of anions in groundwater in the MFa to be a result of mixing with groundwater from the basement rocks was ruled out at Cigar Lake as groundwater flow conditions in the MFa were identified as dominantly horizontal, with a component of downward flow to the altered basement.

**On page 4.21...** The paleoweathered zone was sampled at Cigar Lake; analytical results are provided in Appendix J, as samples 199B and 199D. Sample 199D has been referred to in Figure 27 as “CL-Alt-Bsmt”. The hydrochemical type of the Cigar Lake paleoweathered zone is Na-Cl-HCO<sub>3</sub> and of GWR-031 for the Phoenix deposit is a more mixed hydrochemical type (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>). In the Cigar Lake study, the hydrochemistry of the sample in the paleoweathered zone was explained by recharge of the basement waters from the overlying flow regime in the Lower Athabasca Sandstones. Evolution of the groundwater chemistry in the paleoweathered zone is aligned with this flow path. The groundwater quality in the paleoweathered zone represents an intermediate along the hydrochemical evolution of groundwater from the hydrochemical type of the Athabasca Group Sandstone hydrogeological units (Ca-Na-HCO<sub>3</sub> to Na-Ca-HCO<sub>3</sub> type) to one endmember in basement rock (NaCl type). This evolution is a result of water-rock interactions within basement aquitard (including the paleoweathered zone) and is



most clearly visualized in the Piper plot by shifts in relative abundance of anions, shown with gold arrows in Figure 27. The difference in hydrochemical types between groundwater from the paleoweathered zone at Cigar Lake (Na-Cl-HCO<sub>3</sub> type) and associated with the Phoenix deposit (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>) is likely due to the screened interval of the well, which spans the ore zone, and the paleoweathered zone (Appendix A). Groundwater chemistry in GWR-031 is likely influenced by the hydrochemistry of the ore zone.





## Attachment: IR-81

Number	IR-81
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”. Rationale: Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations <15 Bq/L for the 2020 sample, and 0.1 or <0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.
Information Requirement	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., $\delta^2\text{H}$ , $\delta^{18}\text{O}$ ) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.

### Response:

#### **$\delta^2\text{H}$ , $\delta^{18}\text{O}$ Isotopes in Groundwater**

Analysis of  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  Isotopes in groundwater was not performed for the Wheeler River Project baseline work at Ecometrix’s recommendation. Based on our review of the sampling and analysis of isotope data from neighbouring sites, our interpretation was that similar additional sampling at the Wheeler River Project would not add sufficient value. Other projects in the region including Cigar Lake (AECL, 1994) and Millenium (Devine, 2016) analyzed  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  isotopes in groundwater. At Cigar Lake, stable isotopes of water were measured in all Athabasca Group Sandstone units (“upper”, “lower”, “altered sandstone”), the ore zone, and the altered basement. The results were (quoted from AECL, 1994):

- “The waters from the glacial overburden all plot on or near the Cigar Lake meteoric water line...indicating their meteoric origin”;

- “deep groundwaters also plot entirely within the envelope, suggesting that the variations in the isotopic signatures observed for the groundwaters result entirely from variation in meteoric water compositions. The simplest explanation for these isotopic trends is that they reflect (moving) averaged meteoric water compositions of the Cigar Lake area”; and
- “[W]aters from the three [groundwater flow] regimes [in the Athabasca Sandstone group units], basement and mineralization have similar low temperature meteoric  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  values”

Devine, 2016 analyzed stable isotopes in groundwater for shallow groundwater (of depth < 50 m; groundwater in overburden and upper MFd) at the Millenium and McArthur River Projects. It was concluded that “Oxygen and H isotope compositions reveal that the groundwater sampled was meteoric water and has the same  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  as Saskatoon precipitation”.

The potential for analysis of stable isotopes in groundwater to add value to the development of the CSM for the Pheonix project was, as such, considered low.

### **Tritium in Groundwater**

The potential for tritium to support development of the CSM for the Wheeler River program was evaluated using the available information. The conclusion was that, beyond alignment between some samples in the overburden and the upper sandstone aquifer, tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface at the Site. The reasons for this, and information supporting that conclusion are presented below.

Two tables have been presented in this IR to support the discussion below.

- a) Table IR-81-1: Provides tritium concentrations in precipitation over time since the 1950s. The source of the tritium data for Canadian locations, including Churchill, Fort Smith and Ottawa, was from the International Atomic Energy Agency Global Network of Isotopes in Precipitation database (GNIP; <https://nucleus.iaea.org/wiser>). Tritium concentrations over time due to radioactive decay were calculated for examination against tritium concentrations in groundwater concentrations for the Wheeler River Project.
- b) Table IR-87-2: Provides tritium concentrations measured in groundwater under baseline conditions for the Wheeler River Project. The tritium concentrations highlighted in yellow/orange were analyzed at the André E. Lalonde AMS Laboratory, University of Ottawa. The detection limit of < 15 Bq/L at the Saskatchewan Research council does not support interpretation of tritium concentrations with respect to groundwater flow conditions, considering the discussion below. The detection limit at the University of Ottawa is 0.8 TU (0.095 Bq/L). Tritium values measured in groundwater samples in 2021 at the University of Ottawa were examined further in the context of ageing groundwater for the Project.

Tritium concentrations in groundwater measured for the Wheeler River Project must consider several factors. These include:

- a) Tritium concentrations in groundwater can be used to identify recharge to mostly granular aquifers in the last approximately 68-70 years, since the early 1950s (Cherry et al., 2004); water recharged prior to that time will have tritium values below analytical detection limits. This is

shown in Table IR-81-1, where groundwater recharged prior to 1952, extrapolated out more than 60 years, has tritium values that are below the analytical detection limit of 0.1 Bq/L.

- b) Maximum tritium concentrations in the precipitation, associated with “bomb tritium” were observed in the early 1960s. At the present time, tritium concentrations in groundwater recharged at that time would be in the range of 14 Bq/L to 53 Bq/L. Values this high were not observed in groundwater at the Wheeler River Project in 2021, and only in one instance in 2020, which is discussed further below.
- c) Tritium concentrations in precipitation have stabilized from historically high “bomb tritium” values to values of approximately 9-25 Tritium Units (TU), equivalent to 1.1 – 3.0 Bq/L, in the last approximately 20 years (as noted by the CNSC review).
- d) Tritium concentrations may reflect the influence of drilling fluids, which is generally other groundwater from the site.
- e) Tritium is produced within the uranium ore deposits of the Athabasca region; this is evidenced by tritium concentrations at GWR-032 (Table IR-87-1) that were measured to be 950 Bq/L (2020) and 1800 Bq/L (2021) and are higher than can be explained by “bomb tritium” (Table IR-87-3). Tritium production in the ore zone is primarily by neutron capture by <sup>6</sup>Li (AECL, 1994). The groundwater sample from the paleoweathered zone (GWR-031; 910 Bq/L) are also considered to be reflecting tritium generation associated with the deposit.

It is our opinion, based on the above considerations and the discussion that follows, that measurement and analysis of tritium data at the Wheeler River Project is limited in value to conceptual model development, and the current data suggests it raises more questions than can be answered. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

Table IR-81-2: Calculated Tritium Concentrations in Groundwater based on time period of recharge

Time Periods of Interest for recharge	Tritium concentrations in precipitation		Half-Lives of Tritium				
			1	2	3	4	5
			Years Elapsed				
			12.3	24.6	36.9	49.2	61.5
	TU	Bq/L <sup>a</sup>	Tritium concentration measured in Groundwater (Bq/L) <sup>b,c</sup>				
Recharged Prior to 1952 (Clark and Fritz, 1997)	8.2E+00	9.8E-01	4.9E-01	2.4E-01	1.2E-01	6.1E-02	3.1E-02
1953, annual average, Ottawa	2.7E+01	3.3E+00	1.6E+00	8.1E-01	4.1E-01	2.0E-01	1.0E-01
1956, annual average, Ottawa	1.5E+02	1.7E+01	8.7E+00	4.3E+00	2.2E+00	1.1E+00	5.4E-01
1959, annual average, Ottawa	5.4E+02	6.4E+01	3.2E+01	1.6E+01	8.0E+00	4.0E+00	2.0E+00
1963, monthly maximum, Fort Smith (NWT)	7.1E+03	8.5E+02	4.3E+02	2.1E+02	1.1E+02	5.3E+01	2.7E+01
1963, annual average, Fort Smith (NWT)	3.8E+03	4.6E+02	2.3E+02	1.1E+02	5.7E+01	2.9E+01	1.4E+01
1969, annual average, Fort Smith (NWT)	4.0E+02	4.8E+01	2.4E+01	1.2E+01	6.0E+00	3.0E+00	1.5E+00
1979, annual average, Ottawa	4.8E+01	5.8E+00	2.9E+00	1.4E+00	7.2E-01	3.6E-01	1.8E-01
1992 Average (Churchill, MB)	1.8E+01	2.1E+00	1.1E+00	5.3E-01	2.6E-01	1.3E-01	6.6E-02
2000-2019, Maximum annual average, Ottawa	2.3E+01	2.7E+00	1.3E+00	6.7E-01	3.4E-01	1.7E-01	8.4E-02
2000-2019, Minimum annual average, Ottawa	9.7E+00	1.2E+00	5.8E-01	2.9E-01	1.4E-01	7.2E-02	3.6E-02
Snow (AECL, 1994) (6 TU)	6.0E+00	7.1E-01	3.6E-01	1.8E-01	8.9E-02	4.5E-02	2.2E-02

Notes

a Tritium concentrations in TU were converted to Bq/L using the conversion factor of 0.1191 used by the André E. Lalonde AMS Laboratory at the University of Ottawa

b Yellow Highlighting indicates calculated concentration at approximate present-day (2019-2021)

c The detection limit for tritium at the André E. Lalonde AMS Laboratory, University of Ottawa in the water samples is 0.8 TU (0.095 Bq/L);  
*Values shown in italics are below the detection limit*



Table IR-81-1: Summary of Tritium Concentrations Measured in Groundwater for the Wheeler River EIS

Groundwater Well	Hydrostratigraphic Unit	Sampling Date	Tritium Concentration (Bq/L)
GWR-006	OB	2020-08-22	<15
GWR-006		2021-04-14	0.1
GWR-029	LSA	2020-08-30	<15
GWR-029		2021-04-12	0.1
GWR-003	OB	2020-08-16	<15
GWR-003		2021-04-18	1.1
GWR-025	LSA	2020-08-22	<15
GWR-025		2021-04-17	0.4
GWR-008	LSA/DSZ	2020-09-06	<15
GWR-008		2021-04-09	0.5
GWR-009	ISA/DSZ	2020-09-14	16
GWR-009		2021-04-10	1.2
GWR-033	LSA	2020-11-03	<15
GWR-033		2021-05-25	0.5
GWR-034	ISA	2020-10-30	<15
GWR-034		2021-05-24	1.2
GWR-035	USA	2020-11-03	<15
GWR-035		2021-05-24	0.80
GWR-005	OB	2020-08-29	<15
GWR-005		2021-05-22	<0.1
GWR-014	ISA/DSZ	2020-08-29	19
GWR-014		2021-05-21	0.13
GWR-012	LSA/DSZ	2020-08-29	<15
GWR-012		2021-05-23	<0.1
GWR-036	OB	2020-11-05	<15
GWR-036		2021-04-08	0.8
GWR-037	USA/DSZ	2020-10-24	<15
GWR-037		2021-04-09	0.1
GWR-031	PWZ	2020-08-09	<15
GWR-031		2021-06-04	910
GWR-011	LSA/DSZ	2020-08-08	<15
GWR-011		2021-06-01	0.13
GWR-013	ISA/DSZ	2020-08-09	<15
GWR-013		2021-06-02	0.78
GWR-032	OZ	2020-11-01	-
GWR-032		2020-08-08	950
GWR-032		2021-06-04	1800
GWR-046	ISA	9/14/2021	<40
GWR-047	ISA/DSZ	9/10/2021	<40
GWR-048	LSA	9/10/2021	<40

### **Overburden and Groundwater Wells in the uppermost Upper Sandstone Aquifer**

There are three wells monitored as part of the baseline program that are installed in overburden materials: GWR-006, GWR-003 and GWR-005. Two other wells are installed in the uppermost Athabasca Sandstone Group unit (MFd) immediately beneath the overburden. These wells are GWR-036, GWR-035. Tritium values in groundwater wells installed in the overburden and upper sandstone ranged from <0.1 Bq/L to 1.1 Bq/L. Tritium concentrations were 1.1 Bq/L in GWR-003, 0.8 Bq/L in GWR-036 and 0.8 Bq/L in GWR-035. These tritium concentrations in groundwater sampled in these wells is considered to have been recharged in the last 12-25 years. To check alignment between these results and the 3D hydrogeological model, particle tracking was done to estimate minimum groundwater residence times (in years) at each well cluster location. For the overburden unit, the particle tracking results indicated minimum residence times of between 0.5 and 20 years.

Tritium concentrations were at or below the detection limit of 0.1 Bq/L at GWR-006 and GWR-005. Monitoring well GWR-006 is very shallow (screened from 9-15 mbgs), whereas GWR-005 is the deepest of the overburden wells, with a screened interval from 117-123 mbgs. It is considered plausible that the low tritium values reflects the potential for longer residence groundwater times due to heterogeneity in hydraulic conductivities of till material in the overburden. However, tritium concentrations in snow are also lower than in precipitation (AECL, 1994). Thus, it is possible that in the localized areas to those groundwater monitoring wells, materials are lower hydraulic conductivity, and the tritium concentrations are relatively more influenced by snowmelt. Longer residence times in the overburden materials in wells GWR-006 and GWR-005 is supported by higher specific conductance in those wells GWR-003 and GWR-036. Field-measured specific conductance values in GWR-006 and GWR-005 were approximately 150 µS/cm in 2021, whereas values at GWR-003 and GWR-036 were < 75 µS/cm in 2021 (Table 3-2 of Appendix 7-A to the EIS).

### **Deeper Groundwater**

Interpretation of tritium values for “ageing” of groundwater was considered inappropriate beyond the shallowest units at the Site. This is because of the relatively low values of tritium in the groundwater in all but the ore zone, and the numerous confounding factors/complexities. Several tritium concentrations are within 1-3 times the analytical detection limits and are thus considered at the limits of interpretability.

One possible confounding factor at low tritium concentrations is contamination of the sample with drilling fluids. Influence of drilling fluids is possibly a factor in the tritium concentrations observed in groundwater well GWR-014. In that well, tritium values in 2020 were measured as 16 Bq/L at SRC. This is the highest value of tritium detected in groundwater in the Athabasca Sandstone hydrogeologic units and was not reproduced when the well was sampled in 2021; the tritium concentration fell significantly to 0.13 Bq/L. The higher relative concentration of tritium in that well is not considered to reflect “bomb tritium” because of the significant change upon resampling, and it is considered possible that the groundwater quality in that well was influenced by drilling fluids/well construction materials, which was also noted for this well in terms of groundwater quality in the Baseline Report (Appendix 7-A of the EIS). Influence of drilling fluids is also considered the likely explanation for the tritium concentration of 1.2

Bq/L in monitoring well GWR-034. As was noted in the Baseline Report, the water quality in GRW-034 is considered to reflect influence from drilling fluids and additives and is not considered reliable.

Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

### References

AECL (Atomic Energy of Canada Ltd.), 1994. Final Report for the AECL/ SKB Cigar Lake Analog Study. Report No. AECL-10851. July.

Cherry, J.A., Parker, B.L., Bradbury, K.R., Eaton, T.T., Gotkowitz, M.G., Hart, D.J., and Borchardt, M.A., 2004, Role of aquitards in the protection of aquifers from contamination: a “state of the science” report: Awwa Research Foundation, Denver, Colorado.

Clark, I.D., and Fritz P. 1997. Environmental isotopes in hydrogeology. Lewis Publishers: New York. 328pp.

Devine, 2016. Sources and Pathways of Radiogenic Elements in Surface Media Above the Millennium and McArthur River Uranium Deposits in the Athabasca Basin, Saskatchewan, Canada. Ph.D. Thesis, Department of Earth Sciences, Faculty of Science, University of Ottawa.

## Attachment: IR-82

Number	IR-82
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit Appendix 7-C, Section 3.5
Context and Rationale	<p>Context: A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p>Rationale: A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p>Reference:  [1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.</p>
Information Requirement	1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2]

	<p>below provide an example of simplified framework for characterizing redox conditions in aquifers.</p> <p>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</p> <p>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</p> <p>Reference:  [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>
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### Response to #1

Redox conditions within the different hydrostratigraphic units at the site, which addresses spatial heterogeneity, was provided as part of Section 4.3.3 of Appendix 7-A of the draft EIS. As was noted by the CNSC reviewer in this IR (IR-82), the measurement of ORP in the system is qualitative at best, and this is also true of field-measured dissolved oxygen, which, upon exposure of groundwater to the atmosphere will quickly equilibrate with atmospheric oxygen. For the project, where concentrations of nitrate are low in all hydrostratigraphic units, the primary indicators of redox conditions are dissolved iron and sulphate concentrations. At the circumneutral pH range observed in groundwater in all hydrostratigraphic units at the site, concentrations of dissolved iron in groundwater above approximately 0.1 mg/L indicate definitively that the system is anoxic. Ferric oxyhydroxide solid control dissolved ferric iron ( $\text{Fe}^{3+}$ ) concentrations to values less than 0.1 mg/L in near neutral pH water, whereas ferrous iron ( $\text{Fe}^{2+}$ ) is very soluble and mobile in groundwater that is anoxic. The presence of sulphate and qualitative absence of detectable sulphide (based on absence of odour;  $\text{H}_2\text{S}_{(\text{g})}$ ) can typically be detected by odour down to 10  $\mu\text{g/L}$  in the groundwater is also an indicator that the system is not currently highly reducing. Sulphate reduction is typically tied to organic matter oxidation and the system does not appear to have organic carbon sources at this time.

As discussed in Section 4.3.3. of Appendix 7A of the draft EIS, the exception to the above is within the ore zone, where more reducing conditions are evidenced by the mineralogy and the persistence of sulphide minerals and uraninite for more than 1 billion years. In this zone, any oxidant will be scavenged by pyrite, maintaining a reducing environment. This is reflected qualitatively by the ORP measurements in the ore zone which was measured to be -265 mV (page 4.20 of Appendix 7A of the draft EIS).

The technical team acknowledges that there are other redox pairs or species, and specifically As(V)/As(III) and the measurement of dissolved reduced sulphur species sulphide species, that may support the interpretation of redox in groundwater. Holm (1989) concluded on the basis of his work calculating redox potentials from As(V)/As(III), Fe(III)/Fe(II) that the arsenic redox pairs provides supplementary information to that provided by dissolved iron, but is considered qualitative in nature. For the As(V)/As(III) pair, the solution phase speciation of the arsenic ions also has to be considered and may affect the accuracy of calculation of redox potentials from their analytical quantification in groundwater.

It is generally understood that groundwaters are typically not at redox equilibrium (e.g., Lindberg and Runnells, 1984). Thus, in this work, our primary reliance on the concentrations of dissolved iron and sulphate in the groundwater, as well as the mineralogy of the system was considered adequately robust for interpretation of baseline redox conditions in the hydrostratigraphic units for the Wheeler River project. Use of tools like the Jurgen et al., (2009) excel spreadsheet referenced by the CNSC reviewer requires careful consideration and qualification of the results provided, as it based on measured redox indicator ion concentrations and empirical relationships between them. The tool was applied to the available data on groundwater and returns interpretation that is aligned with what was discussed in the draft EIS and herein.

#### Response to #2

The redox conditions assumed for the 3D modelling, using PiChem, were the same for all scenarios as in the 1D modelling in PHREEQC. This includes the equilibration of the groundwater with atmospheric concentrations of oxygen for most of the modelling scenarios. The one exception was the “Redox Scenario” (page 3.48 of Appendix 7-C of the EIS), in which the solution was equilibrated with pyrite, resulting in reducing conditions controlled by the iron sulphide mineral.

It is noted that this equilibration of the groundwater solutions with atmospheric concentrations of oxygen affects only the speciation of elements that are redox sensitive and is a modelling approach that is used to force redox sensitive species to be in their most oxidized form. As noted above, groundwaters are seldom at equilibrium with respect to the speciation of redox sensitive species and thus, using thermodynamic considerations alone can results in elements being present in the model as species that are not observed in the environment. This was mitigated by forcing the conditions in the model to oxidized conditions. As was discussed in Appendix 7-C of the draft EIS (page 3.29), this is a conservative approach because the important redox-active constituents of concern are more mobile in their oxidized forms, including uranium as U(VI).

#### Response to #3

The “Redox” scenario model (page 3.48 of Appendix 7-C of the draft EIS) was run iteratively to evaluate the minimum amount of pyrite that would be required to reduce dissolved-phase U(VI) associated with remediation of the mining zone (i.e., the restored solutions). As was outlined on page 3.49 of Appendix 7-C of the draft EIS, the information available included quantification of total iron through wet chemical extraction in core samples, and observations recorded by Denison personnel during core logging. Specifically, pyrite was observed associated with hydrothermally altered materials between an approximate depth interval of 240-390 mbgs (page 3.49 of Appendix 7-C of the draft EIS).

Total (wet chemical) extraction of iron content of the core materials does not provide speciation of iron. The maximum, minimum, and median total iron concentration, expressed as Fe<sub>2</sub>O<sub>3</sub> weight %, in the MFa are provided in Table 3-2 of Appendix 7-C of the draft EIS. Not indicated in that table is that these statistics are based on 10,436 elemental analyses of core samples. *(Noted is that as part of the response to IR-92, Table 3-2 is being updated to indicate the total number of samples from which the statistics were derived).*

A sample from the MFa downgradient of the mining zone was recently submitted to the Saskatchewan Research Council (SRC) for analysis of total iron and mineralogy by XRD. The sample was taken from location GWR-062 (located within Phase 1 of mining) at a depth of 398.7 mbgs in sandstone and was

named “Altered Pyrite”. The total iron content of the sample was determined in the whole rock assay (by lithium metaborate fusion) to be 13% by weight; the analytical results are provided in Appendix A. The certification of analysis for the whole rock assay is attached to this IR. Pyrite and marcasite were identified as the iron phases in the sample by XRD; the XRD results are attached to this IR in Appendix A.

*Pyrite Content Assumed in the “Redox Scenario”*

In the numeric model for the sensitivity “Redox Scenario”, the total iron content was considered was the median value in the MFA. The Median total iron value in the MFA is 1.4 wt % (1.4 g) of  $\text{Fe}_2\text{O}_3$  per kg of sediment/rock, which is equivalent to 0.0175 moles of Fe per kg of soil. Because of the stoichiometry of pyrite ( $\text{FeS}_2$ ), this is equivalent to 0.0175 moles of pyrite per kg of soil. This value was then converted to moles of Fe per litre of water, as is the convention for PHREEQC. To do this conversion, it was assumed that the groundwater flow was predominantly through the desilicified/hydrothermally altered portion of the MFA, with a porosity of 0.2 and a bulk density of  $2.12 \text{ g/cm}^3$ . The total moles of pyrite per litre of soil was calculated as 0.186 moles/L.

Determined through the reactive transport modelling in PHREEQC was that only 0.0001 moles of pyrite per litre of water was required to oxidize the mass of U(VI) transported from the mining zone. This amount of pyrite represents 0.054% of the median total moles of iron present in the MFA.

The pyrite content measured in the “Altered pyrite” sample by XRD, presented herein, exceeds that assumed in the reactive transport modelling.

References

Holm, T.R. and Curtiss, C.D., 1989. A comparison of oxidation-reduction potentials calculated from the As(V)/As(III) and Fe(III)/Fe(II) couples with measured platinum-electrode potentials in groundwater. J. Contam. Hydrol., 5: 67-81.

Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.

Lindberg, R.D. and Runnells, D.D., 1984. Ground water redox reactions: an analysis of equilibrium state applied to Eh measurements and geochemical modeling. Science, 225:925 927.



Attachment IR-82 Appendix A

**SRC Mineral Processing**  
Attention: Jack Zhang  
PO #/Project: 15475  
Samples: 3

**SRC Geoanalytical Laboratories**  
2901 Cleveland Avenue, Saskatoon, Saskatchewan, S7K 8A9  
Tel: (306) 933-8118 Fax: (306) 933-5656 Email: geolab@src.sk.ca

Report No: G-2023-1281

Date of Report: Jun 28, 2023

**ICP Whole Rock Assay**  
**Lithium Metaborate Fusion**

Column Header Details

Aluminum in wt % (Al<sub>2</sub>O<sub>3</sub>)  
Calcium in wt % (CaO)  
Iron in wt % (Fe<sub>2</sub>O<sub>3</sub>)  
Potassium in wt % (K<sub>2</sub>O)  
Magnesium in wt % (MgO)

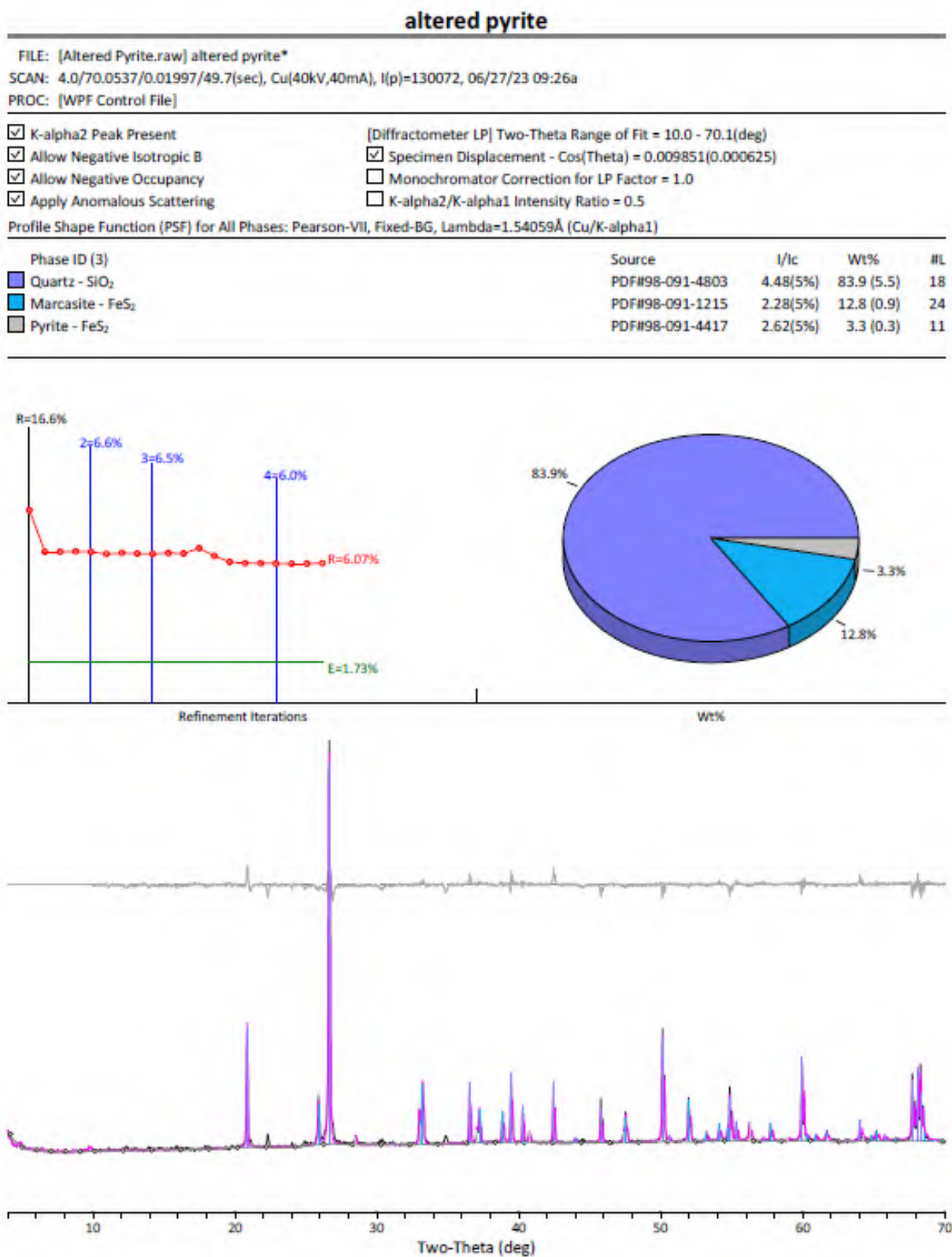
Manganese in wt % (MnO)  
Sodium in wt % (Na<sub>2</sub>O)  
Phosphorus in wt % (P<sub>2</sub>O<sub>5</sub>)  
Titanium in wt % (TiO<sub>2</sub>)  
SiO<sub>2</sub> by ICP in wt % (SiO<sub>2</sub>)

Barium in ppm (Ba)  
Chromium in ppm (Cr)  
Scandium in ppm (Sc)  
Strontium in ppm (Sr)  
Yttrium in ppm (Y)

Zirconium in ppm (Zr)  
Loss on Ignition in wt % (LOI)  
SUM in (SUM)

Sample Number	Al <sub>2</sub> O <sub>3</sub> wt %	CaO wt %	Fe <sub>2</sub> O <sub>3</sub> wt %	K <sub>2</sub> O wt %	MgO wt %	MnO wt %	Na <sub>2</sub> O wt %	P <sub>2</sub> O <sub>5</sub> wt %	TiO <sub>2</sub> wt %	SiO <sub>2</sub> wt %	Ba ppm	Cr ppm	Sc ppm	Sr ppm	Y ppm	Zr ppm	LOI wt %	SUM
SY5	14.5	7.16	10.6	4.23	3.27	0.13	4.18	2.05	1.82	49.9	6410	147	13	3130	57	743	N/R	97.84
ALTERED PYRITE	2.23	0.02	13.0	0.05	0.41	<0.01	0.04	0.05	0.08	67.5	9	49	<2	151	37	176	16.9	100.58
ALTERED PYRITE R	2.16	0.02	13.0	0.05	0.40	<0.01	0.04	0.04	0.10	67.2	9	48	<2	148	36	178	17.5	100.50

Whole Rock Analysis: A 0.1 gram pulp is fused at 1000 C with lithium metaborate then dissolved in dilute HNO<sub>3</sub>.  
The standard is SY5.

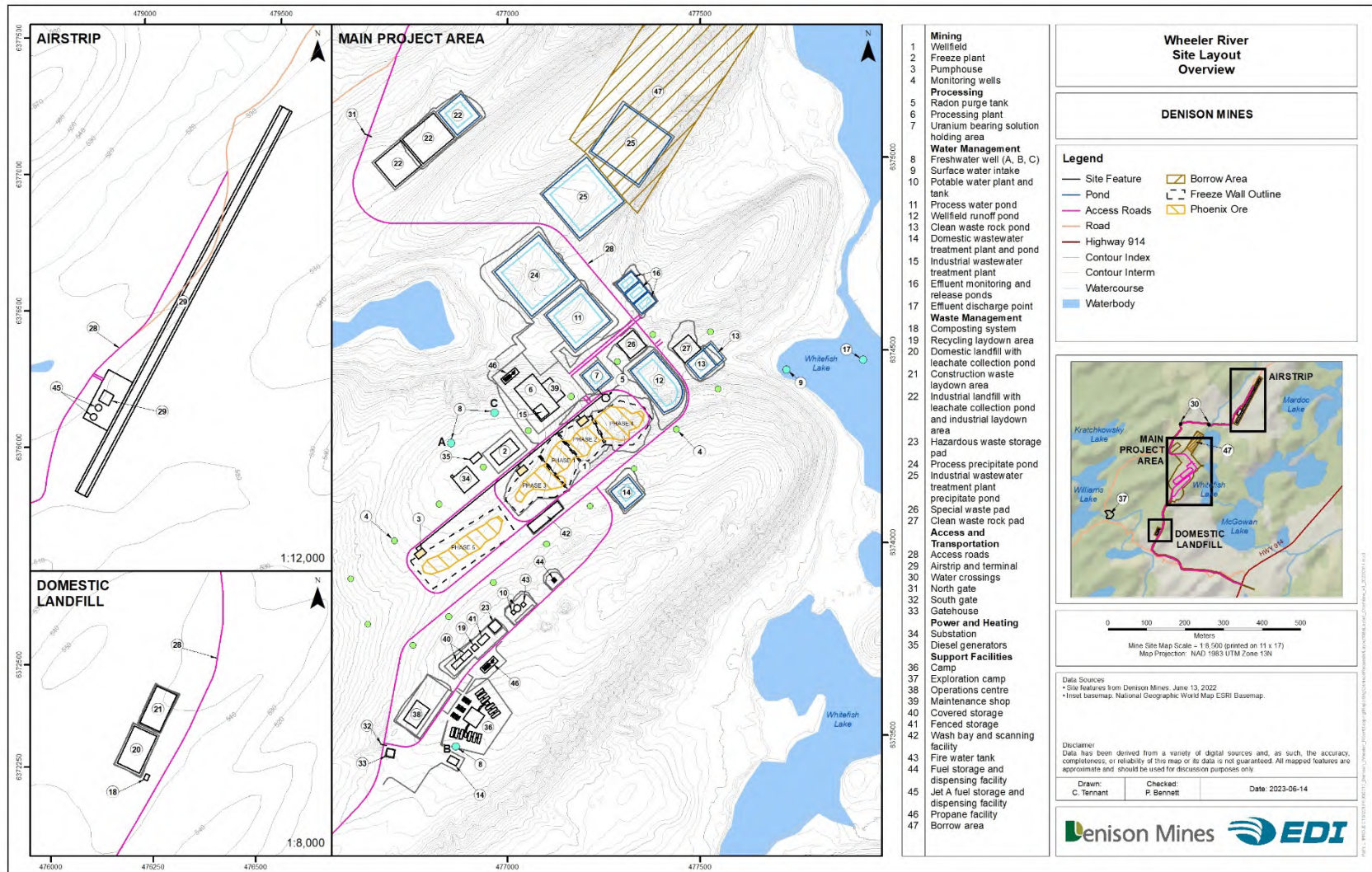


## Attachment: IR-85

Number	IR-85
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C
Context and Rationale	Context: Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C. Rationale: It is not clear where Well A, Well B and Well C are located.
Information Requirement	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Supporting figure to the response provided in table:

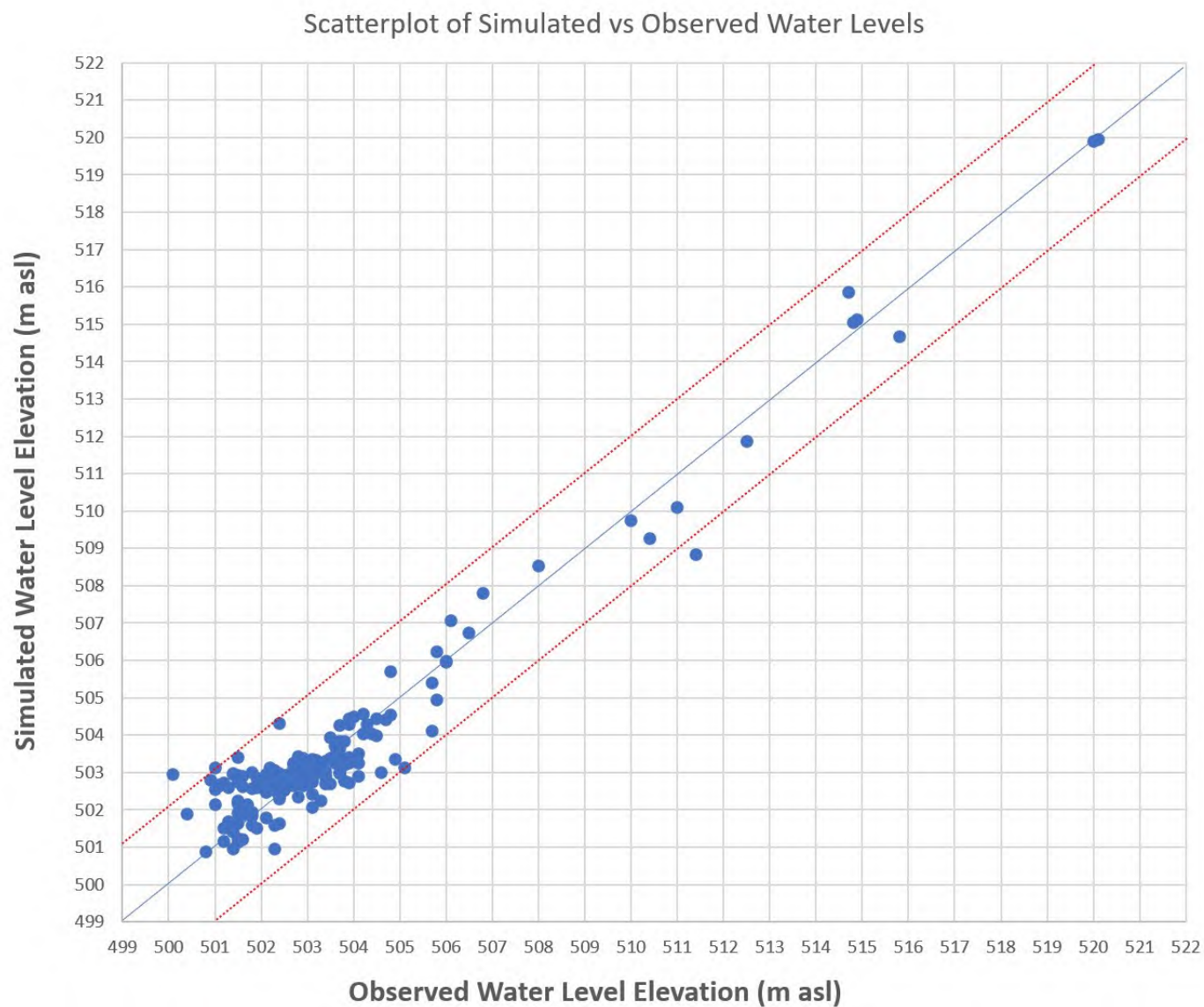


## Attachment: IR-91

Number	IR-91
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, section 2.5.2
Context and Rationale	<p>Context: The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p>Rationale: As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>
Information Requirement	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.



Supporting figure to the response provided in table:



## Attachment: IR-92

Number	IR-92
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 3.2.1, Mineralogical Composition
Context and Rationale	<p>Context: Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca</p> <p>Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p>Rationale: Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported. The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li> <li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is</li> </ol>



	conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. ditrichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).
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#### Response to #1

Table 3-2 in Appendix 7C of the draft EIS has been updated to indicate the number of samples analyzed and arithmetic average and (one) standard deviation values as a measure of sample variability, in addition to the maximum, median and minimum values that had already been provided. Results from Portable Infrared Mineral Analyzer (PIMA) have also been included for the paleoweathered zone. The updated Table 3-2 is included on the next page.

Note that in Table 3-2 in Appendix 7C of the draft EIS, the normative clay content for kaolinite, illite and ditrichlorite in the paleoweathered zone had been entered erroneously as the % of total clay and had not been converted to wt% in the sediment/rock. This was corrected and the updated values represent wt% of kaolinite, illite and ditrichlorite in the sediment/rock.

#### Response to #2

Unlike the iron oxide minerals goethite and ferrihydrite and gibbsite, for which there is an existing compilation of thermodynamic surface complexation constants for sorption of metals, metalloids, and anions to a single, laboratory-produced mineral phase (Dzombak and Morel, 1991; Mathur and Dzombak, 2006; Karamalidis and Dzombak, 2006), such a compilation does not exist for clay minerals. Rather, to develop the database of surface complexation constants for metals and metalloids to illite clay for the modelling work presented in Appendix 7-C of the draft EIS took an extensive review of the literature to make decisions on the most defensible constants to include in the work. For kaolinite, a similarly comprehensive databased could have been developed, but not for chlorite, where the number of studies identified in the literature for sorption characteristics is much more limited.

The decision was made to use illite to represent the clays present in the Athabasca Sandstone group units because:

- for the reasons give above and the discussion provided below, it was not practicable to develop a database of surface complexation constants for more than one clay mineral phase;
- using the updated Table 3-2 provided as part of this IR response, the median illite content (weight %, based on normative clay calculations) of the Athabasca Sandstone Group units is, with only one exception, always more than twice (2x) the median kaolinite content, and three times (3x) the median chlorite content. The exception is the “MFa in downgradient DSZ”, where the median illite content is lower, than the median kaolinite and chlorite contents.

In the model, the choice was made to represent the clays assemblage as a whole as 3.9% illite/kg of sediments/rock (wt %, based on normative clay calculations). Median normative clay contents in the Athabasca Sandstone Units (MFa, MFb, MFC, and MFD) and overburden materials ranged from 1.74-5.85 wt %, and for the locations downgradient of the mining zone (“Downgradient Desilicified Zone, All Units”) was 4.14 %. The robustness of selection of illite to represent the clay assemblage is discussed here below using CEC as an important characteristic of the sorption behaviour of the clays present in the system (illite, kaolinite and chlorite).

Updated Table 3-2 in Appendix 7-C of the draft EIS: CaO, Fe Oxide and Clay Contents of the Athabasca Group Sandstones and Paleoweathered Zone

Lithologic Unit	Number of Samples (CaO and Fe2O3, %)	Number of Samples (Clay %)	Statistic	Elemental Analysis (wt % in sediment/rock)		Normative Clay (wt % in sediments/rock) <sup>b</sup>					PIMA (% of total clay content) <sup>c</sup>			
				CaO (%, Total)	Fe2O3 (%, Total) <sup>a</sup>	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite (%)	Illite (%)	Chlorite (%)	Kaolinite (%)	Dravite <sup>1</sup> (%)
Overburden	8	84	Max	0.21	0.38	6.7	3.63	5.23	2.17	0.62	Data Not Collected			
			Min	0.005	0.03	0.20	0.00	0.06	0.00	0.01				
			Median	0.165	0.28	1.74	0.29	1.06	0.04	0.03				
			Average	0.14	0.26	1.94	0.47	1.22	0.25	0.08				
			Standard Deviation	0.063	0.10	1.23	0.52	0.94	0.47	0.11				
MFd	3077	3556	Max	0.71	1.7	39.6	17.2	24.4	15.2	8.03				
			Min	0.005	0.02	0.02	0.00	0.00	0.00	0.00				
			Median	0.005	0.05	2.05	0.32	1.45	0.00	0.28				
			Average	0.009	0.085	2.27	0.47	1.49	0.30	0.45				
			Standard Deviation	0.014	0.120	1.45	0.76	1.20	0.66	0.53				
MFc	8532	9065	Max	1.44	9.1	60.5	18.9	46.1	27.8	16.3				
			Min	0.005	0.02	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.29	3.76	0.44	2.60	0.08	0.30				
			Average	0.02	0.52	4.08	0.84	2.73	0.49	0.66				
			Standard Deviation	0.02	0.60	2.50	1.23	1.96	1.17	0.99				
MFb	6086	7115	Max	2.48	7.23	64.3	32.61	31.95	52.59	21.60				
			Min	0.005	0.04	0.03	0.00	0.00	0.00	0.00				
			Median	0.02	0.89	5.85	0.95	4.17	0.00	0.17				
			Average	0.02	1.10	6.23	1.56	4.24	0.41	0.51				
			Standard Deviation	0.06	0.87	3.28	1.99	2.20	2.12	1.07				
MFa	10436	10817	Max	3.74	25.8	68.0	34.2	38.2	63.7	45.0				
			Min	0.005	0.01	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.14	3.53	0.67	1.74	0.20	0.33				
			Average	0.021	0.52	4.76	1.16	2.67	0.93	1.00				
			Standard Deviation	0.056	1.08	4.73	1.94	2.95	2.79	2.03				
MFa in Downgradient DSZ	510	542	Max	0.28	5.77	41.3	28.8	17.0	20.9	9.22				
			Min	0.005	0.03	0.40	0.00	0.00	0.00	0.01				
			Median	0.02	0.09	2.62	0.51	0.42	1.18	0.15				
			Average	0.021	0.30	3.96	0.78	1.66	1.52	0.52				
			Standard Deviation	0.022	0.64	3.95	1.70	2.55	1.89	1.23				
Downgradient Desilicified Zone, All Units	1376	1459	Max	0.28	6.73	41.3	28.8	17.0	20.9	9.2				
			Min	0.005	0.03	0.30	0.00	0.00	0.00	0.01				
			Median	0.02	0.23	4.14	0.47	2.42	0.64	0.17				
			Average	0.019	0.58	4.63	0.79	2.94	0.90	0.47				
			Standard Deviation	0.017	0.78	3.05	1.28	2.60	1.36	0.89				
Paleoweathered Zone	109	109	Max	10.1	23.598	67.1	17.9	36.0	65.3	43.3	98.5	95.4	21.1	11.1
			Min	0.1	0	2.81	0.00	0.00	0.00	0.06	0	1.5	0	0
			Median	0.29	2.05	47.1	0.00	9.20	35.5	0.97	13.1	69.5	NC <sup>d</sup>	NC <sup>e</sup>
			Average	0.61	3.4	48.5	1.70	10.10	36.7	1.67	28.1	64.5	NC <sup>d</sup>	NC <sup>e</sup>
			Standard Deviation	1.51	4.2	10.4	3.60	7.60	12.60	4.10	33.2	30	NC <sup>d</sup>	NC <sup>e</sup>

Notes

<sup>a</sup> Iron oxide content for the paleoweathered zone is % Hematite (vs. total iron as Fe<sub>2</sub>O<sub>3</sub>)  
<sup>b</sup> Normative clay values for predominantly basement-hosted paleoweathered zone may be erroneous due to variable host lithology chemistry  
<sup>c</sup> The number of samples analyzed by PIMA for the paleoweathered zone was 9 (i.e., n= 9)  
<sup>d</sup> Kaolinite was only detected in 3 samples in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.  
<sup>e</sup> Dravite was only detected in 1 sample in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.

### Cation Exchange Capacity (CEC) in the Overburden and Athabasca Sandstone Group Units

Literature ranges for cation exchange capacity for kaolinite, illite and chlorite are shown below in Table IR-92-1. Because there is a range of CEC values for each clay mineral in the literature, the maximum and minimum CEC value in the range provided in the literature was used to evaluate the CEC of the overburden and Athabasca Sandstone Group units for the Wheeler River Project. The range of calculated CECs based on the clay mineral assemblage in each sample is given in Table IR-92-2. Note that the number of samples used for each of the lithologic units is the same as that provided in the updated Table 3-2.

In Table IR-92-2, the “Kaolinite+Illite+Dichlorite CEC – Minimum” and “Kaolinite+Illite+Dichlorite CEC- Maximum” were calculated in the following way, to estimate the range of CEC that may be expected by lithologic unit.

*Kaolinite + Illite + Dichlorite CEC – Minimum*

$$= \frac{\text{wt\% kaolinite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 10 \frac{\text{meq}}{\text{kg}} + \frac{\text{wt\% illite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 100 \frac{\text{meq}}{\text{kg}} + \frac{\text{wt\% dichlorite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 14 \text{ meq/kg}$$

*Kaolinite + Illite + Dichlorite CEC – Maximum*

$$= \frac{\text{wt\% kaolinite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 150 \frac{\text{meq}}{\text{kg}} + \frac{\text{wt\% illite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 400 \frac{\text{meq}}{\text{kg}} + \frac{\text{wt\% dichlorite } \left(\frac{\text{kg}}{\text{kg}}\right)}{100} * 100 \text{ meq/kg}$$

This was then compared to the CEC used in the reactive transport modelling presented in Appendix 7-C of the draft EIS. The CEC of illite assumed was 225 meq/kg (Baeyans and Bradbury, 2009), which is a value intermediate to range in the literature sources (Table IR-92-1). At 3.9% illite, which was the illite content assumed in the base case of the modelling scenarios, the CEC assumed for the overburden and Athabasca Sandstones was (3.9 wt % (kg/kg)/100 \* 225 meq/kg = 8.87 meq/kg of sediments/bedrock). In the modelling sensitivity analysis, 1/10 of the reactive phases, including illite, were assumed to be accessible to solution, so that the CEC of the bedrock/sediments was assumed to be 0.887 meq/kg.

The CEC values evaluated in the modelling (0.887 and 8.87 meq/kg) are within the range of median CECs that are represented for the lithologic units for the project. Because groundwater movement from the mining zone is understood to be preferentially through the desilicified zone (DSZ), as presented in Appendix 7-C of the draft EIS, it is important that the CEC assumed in the model is reflective of conditions in that unit. The calculated CEC for the “Downgradient Desilicified Zone, All Units” ranged from 2.7-11.8 meq/kg (Table IR-92-2). The CEC value assumed in the base case of the model (8.87 meq/kg) is intermediate to this range, and the sensitivity analysis value of 0.887 meq/kg is reflective of not all cation exchange sites being accessible for reaction with constituents in groundwater.

Further, three core samples from the desilicified zone at depth were submitted for CEC analysis. Details of the samples, the normative clay content, and the measured CEC using the ammonium-saturation method are provided in Table IR-92-3.

Table IR-92-1: CEC values from the Literature

Clay Mineral	Cation Exchange Capacity (meq/kg)		
	Kaolinite	Illite	(DiTri)Chlorite
Minimum CEC Applied	10	100	14
Maximum CEC Applied	150	400	100
Ranges in Literature (meq/kg)			
Drever (1982)	10-100	100-400	<100
Bain et al., (1994)	30-150	100-400	100-400
Zazzi, 2009	-	-	14-40
Bradbury and Baeyens (2009)		225	

Applied for geochemical reactive transport modelling in Appendix 7-C of the draft EIS

Table IR-92-2: Calculated CEC ranges for the Lithologic Units for the Wheeler River Project

Lithologic Unit	Statistic	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite1 (%)	Kaolinite+Illite +Dichlorite CEC - Minimum	Kaolinite+Illite +Dichlorite CEC - Maximum
Overburden	Max	6.7	3.63	5.23	2.17	0.62	5.4	22.2
	Min	0.20	0.00	0.06	0.00	0.01	0.076	0.39
	Median	1.74	0.29	1.06	0.04	0.03	1.1	4.9
MFd	Max	39.6	17.2	24.4	15.2	8.03	26.6	112.9
	Min	0.02	0.00	0.00	0.00	0.00	0	0
	Median	2.05	0.32	1.45	0.00	0.28	1.5	6.3
MFc	Max	60.5	18.9	46.1	27.8	16.3	48.1	198.7
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.76	0.44	2.60	0.08	0.30	2.8	11.7
MFb	Max	64.3	32.61	31.95	52.59	21.60	34.9	149.2
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	5.85	0.95	4.17	0.00	0.17	4.4	18.6
MFa	Max	68.0	34.2	38.2	63.7	45.0	38.8	157.1
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.53	0.67	1.74	0.20	0.33	2.0	9.0
MFa in Downgradient DSZ	Max	41.3	28.8	17.0	20.9	9.22	19.6	92.3
	Min	0.40	0.00	0.00	0.00	0.01	0.11	0.64
	Median	2.62	0.51	0.42	1.18	0.15	0.7	3.9
Downgradient Desilicified Zone, All Units	Max	41.3	28.8	17.0	20.9	9.2	19.6	92.3
	Min	0.30	0.00	0.00	0.00	0.01	0.11	0.64
	Median	4.14	0.47	2.42	0.64	0.17	2.7	11.8

Table IR-92-3: Normative Clay and Measured CEC for Desilicified Zone Samples

Sample Name	Corehole Location	Normative Clay Content					CEC (meq/kg)
		Clays (wt %)	Kaolinite (wt %)	Illite (wt %)	DiTriChlorite (wt %)	Dravite (%)	
DS-1	GWR-054	10.16	0.14	9.5	0.49	0.24	21
DS-2	GWR-059	5.74	0.40	6.2	3.6	0.743	26
DS-3	GWR-060	12.12	0.89	6.7	2.6	0.312	25
DS-Feed	Composite of DS-1, DS-2, DS-3	7.91	0.61	7.4	2.2	0.404	21

### The Paleoweathered Zone

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz, as was described on page 3-29 of Appendix 7-C of the draft EIS. For the paleoweathered zone, there is a smaller dataset and the normative clay content in this unit can be inaccurate due to the host (basement) mineralogy. This is because the normative clay percentages for kaolinite, illite, dravite and chlorites are calculated from the bulk total geochemical composition of the sandstones using an in-house set of linear equations that govern the distribution of oxides into minerals of interest. Key oxide inputs are  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{K}_2\text{O}$ , and  $\text{MgO}$  in percent and B in ppm. Unlike the sandstones, that contain little parent basement rock material, calculation of clay content in samples from the paleoweathered zone – because this unit is basement-hosted – can be influenced by the presence of parent rock material that has the same/similar chemical composition. In the paleoweathered zone, portable infrared mineral analysis (PIMA) was used to support the information from the normative clay content in terms of the relative abundance of the clay mineral phases. PIMA does not quantify the total clay in the rock sample (i.e., clay as a wt% of rock), but it does provide the relative abundances of the clay minerals present.

The conceptualization of the paleoweathered zone with respect to reactive mineral phases in the numeric modelling presented in Appendix 7-C of the draft EIS is considered conservative and robust based on the alignment of the following:

- The normative clay content, which as shown in the updated Table 3-2 presented above in this IR has a median value of 47.1 wt % clay content, with median illite and chlorite contents of 9.20 wt %, and 35.3 wt %, respectively.

- The PIMA results, presented in the updated Table 3-2. The PIMA results support the normative clay content results in that the dominant clay is chlorite (median of 69.5% relative abundance) followed by illite (median 13.1% relative abundance).
- Characteristics of the paleoweathered zone have been discussed for the Cigar Lake program (AECL, 1994) and for other study areas in the Athabasca Basin by Macdonald (1980) and by Wilson (1986). Macdonald (1980) studied the Precambrian regolith in areas of the Athabasca Basin that were not mineralized – meaning away from areas of hydrothermal alteration. The mineralogy of the regolith depended on the depth in the regolith and on the specific parent basement rock (Meta-arkose, meta-semipelite, and meta-pelite). The quartz content of the regolith ranged from 5-40 volume % with values generally close to 25 volume %.
- In Wilson (1996), the author identifies zones of hydrothermal alteration overprinting the regolith that are dominated by quartz, illite, and kaolinite.
- In the Cigar Lake study (AELC, 1994) the paleoweathered zone beneath the ore body is described in the following way: *“A noticeable feature is the funnel-shaped zone of hydrothermally altered basement rock which also overprints the older regolithic alteration immediately underneath the unconformity. This hydrothermal alteration is characterized by a weakening of the rock strength through shearing and foliation dominated by clay-mineral development”*.

#### *Support from CEC and XRD Analyses*

Using the same calculation method as above, the CEC of the paleoweathered materials would be 20.25 meq/kg assuming 9% wt% illite.

Recently, a composite sample of 4 core samples taken from the paleoweathered zone (“PW-Feed”) was analyzed by XRD for mineralogy and the CEC was measured. Details of the samples included in the “PW-Feed” sample are provided below in Table IR-92-4. The CEC for PW-Feed is also included in that table, and was 72 meq/kg, and is aligned with a higher content of illite in the PW-Feed sample than is assumed for the numerical modelling and suggests a contribution to the CEC from the chlorite. The XRD results are provided as Appendix A of this IR response. The results indicate that the mineralogical makeup of PW-feed is: 24.4 wt% quartz (which aligns very well with the assumptions of 25 wt% in the conceptualization), 31.4 wt% illite, and 40.5 wt% chlorite. There is also a small amount of basement rock/parent material present in the sample (3.7wt% biotite).

The measured CEC was substantively (~3x) higher than assumed in the numeric model. It was understood in representing the clay mineral phases in the paleoweathered zone by 9% illite that the sorptive capacity may be underestimated. The decision was made to take a conservative approach because the dataset of surface complexation constants developed for the project was for illite, and it was considered inappropriate to apply the same sorptive reactivity to the much larger relative content of chlorite in this zone. The results of the XRD and the measured CEC provide support to the approach in the reactive transport modelling of assuming illite as the sorptive clay mineral as a conservative one.

Table IR-92-4: Measured CEC for PW-Feed Sample

Sample Name	Corehole Location	CEC (meq/kg)
PW-1	GWR-054	-
PW-2	GWR-061	-
PW-3	GWR-057	-
PW-4	GWR-060	-
PW-Feed	Composite of PW-1 through PW-4	72

#### Changes to the draft EIS text

To reflect the discussion above and updates to Table 3-2 of Appendix 7-C of the draft EIS, the following changes will be made to the text on page 3.29-3.20 of Appendix 7-C of the EIS.

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.

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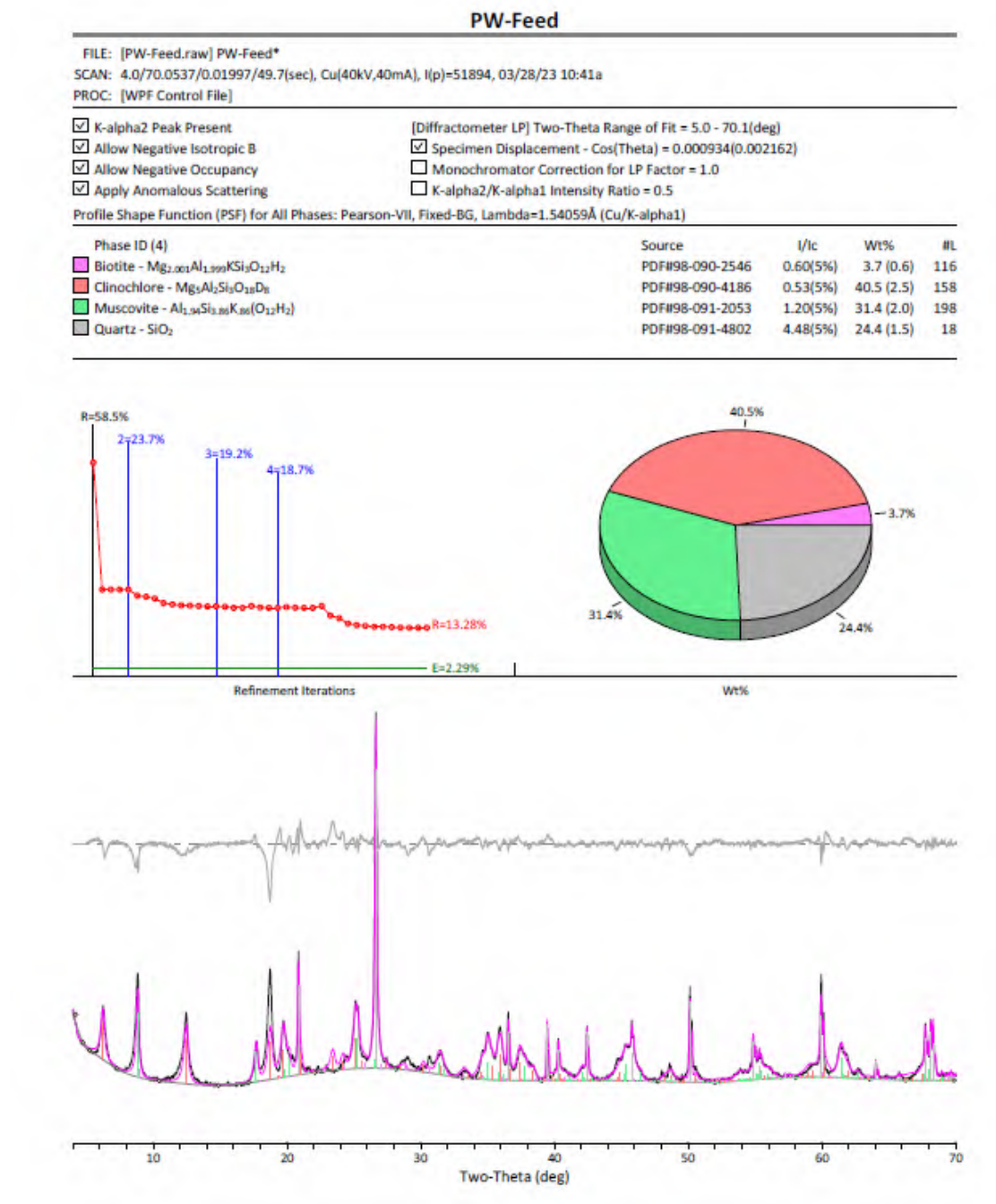
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## Attachment IR-92 Appendix A

Note the following on the XRD results for the PW-Feed sample:

- Chlinochlore is part of the chlorite group of minerals.
- The diffraction patterns for illite and muscovite are nearly identical, and thus, muscovite is interpreted as illite in this sample.



## Attachment: IR-93

Number	IR-93
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-10: Properties of Adsorbing Mineral Phases
Context and Rationale	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Goethite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m<sup>2</sup>/g, this equals to 1600/6E4 mol/m<sup>2</sup>, or 0.0266 mol/m<sup>2</sup>, 1.6e4 sites/nm<sup>2</sup>.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm<sup>2</sup>. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters. The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>
Information Requirement	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport modelling should be re-run to update the contents presented in the EIS report.

### Response:

The value provided in Table 3-10 for site density on goethite was a typographical error. The correct value for the density of reactive sites for goethite is 0.203 moles/kg. This value is derived below.

Equation for site density on goethite per kg of goethite:

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = \text{Site Density} \left( \frac{\text{mole sites}}{\text{mole Fe}} \right) \times \text{MW Goethite} \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{kg}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.018 \left( \frac{\text{mole sites}}{\text{moles Fe}} \right) \times 88.8517 \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{mol}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.203 \left( \frac{\text{mol}}{\text{kg}} \right)$$

The values for site density of 0.018 mole sites/mole Fe and the was given by Mathur and Dzombak (2006). The formula of goethite is FeOOH (also given by Mathur and Dzombak, 2006) and has a molecular weight ("MW") of 88.8517 g/mol.

The corrected table 3-10 is provided here below. Noted is that the value for site density for quartz has also been corrected. Please see the discussion below.

Table 3-10: Properties of Adsorbing Mineral Phases

Sorbent Phase	Site Density (mol/kg)	Specific Area (m <sup>2</sup> /g)	Reference
Goethite (FeOOH)	0.203	60	Mathur and Dzombak, 2006
Quartz (SiO <sub>2</sub> )	0.00118	0.31	Prikryl et al., 2001
Illite	Strong Sites: 0.002 (metals and protons sorb); Weak Sites: 0.04 (protons only sorb)	97	Bradbury and Baeyans, 2009

### Properties of Sorbent Phases used in PHREEQC/piChem modelling

The erroneous values reported in Table 3-10 were not used in the modelling. Below, example calculations are given for goethite to derive the total number of binding sites, in moles, for the mineral phase. The total number of sites for the clay, quartz and goethite were provided in the example PHREEQC file given in Appendix E of Appendix 7C of the EIS.

In PHREEQC, the default assumption is that a reaction occurs within 1L of the aqueous phase. This aqueous phase is pore water in the calculations of geochemical reactive transport through rocks and soils. Thus, the total moles of reactive sites associated with goethite (and other reactive phases) is expressed as that which is present in contact with 1L of pore water.

For total density of reactive sites on the goethite surface in the model, the following information was used:

- Site density: 0.018 mole of sites/mole Fe
- Fe<sub>2</sub>O<sub>3</sub> content of sediment/rock: 0.29 wt % in whole rock (from rock core)  
(equivalent to 2.9 g/kg in whole rock)
- MW of Fe<sub>2</sub>O<sub>3</sub> 159.6882
- MW of FeOOH (goethite) 88.8517
- Specific Area of goethite 60 m<sup>2</sup>/g
- (Rock) Effective Porosity 0.2 (Desilicified Zone; Appendix 7C, Table 2-4)
- Bulk Density of sediment/rock 2.12 g/cm<sup>3</sup> (calculated) (equivalent to 2.12 kg/L)
- Density of quartz 2.65 g/cm<sup>3</sup>

### Step 1: Total moles of reactive sites on goethite per kg of soil

*Total moles reactive sites on goethite per kg of soil*

$$= \text{mass Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{kg soil}} \right) \div \text{MW Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right) \times 0.018 \left( \frac{\text{mole reactive sites}}{\text{mole Fe}} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 2.9 \left( \frac{\text{g}}{\text{kg soil}} \right) \div 159.6882 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right)$$

## Step 2: Bulk Density of the sediment/soil

Quartz is the predominant mineral present in the Athabasca Sandstones. Thus, the bulk density of the sediment/rock was first calculated for the modelling purposes using the density of quartz, for a given effective porosity.

Density of Quartz ( $\rho_{\text{quartz}}$ ) = 2.65 kg/L (Appelo and Postma)

Effective porosity ( $\epsilon$ ) = 0.2 (Desilificied zone, as above)

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{(1 - \epsilon)}{\left( \frac{1}{\rho_{\text{quartz}} \left( \frac{\text{kg}}{\text{L}} \right)} \right)}$$

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{1 - 0.2 \text{ (unitless)}}{\frac{1}{2.65 \left( \frac{\text{kg}}{\text{L}} \right)}}$$

$$\text{Bulk Density of soil} = 2.12 \text{ kg/L}$$

## Step 3: Reactive sites per 1L of aqueous solution (groundwater)

*Total moles reactive sites on goethite per 1L porewater*

$$\begin{aligned} &= \text{Total moles of reactive sites on goethite per kg of soil} \left( \frac{\text{moles}}{\text{kg}} \right) \times \text{soil bulk density} \left( \frac{\text{kg}}{\text{L}} \right) \\ &\div \text{soil effective porosity (unitless)} \end{aligned}$$

*Total moles of reactive sites on goethite per 1L porewater*

$$= 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right) * 2.12 \div 0.2$$

$$\text{Total moles of reactive sites on goethite per 1L pore water} = 0.00693 \text{ moles/L}$$

This is the value for reactive sites on goethite provided in the example PHREEQC File “**#PHREEQC Input File\_Transport\_PWZ\_DSZ and Sediments2\_Chlorite2.phr**” provided in Appendix E of Appendix 7-C of the EIS. Goethite in the model was indicated by “Hfo\_”. The values “60” and “32.4” are the specific surface area of goethite (60 m<sup>2</sup>/g) and mass of goethite in contact with 1 L of porewater, respectively. The specific area and mass of goethite are not used in the model calculations, as the reactive sites are provided as the absolute number of moles (0.00693 moles reactive sites per 1 L of porewater).

(Excerpted from the PHREEQC input file provided)

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Surface 56-145 #Mineral Assemblage, reactive sites, Desilicified zone			
-equilibrate with solution 96-145			
Hfo	0.00693	60	34.2
-no_edl			
Hao_s	0.0008268	97	413.4
Hao_w	0.0165		
Hao_ww	0.0165		
-no_edl			
QOH	0.0119	0.31	10017
-no_edl			

## References

Appelo, C.A.J, and Postma, D. Geochemistry, groundwater and pollution, 2<sup>nd</sup> edition. CRC Press, Boca Raton, Florida. 649 pages.

## Attachment: IR-95

Number	IR-95
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-11
Context and Rationale	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated. Rationale: It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these K<sub>d</sub> analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients. In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of K<sub>d</sub> value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>
Information Requirement	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.

### Response:

Solid-liquid partition coefficients (K<sub>d</sub> values) were not used in the geochemical reactive transport modelling for groundwater except for the lake bottom sediments of Whitefish Lake, as described in Appendix 7-C, Sections 4.5.1 and 4.5.6.2.3 of the draft EIS. The lake bottom sediments are encountered only at the very end of the (much longer; approximately 1000 m) transport pathway from the mining area to Whitefish Lake and were conceptualized as a 1 m zone between the overburden soils and the lake (page 4.6 of Appendix 7-C of the draft EIS).

For reactive transport of groundwater through all subsurface hydrogeologic units (paleoweathered zone, Athabasca Group Sandstone units, and overburden materials), the geochemical code PHREEQC was incorporated for geochemical reactive transport modelling, and sorption reactions included cation exchange and adsorption of constituents from solution to reactive sites at the surface of mineral phases as surface complexes (i.e. using the Surface Complexation Model). The Surface Complexation Model accounts for:

- non-linear sorption of metals and other constituents



- competition amongst these constituents for reactive sites at mineral surfaces
- pH-dependent sorption.

$K_d$  values were presented in Appendix 7-C, Section 3.5.6.2.3 of the draft EIS as a check on the reasonableness of the modelled. COPC adsorption that was conceptualized in the model as occurring at quartz, illite and goethite mineral surfaces. It was important, *as a check*, to demonstrate that modelled sorption to these surfaces was not overpredicting COPC concentrations in the solid phase under initial/baseline conditions. To do this, measured concentrations of COPCs in core material were compared to predicted solids concentrations in the model. Further, using concentrations of COPCs in representative groundwater,  $K_d$  values were calculated from both the measured COPC concentrations and those modelled.

#### **Supplemental Information – calculation of $K_d$ s**

Information supplemental to the response above is presented herein to detail how the  $K_d$  values provided in Appendix 7-C, Section 3.5.6.2.3 and Table 3-11 of the draft EIS were calculated.

The  $K_d$  (L/kg) is calculated as the solid phase concentration of an element, divided by the dissolved-phase concentration of that element.

##### *Measured Solid-Phase COPC Concentrations:*

- “Desilicified Zone” refers to solid phase elemental concentrations in core from wells indicated in Figure 3-1 of Appendix 7-C of the draft EIS. Elemental concentrations were measured on total and partial digestions. The total number of samples used in the calculation of the maximum, minimum and median values of the solid phase concentrations was 1,459 for samples for which total digestion results were presented. This includes all elements presented other than arsenic (As) and selenium (Se). For these elements, only partial digestion results were available. The total number of samples used to calculate maximum, minimum and median solid phase concentrations for As and Se was 843.
- Elemental Analysis for the Paleoweathered Zone represents a total of 108 samples, as provided in Appendix E of Appendix 7C, Table E-1.

*Measured Solution-Phase Concentrations:* Representative groundwater concentrations of COPCs were those used in the model, and are presented in Appendix 7-C, Table 3-5.

An example  $K_d$  calculation is provided here below for chromium in the Desilicified Zone, using the measured median solid-phase concentration and the Cr concentration in groundwater:

$$K_d \text{ (L/kg)} = \frac{\text{Median Solid phase Cr concentration (total digestion; mg/kg)}}{\text{Concentration of Cr in Representative Solution for Desilicified Zone (mg/L)}}$$

$$K_d \text{ (L/kg)} = 8 \text{ mg/kg} \div 0.0005 \text{ mg/L}$$

$$K_d \text{ (L/kg)} = 1.6 \times 10^4 \text{ L/kg}$$

Calculating  $K_d$  values in this way is appropriate because it is calculated using measured data. Thus, no assumptions were made with respect to pH. The pH of groundwater in the system is circumneutral (i.e., pH = 6-7) and the measured solid-phase concentrations are from rock material that was in equilibrium with the groundwater when collected and analyzed.

In the PHREEQC and, likewise, piChem models, solid phase concentrations are yielded by assuming equilibrium occurs between the solution phase concentrations of COPCs, which are the inputs to the model, and the sorbing phases. As is described in Appendix 7C, Section 3.5.6.2.3, within the model the solid sorbent phases (quartz, illite and goethite) are “pre-loaded” (pre-equilibrated) with COPCs to bring the solid phase concentrations into equilibrium with the dissolved phase, groundwater, concentrations before the transport simulation is started. Outside of the model, an “Apparent  $K_d$ ” was then calculated by dividing the modelled solid phase concentration for each COPC by its solution phase concentration. These  $K_d$  values are referred to as “apparent” because they are modelled and because they are derived from the modelled concentrations metals sorbed to mineral surfaces and the modelled solution phase concentrations of those metals; they do not account, for example, for metals that are present within the crystal structure of the minerals in the bedrock.

The  $K_d$ s derived from the core and groundwater data were compared to the Apparent  $K_d$ s. For the majority of the COPCs and for both the Desilicified and paleoweathered zones, the modelled solid phase concentrations and apparent  $K_d$  values were below those measured, and calculated from measured values, respectively. This indicates that the model is not overpredicting solid-phase concentrations based on sorption, nor are the apparent  $K_d$  values exceeding those reported in the literature.”

It was noted that there a few were minor transcription errors in the results presented for the Desilicified Zone in Table 3-11 of Appendix 7-C. None of the corrections affect the interpretation above. The corrected table is given here (below), and will be updated in the final EIS.

Table 3-11: Solid-Phase Concentrations and Partitioning Constants for COPCs, measured and simulated (Updated)

Desilicified Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	8.46E+00	7.00E-01	2.25E+01	1.09E+02	1.09E+02	4.51E+00	1.58E+02	7.33E+01	4.00E-01	2.13E+02	3.71E+02	9.30E+01
Solid Phase Concentration - Minimum	mg/kg	9.00E-02	5.00E-02	1.20E-01	2.00E+00	2.00E-01	4.00E-02	1.00E+00	7.80E-01	1.00E-01	5.00E-01	1.40E+00	5.00E-01
Solid Phase Concentration - Median	mg/kg	5.60E-01	1.00E-01	4.90E-01	8.00E+00	2.00E+00	1.70E-01	6.00E+00	2.95E+00	1.00E-01	1.77E+00	7.70E+00	3.00E+00
Concentration in Representative Groundwater	mg/L	1.30E-03	1.00E-05	1.00E-04	5.00E-04	1.80E-03	4.20E-03	1.00E-04	1.00E-04	1.00E-04	7.00E-04	1.00E-04	1.20E-02
K <sub>d</sub> - maximum value	L/kg	6.51E+03	7.00E+04	2.25E+05	2.18E+05	6.06E+04	1.07E+03	1.58E+06	7.33E+05	4.00E+03	3.04E+05	3.71E+06	7.75E+03
K <sub>d</sub> - minimum value	L/kg	6.92E+01	5.00E+03	1.20E+03	4.00E+03	1.11E+02	9.52E+00	1.00E+04	7.80E+03	1.00E+03	7.14E+02	1.40E+04	4.17E+01
K <sub>d</sub> - median value	L/kg	4.30E+02	1.00E+04	4.90E+03	1.60E+04	1.11E+03	4.05E+01	6.00E+03	2.95E+04	1.00E+03	2.53E+03	7.70E+04	2.50E+02
Modelled Solids Concentration <b>Base Case</b>	mg/kg	7.70E-03	1.11E-04	5.62E-03	1.90E+00	3.57E+00	5.51E-07	1.30E-02	8.68E-02	6.60E-06	7.25E-02	3.90E-07	1.37E+00
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	5.92E+00	1.11E+01	5.62E+01	3.81E+03	1.98E+03	1.31E-04	1.30E+02	8.68E+02	6.60E-02	1.04E+02	3.90E-03	1.14E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	5.92E-01	1.11E+00	5.62E+00	3.81E+02	1.98E+02	1.31E-05	1.30E+01	8.68E+01	6.60E-03	1.04E+01	3.90E-04	1.14E+01
Paleoweathered Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	5.66E+02	8.00E+00	4.23E+02	4.41E+02	5.24E+04	3.93E+03	5.88E+02	5.15E+03	2.00E+02	5.56E+04	6.05E+03	1.58E+03
Solid Phase Concentration - Minimum	mg/kg	5.00E-01	1.00E-01	6.00E+00	6.00E+00	5.00E+00	5.00E-01	4.40E+01	1.00E+00	5.00E-01	9.00E+00	2.20E+01	7.00E+00
Solid Phase Concentration - Median	mg/kg	2.40E+01	1.00E+00	2.80E+01	1.55E+02	2.28E+02	5.00E+00	1.67E+02	4.60E+01	1.00E+00	4.03E+02	3.10E+02	3.10E+01
Concentration in Representative Groundwater	mg/L	5.00E-02	1.00E-05	1.00E-02	4.50E-03	5.00E-03	1.28E-02	1.50E-02	1.00E-04	1.00E-04	1.24E-02	1.00E-04	4.25E-03
K <sub>d</sub> - maximum value	L/kg	1.13E+04	8.00E+05	4.23E+04	9.80E+04	1.05E+07	3.07E+05	3.92E+04	5.92E+07	2.00E+06	4.49E+06	6.05E+07	3.72E+05
K <sub>d</sub> - minimum value	L/kg	1.00E+01	1.00E+04	6.00E+02	1.33E+03	1.00E+03	3.91E+01	2.93E+03	7.00E+04	5.00E+03	7.26E+02	2.20E+05	1.65E+03
K <sub>d</sub> - median value	L/kg	4.80E+02	1.00E+05	2.80E+03	3.44E+04	4.56E+04	3.91E+02	1.11E+04	8.30E+05	1.00E+04	3.25E+04	3.10E+06	7.29E+03
Modelled Solids Concentration <b>Base Case</b>	mg/kg	1.87E-01	9.80E-05	4.69E-01	0.00E+00	5.30E+00	0.00E+00	2.34E+00	6.34E-02	2.87E-06	3.63E-01	0.00E+00	4.41E-01
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	3.74E+00	9.80E+00	4.69E+01	0.00E+00	1.06E+03	0.00E+00	1.56E+02	6.34E+02	2.87E-02	2.93E+01	0.00E+00	1.04E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	3.74E-01	9.80E-01	4.69E+00	0.00E+00	1.06E+02	0.00E+00	1.56E+01	6.34E+01	2.87E-03	2.93E+00	0.00E+00	1.04E+01
Literature K <sub>d</sub> values (mean value and range) <sup>a,b</sup>	L/kg	550 (25-3000)	15 (2.0-250)	1.9x10 <sup>3</sup> (29-99,000)	18 (1.0-1600)	530 (760-2700)	40 (7-130)	58 (7.0-1100)	2000 (25- 130,000)	56 (4-1600)	740 (2.6 - 6.2x10 <sup>4</sup> )	1.1-2.7	1.6x10 <sup>3</sup> (6.2- 30,000)

**Notes**

<sup>a</sup> Literature K<sub>d</sub> values are for pH values ranging from 5-8 from IAEA, 2010. These values show mean values (and range). Value for Cd is for soils with pH < 6.5. Where pH dependent K<sub>d</sub> values were not available, the mineral soil texture values were obtained. Where a K<sub>d</sub> was not available for mineral soil, the value for "All soil" texture or "Sand" was used.

<sup>b</sup> Literature range of K<sub>d</sub> values for Vanadium taken from US EPA, 2005

<sup>c</sup> Literature value of maximum K<sub>d</sub> for pH values ranging from 5-7 from IAEA, 2010.

## Attachment: IR-96

Number	IR-96
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions
Context and Rationale	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (<math>1 \times 10^{-9}</math> m<sup>2</sup>/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)”. The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport. Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p>Reference: [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>
Information Requirement	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large- scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89</p>

### **Response Part 1:**

The transport parameters applied in the model were not calibrated and that is why they were: a) selected to be conservative, and b) why more conservative parameters were selected for prediction uncertainty analyses.

Diffusion rates are unknown, as is commonly the case at most sites, and so a representative literature value was selected. Matrix diffusion of mass into lower permeability zones is considered the most relevant area for diffusion; migration to Whitefish Lake is advection-dominated such that diffusion along

the flow path would not appreciably enhance transport timing. Matrix diffusion was accounted for in the set-up of transport simulation parameters using PHREEQC.

Longitudinal and transverse dispersivity rates can vary greatly and are generally scale dependent. Literature references for dispersivity are noted below and used to estimate longitudinal and transverse dispersivity rates for the plume, which is estimated to have a length of 0.9 to 1.7 km. Graphic representation of the values suggested by the literature are appended.

- Gelhar et al. (1992), as quoted in the B.C. guidance (BC MOE, 2012), suggests a representative longitudinal dispersivity of approximately 40 m (with a range from 10 to 150 m), and a transverse dispersivity of 5 m.
- Neuman (1995) suggests a “best fit” longitudinal dispersivity of 350 m to be consistent with field observed values (note the range of model-calibrated values was 10 to 350 m).
- Schulze-Makuch (2005), suggests a best fit value for sandstone units of 10 to 20 m.
- Chapman et al (2014) found a longitudinal dispersivity for a site in a similar fractured sandstone environment to be 10 m for a plume 1.2 km in length. Martin et al. (2019) found the equivalent longitudinal dispersivity appropriate under dual porosity and EPM simulations was 10.7 m for the same site.

Recognizing all of this, the longitudinal dispersivity applied (i.e., 10 m) is considered reasonable, and the more conservative value of 5 m represents a reasonable lower bounding limit. Similarly, the literature supports the transverse dispersivity value of 5 m applied. It was noted that minor exceedances were noted under the lower dispersivity simulations; however, these simulations more importantly also contain conservative geochemical assumptions, such that we feel such breakthrough is unlikely.

## **Response Part 2:**

As noted in the literature (e.g., Neuman et al., 2003; Neuman, 2006) dispersivity is expected to increase as a plume encounters heterogeneities of increasing length-scales. This is the foundation of scale-dependent dispersivity. As such, large-scale heterogeneity will enhance dispersion of the plume, and reduction of solute concentrations, as the plume gets larger and encounters heterogeneities of increasing length-scales. At the Phoenix site, an example of such large-scale features is the desilicified zone, wherein dispersion is simulated to play a role in reducing transported solute concentrations. The dispersion of solute concentrations is coupled with geochemical reactions along the plume trajectory. The plume dispersion exposes concentrations to a greater surface area of the geologic materials, which enhances the ability of geochemical processes to curtail plume migration.

## **References**

- British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.
- Chapman, S.W., B. Parker, J. Cherry, P. Martin, D. Abbey, S.D. McDonald. 2014. Combined EPM-DFN Modelling Approach for Plume in Sedimentary Bedrock Aquifers. DFNE 2014-236.
- Gelhar, L.W., Welty, C., & Rehfeldt, K.R. (1992). A critical review of data on field-scale dispersion in aquifers. *Water Resources Research* 28, no. 7, 1955-1974.
- Martin, P.J., B. Parker, S. Chapman, and K. Walton. 2019. Utilizing the DFN-M Framework to Inform Transport Modelling. Presentation to the American Geophysical Union (AGU).

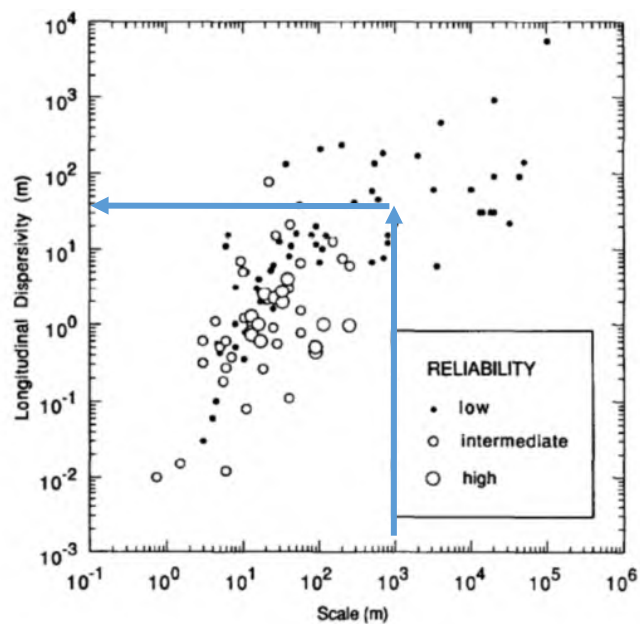
Neuman, S.P. 1990. Universal scaling of hydraulic conductivities and dispersivities in geologic media. *Water Resources Research* 26, no. 8: 1749–1758.

Neuman, S.P. 1995. On advective dispersion in fractal velocity and permeability fields. *Water Resources Research* 31, no. 6: 1455–1460.

Neuman, S.P., and V. Di Federico. 2003. Multifaceted nature of hydrogeologic scaling and its interpretation. *Reviews of Geophysics* 41, no. 3: 1014.

Neuman, S.P. 2006. Response to paper: Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 44, no. 2: 139–141.

Schulze-Makuch, D. 2005. Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 43, no. 3: 443–456.



(b)

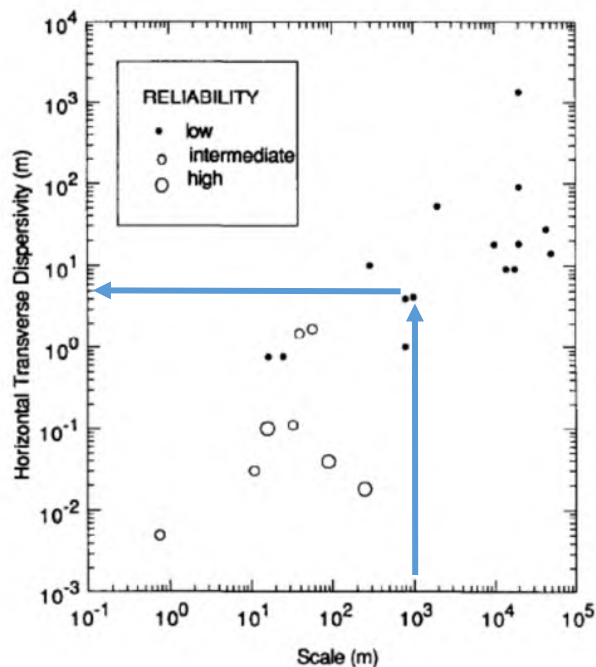
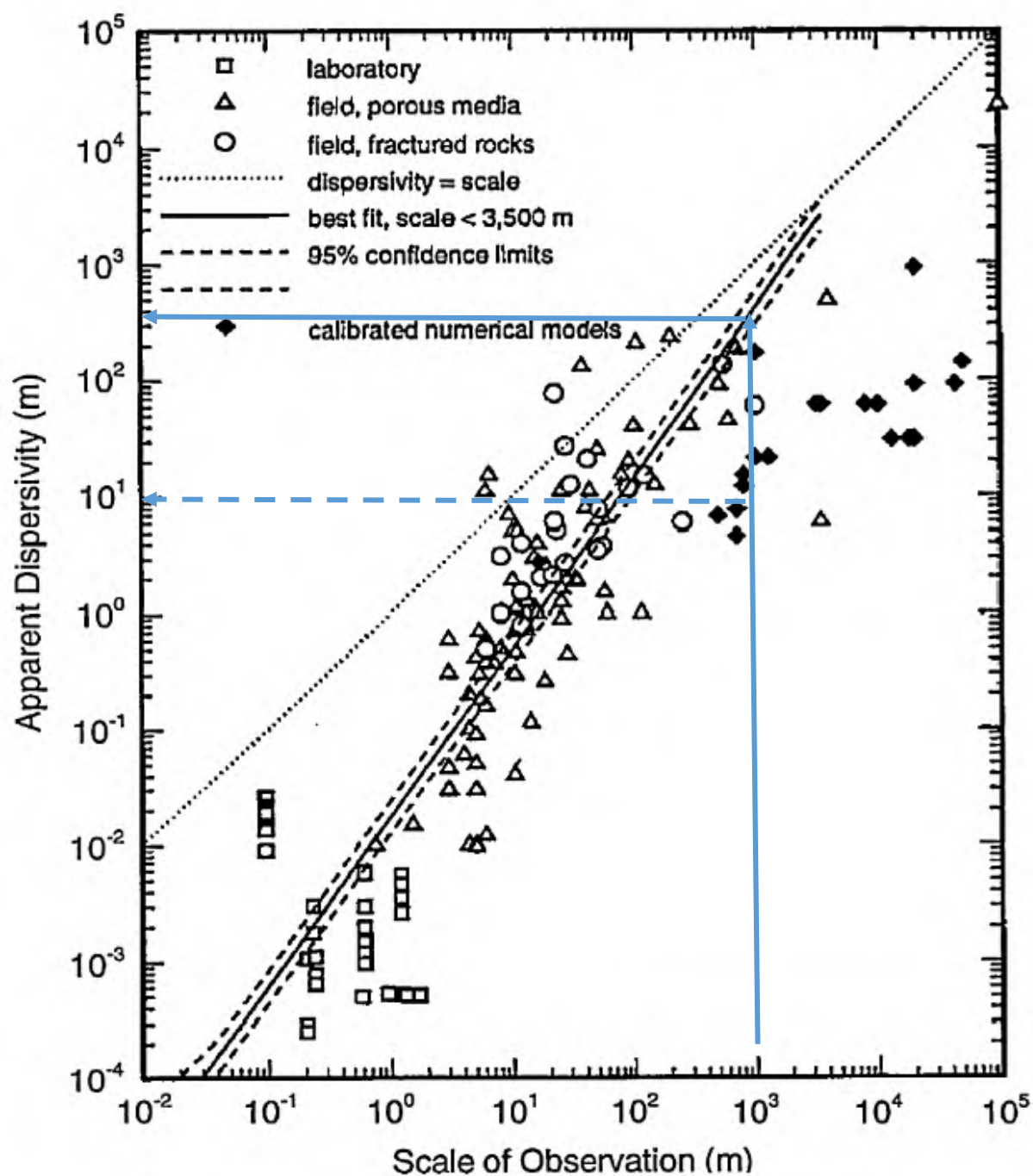
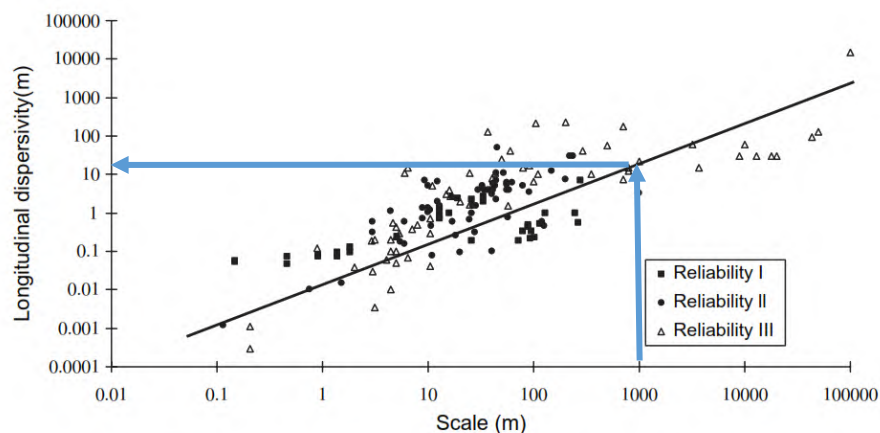


Figure 9-5: (a) Longitudinal dispersivity versus scale with data classified by reliability and (b) horizontal transverse dispersivity as a function of observation scale (from Gelhar et al., 1992).

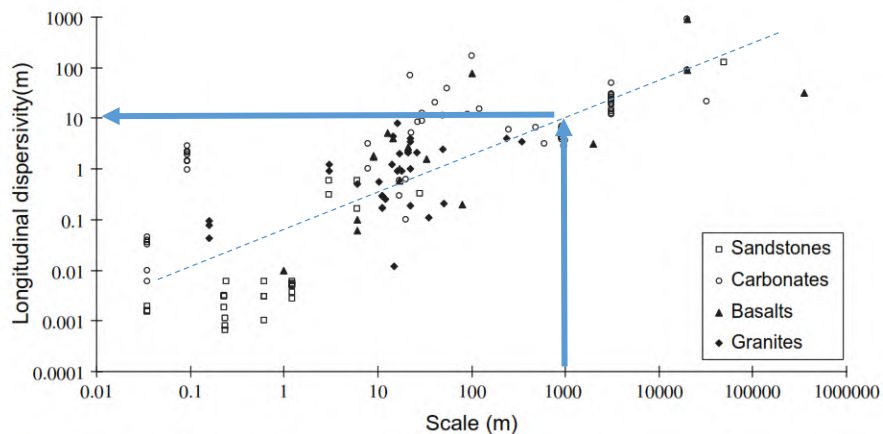




**Figure 1. Apparent longitudinal dispersivities vs. scale of observation based on worldwide tracer studies (after Neuman 1995).**



**Figure 1. Relationship of longitudinal dispersivity to scale of measurement for unconsolidated sediments. The line represents the regression line for all data points (regardless of assigned reliability class) with a scaling exponent of 0.81 and a  $c$  value of 0.085 m.**



**Figure 2. Relationship of longitudinal dispersivity to scale of measurement for various rock types. The scaling behavior for each rock type is quantified in Table 3.**

## Attachment: IR-99

Number	IR-99
Dept.	CNSC
Project effects link	Aquatic environment
Reference to EIS, appendices, or supporting documentation	Section 8, Water Quality, Table 8.2-13
Context and Rationale	<p>Context: Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.</p> <p>Rationale: It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L.</p>
Information Requirement	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.

Revised Table 8.2-13 to support response in IR table:

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated)

Location	Maximum Concentration (mg/L) of Non-radionuclides in Surface Waters During Project Phases										
	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	8.40E-04
Location	Maximum Concentration (Bq/L) of Radionuclides in Surface Waters During Project Phases										
	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-210	Polonium-210					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03					
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03					
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03					
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03					
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03					
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03					
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03					

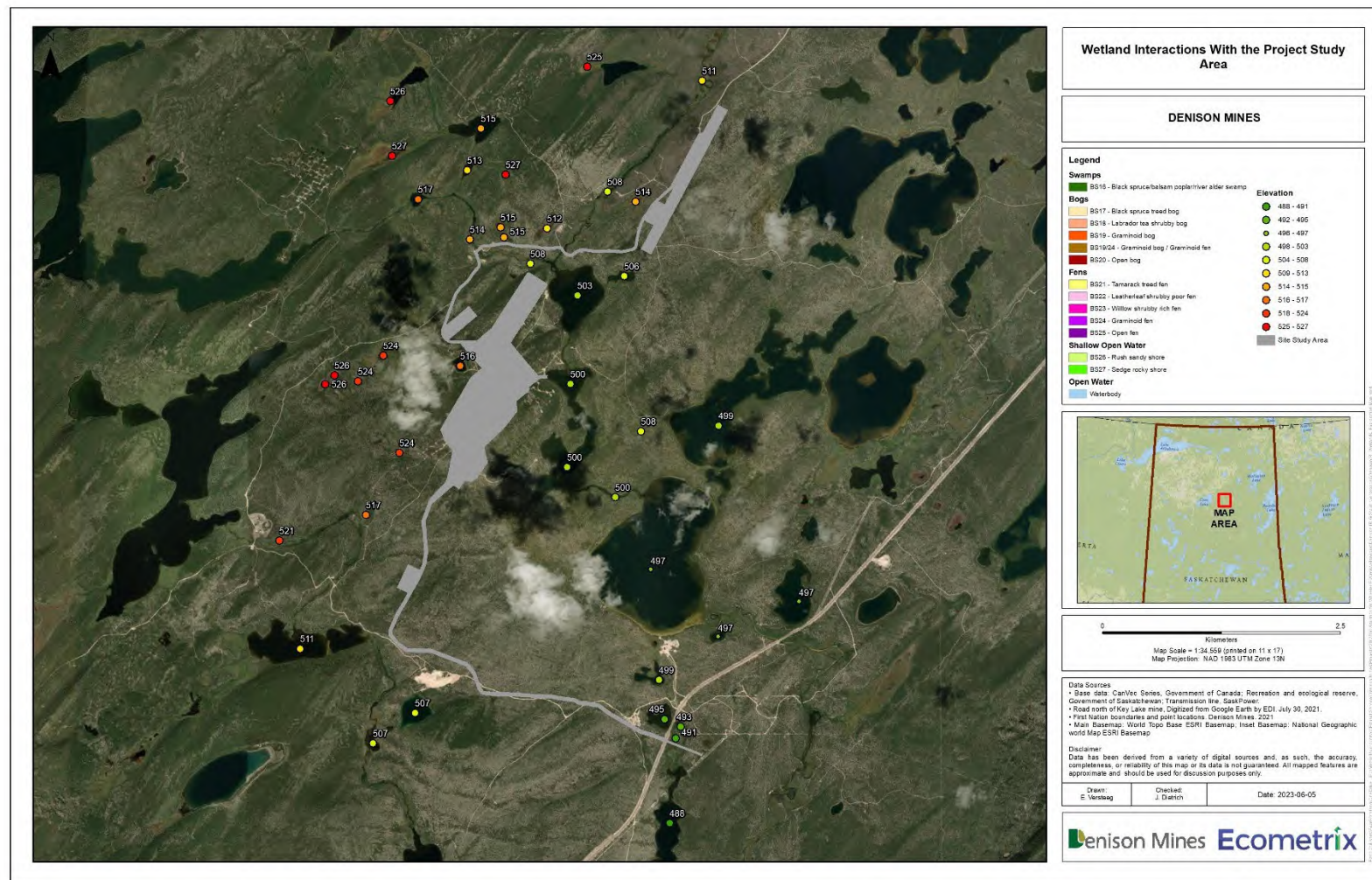
## Attachment: IR-101

Number	IR-101
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment
Context and Rationale	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>
Information Requirement	1) Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of

	<p>wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <ol style="list-style-type: none"><li>2) Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</li><li>3) Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</li><li>4) Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</li></ol>
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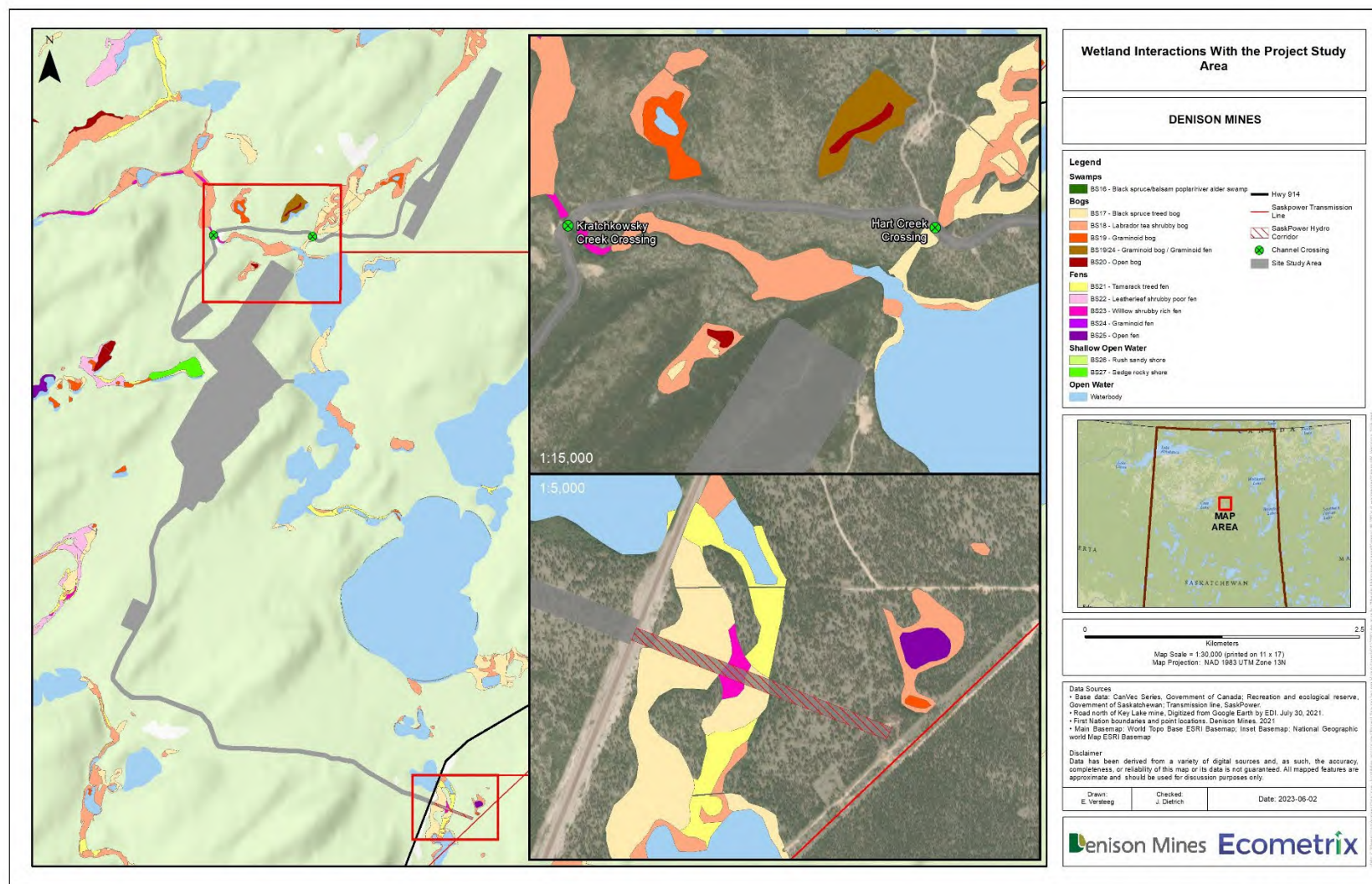
Supporting figures to the response provided in table:





Attachment IR-101 Figure 1 – Elevations of Wetland Features in the LSA.





Attachment IR-101 Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution

## Attachment: IR-102

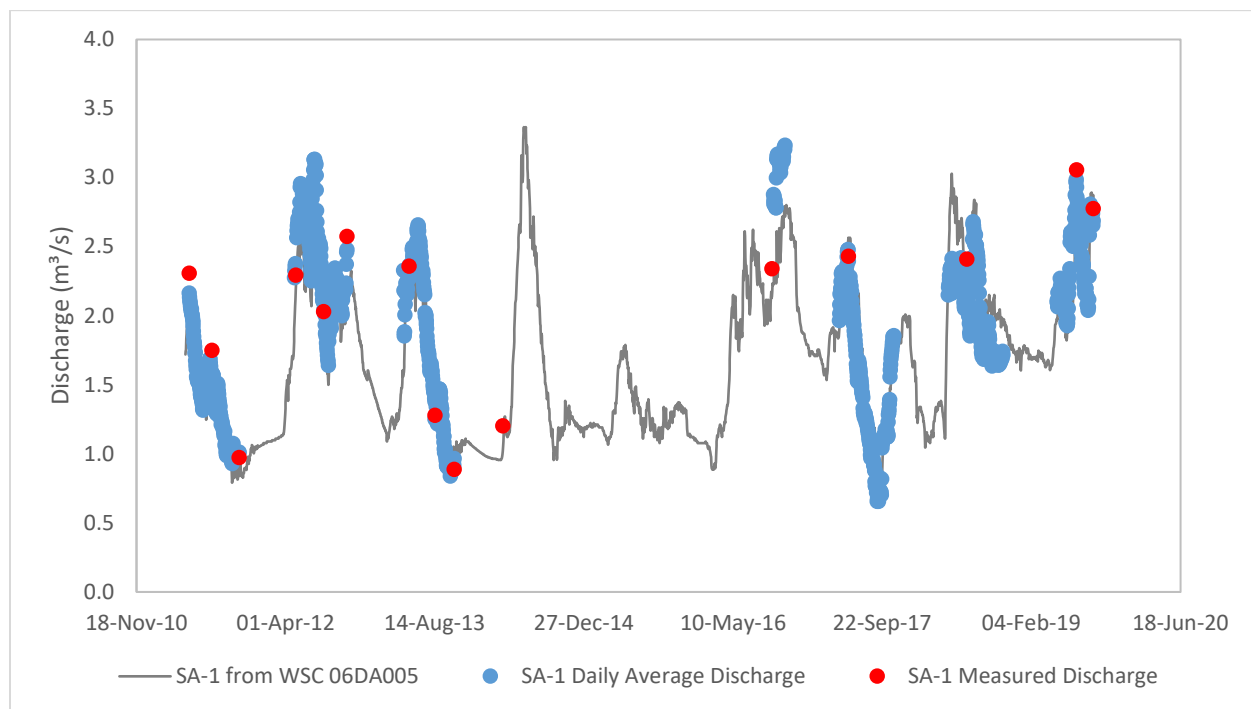
Number	IR-102
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	8.1.3.1 Appendix 8-C, including Appendix II, Table 1 (p. 2)
Context and Rationale	<p><b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent's estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.</li> <li>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</li> <li>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</li> </ol>

Supporting information to the response provided in table:

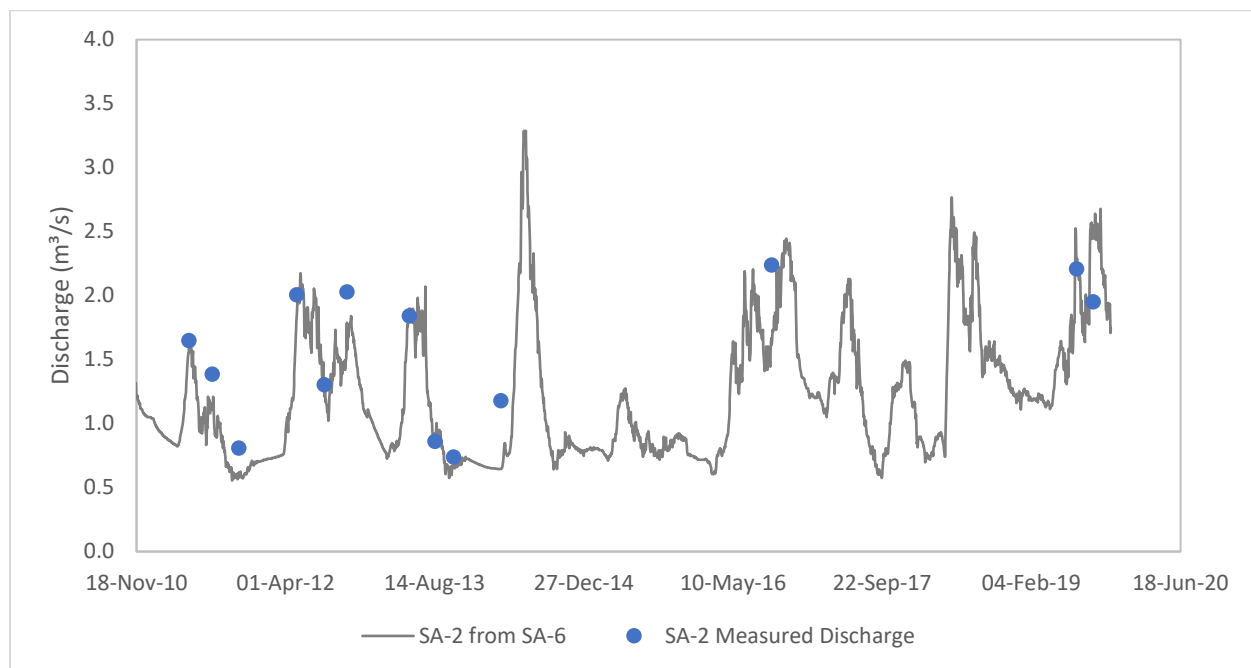
Attachment IR-102 Table 1: Record Extension Variables

Assessment Node (AN)	Assessment Node Drainage Area (km <sup>2</sup> )	Source Station (SS)	Source Station Drainage Area (km <sup>2</sup> )	Extension Method	Equation Parameters: $QAN = A(B+C(QSS+D)E)$				
					A	B	C	D	E
SA-1	280.55	06DA005	3030	Correlation	7.1250E-01	0.0000E+00	1.3029E-01	0.0000E+00	1.0599E+00
SA-2	257.36	SA-6	251.69	Unit Area Runoff with Scaling and Offset	1.0000E+00	-6.2600E-02	1.0708E+00	0.0000E+00	1.0000E+00
SA-3	15.537	SA-1	280.55	Unit Area Runoff with Scaling	1.0000E+00	0.0000E+00	2.3453E-01	0.0000E+00	1.0000E+00
SA-4	80.498	SA-6	251.69	Correlation	7.6738E-01	0.0000E+00	3.4997E-01	0.0000E+00	9.0494E-01
SA-5	167.32	SA-6	251.69	Unit Area Runoff	6.6479E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
SA-6/LA-6	251.69	SA-1	280.55	Correlation	8.0221E-01	3.3463E-01	2.1528E-01	5.3078E-01	2.0643E+00
SB-3	24.869	SA-1	280.55	Unit Area Runoff	8.8644E-02	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-1	277.52	SA-1	280.55	Unit Area Runoff	9.8920E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-5	257.18	SA-2	257.36	Unit Area Runoff	9.9930E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00

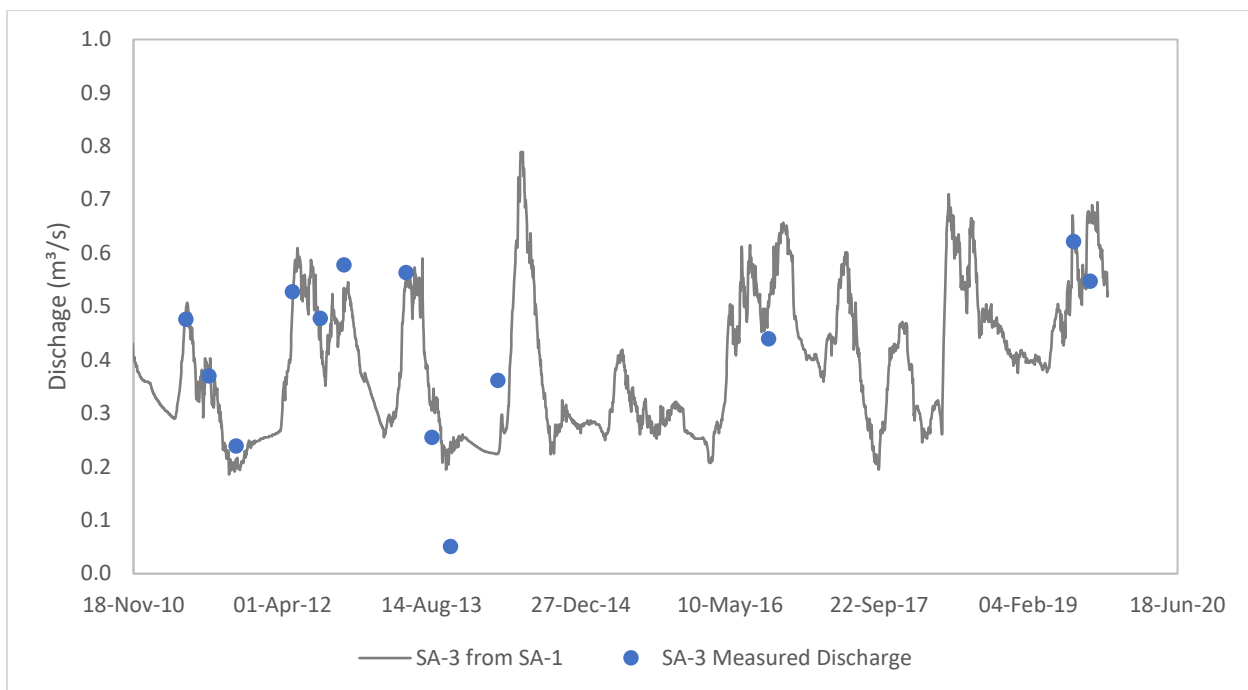
Attachment IR-102 Figure 1: SA-1 from WSC 06DA005



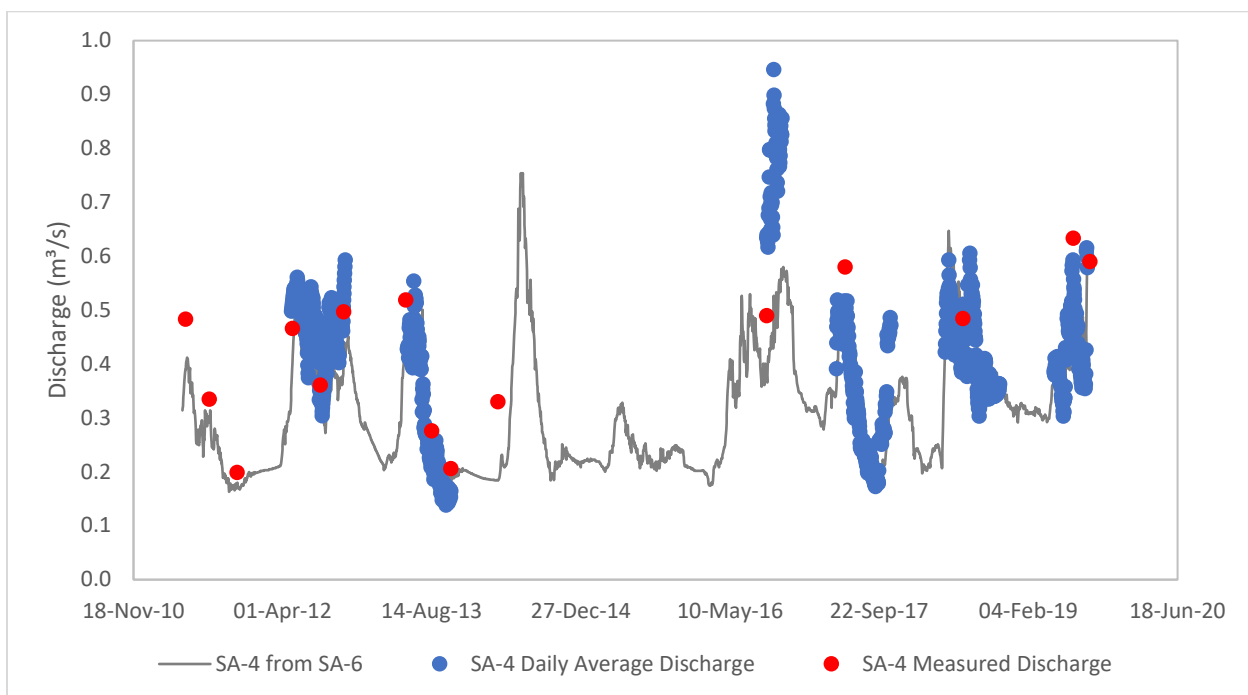
Attachment IR-102 Figure 2: SA-2 from SA-6



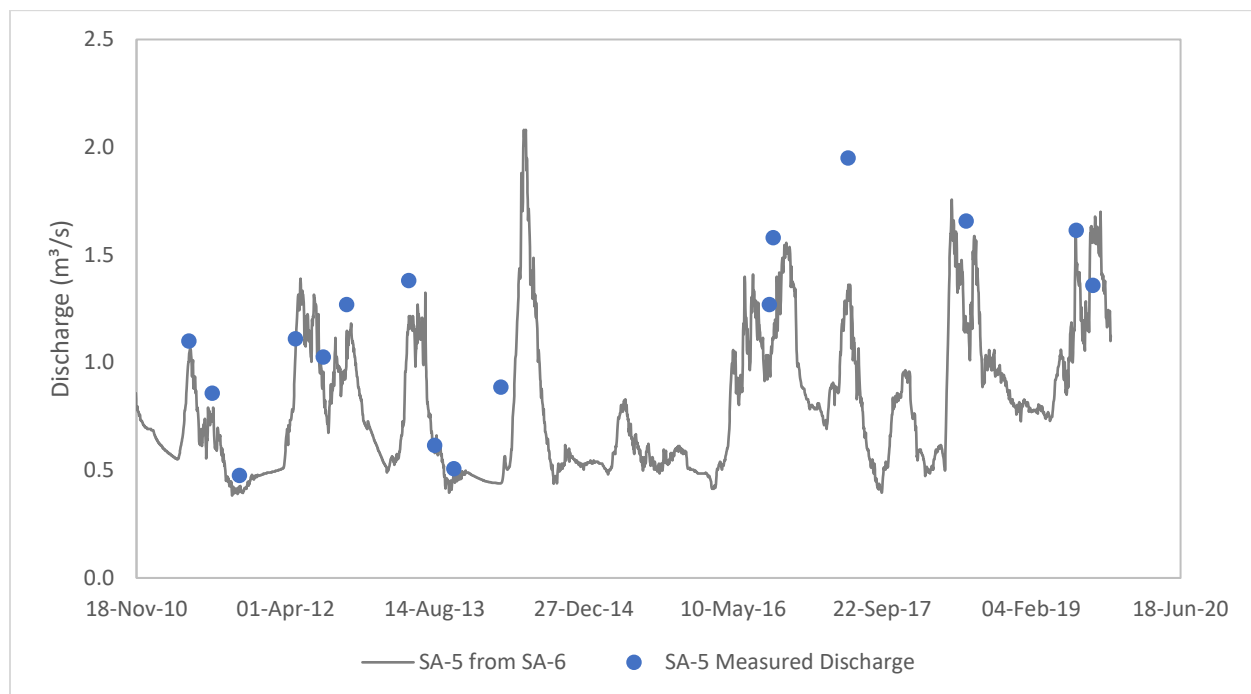
Attachment IR-102 Figure 3: SA-3 from SA-1



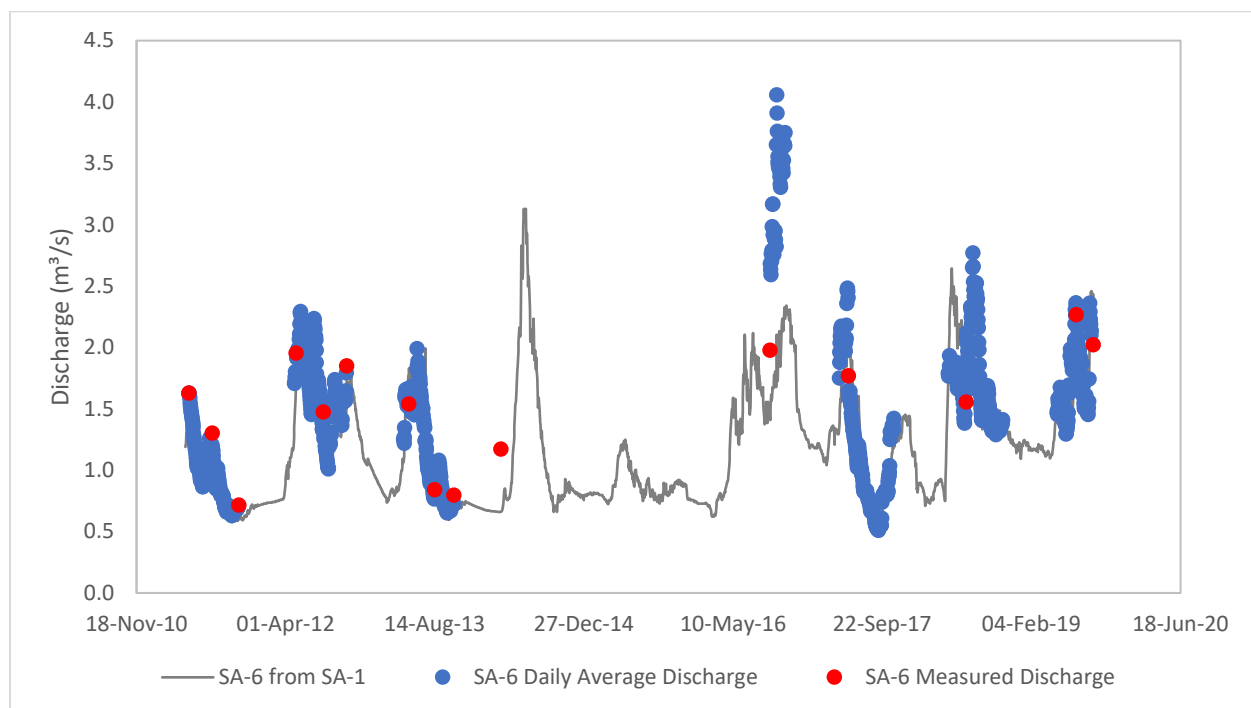
Attachment IR-102 Figure 4: SA-4 from SA-6



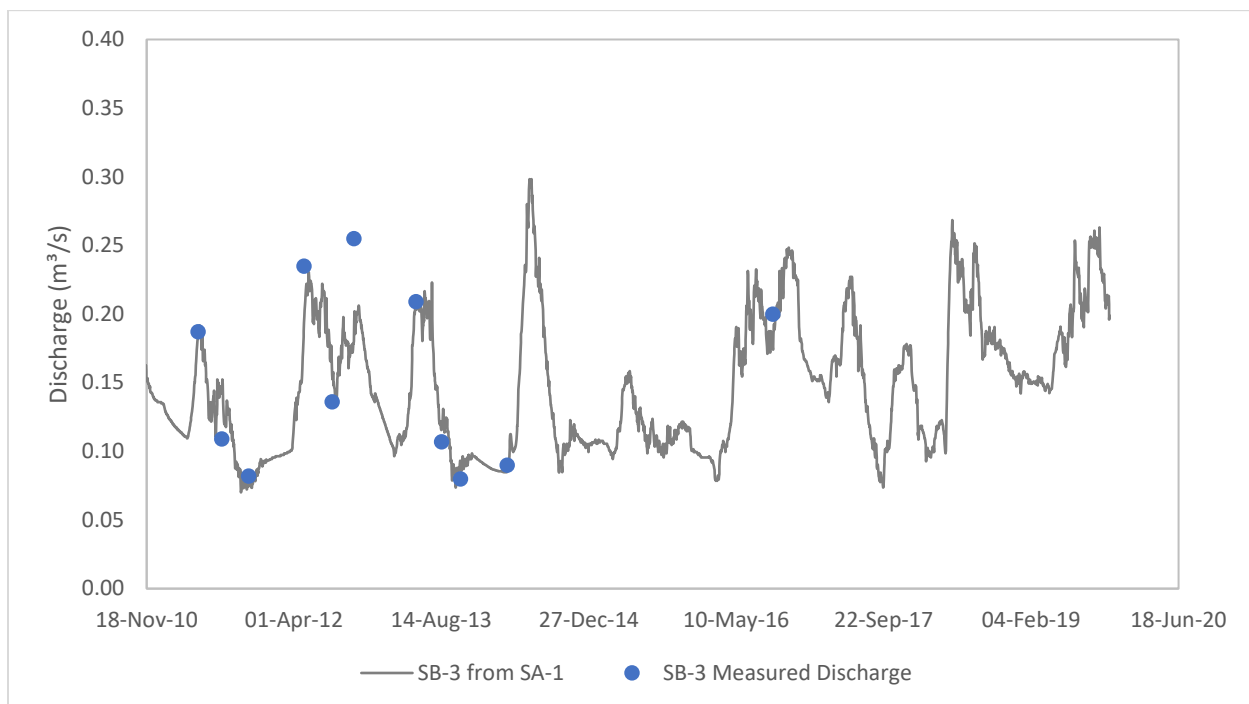
Attachment IR-102 Figure 5: SA-5 from SA-6



Attachment IR-102 Figure 6: SA-6 from SA-1



Attachment IR-102 Figure 7: SB-3 from SA-1





## Attachment: IR-108

Number	IR-108
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.3.3 Aquatic Environment
Context and Rationale	<p>Context: Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><u>Rationale:</u> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>
Information Requirement	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>

### Response:

Tables 8.2-2 and 8.2-3 will be updated in the final EIS to include 1) all COPCs that require effluent characterization and receiving environment monitoring under the MDMER and 2) missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters. The updated EIS tables are provided below for completeness.

**Table 8.2-2: Baseline Surface Water Quality in Local Study Area Lakes and Russell Lake (Updated)**

Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Alkalinity	mg/L			2	10	6	3	13	7.7	3	38	15
Aluminum	mg/L	0.005	SEQG	0.001	<b>0.0051</b>	0.0034	0.0048	<b>0.0078</b>	<b>0.0061</b>	0.005	<b>0.073</b>	<b>0.0201</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.09	0.0266	<0.01	0.07	0.043	<0.01	0.05	0.026
Ammonia, *unionized	ug/L	19	CWQG	0.008	0.072	0.0229	0.013	0.105	0.0543	0.005	0.036	0.0164
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.000233	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0023	0.0038	0.003	0.0021	0.0032	0.0027	0.0024	0.0051	0.00328
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	12	7.8	4	16	9.3	4	46	13.4
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	0.00003	0.000015	<0.00001	0.00002	0.000013	<0.00001	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.35	1.2	1.6	1.4	1.1	1.5	1.24
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.5	0.43	0.3	0.4	0.33	0.3	0.4	0.32
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.00024
DOC	mg/L			2	2.6	2.23	2	2.5	2.2	2	2.5	2.22
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	<0.01	0.08	0.03166	0.02	0.07	0.037	0.02	0.08	0.042
Hardness	mg/L			5	6	5.5	5	6	5.3	5	5	5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.037	0.27	0.12	0.04	0.19	0.11	0.031	0.21	0.1064
Lead	mg/L	0.001	CWQG	<0.0001	0.0004	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	<b>0.0012</b>	0.00032
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.42	0.4	0.4	0.4	0.2	0.4	0.36

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Manganese	mg/L			0.0039	0.029	0.016	0.0046	0.02	0.0142	0.0024	0.019	0.01232
Mercury	mg/L	2.60E-05	CWQG	1.00E-07	1.00E-05	6.00E-06	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-05	6.00E-06
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.00016
Nitrate	mg/L	13.29	SEQG	<0.04	0.49	0.18	<0.04	0.26	0.15	<0.04	0.31	0.1725
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.52	6.94	6.77	6.6	7	6.8	<b>5.71</b>	6.79	6.502
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	0.008	0.006	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.37	0.2	0.4	0.33	0.2	0.4	0.32
Radium-226	Bq/L	0.11	SSWQO	<0.005	<0.005	<0.005	<0.005	0.01	0.0076667	<0.005	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.8	1.5	1.4	1.7	1.5	1.4	1.8	1.52
Conductivity	µS/cm			9	24	16.8	16	22	19	9	21	15.2
Strontium	mg/L			0.012	0.016	0.014	0.012	0.015	0.013	0.011	0.014	0.0126
Sulphate	mg/L	128	SEQG	0.7	0.8	0.75	0.6	0.7	0.63	0.5	0.7	0.64
Sum of Ions				6	18	12.5	8	22	14	8	51	18
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.0133	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	0.0013	0.0004	<0.0001	0.0008	0.00033	<0.0001	0.0011	0.0003
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			18	26	22.167	22	29	24	14	29	22.2
TKN	mg/L			0.17	0.38	0.27333	0.14	0.34	0.22	0.24	0.43	0.306
TOC	mg/L			2.2	2.6	2.3667	1.9	4.3	2.8	2.2	2.9	2.36
TSS	mg/L			<1	4	2.5	<1	4	2.66	<1	4	2

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Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.001	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	0.02	0.00474

**Table 8.2-2 (Continued)**

Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			2	14	7.7	8	8	8	7	12	9.5
Aluminum	mg/L	0.005	SEQG	0.0023	0.0025	0.0024	0.0029	0.0029	0.0029	<b>0.0067</b>	<b>0.0096</b>	<b>0.0082</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.0233	<0.01	<0.01	<0.01	<0.01	0.04	0.025
Ammonia, *unionized	ug/L			0.016	0.055	0.0303	0.033	0.033	0.033	0.011	0.028	0.0195
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium	mg/L			0.0033	0.0039	0.0036	0.0034	0.0034	0.0034	0.0033	0.0046	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	17	9	10	10	10	8	15	12
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L			2.7	3.9	3.5	3.5	3.5	3.5	1.3	1.8	1.6
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	<0.1	0.5	0.3333333	0.4	0.4	0.4	0.2	0.2	0.2
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.1	2.5	2.3	2.2	2.2	2.2	2.6	3.5	3.1
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02
Fluoride	mg/L	0.12	CWQG	0.02	0.07	0.04	0.03	0.03	0.03	<0.01	0.07	0.04

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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Hardness	mg/L			9	13	11	12	12	12	5	6	5.5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.056	0.08	0.070667	0.039	0.039	0.039	0.15	0.15	0.15
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.5	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4
Manganese	mg/L			0.029	0.064	0.045	0.019	0.019	0.019	0.0094	0.037	0.0232
Mercury	mg/L	2.60E-05	CWQG	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-07	1.00E-07	1.00E-06	1.00E-05	5.50E-06
Molybdenum	mg/L	26	SEQG	0.0003	0.0013	0.00077	0.0011	0.0011	0.0011	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.00015
Nitrate	mg/L	13.29	SEQG	0.05	0.44	0.25	0.05	0.05	0.05	<0.04	0.66	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.7	7	6.9	7.2	7.2	7.2	6.7	6.8	6.8
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	mg/L			0.3	0.6	0.5	0.8	0.8	0.8	0.2	0.4	0.3
Radium-226	Bq/L	0.11	SSWQO	<0.005	0.006	0.0053333	0.007	0.007	0.007	<0.005	0.008	0.0065
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.7	2	1.8	1.7	1.7	1.7	1.4	1.6	1.5
Conductivity	µS/cm			30	47	38	42	42	42	20	22	21
Strontium	mg/L			0.017	0.018	0.017	0.016	0.016	0.016	0.013	0.016	0.0145
Sulphate	mg/L	128	SEQG	3.7	8.1	6.5	8.3	8.3	8.3	0.5	0.8	0.65
Sum of Ions				18	28	23	25	25	25	12	21	16.5
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Tin	mg/L			<0.0001	0.001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.00045
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			30	35	32	35	35	35	19	30	24.5
TKN	mg/L			0.14	0.22	0.17	0.29	0.29	0.29	0.13	0.35	0.24
TOC	mg/L			2.2	2.6	2.4	2.2	2.2	2.2	2.7	3.6	3.2
TSS	mg/L			1	1	<1.0	4	4	4	<1	<1	<1
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.00115

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

**Table 8.2-3: Baseline Surface Water Quality in Local Study Area Watercourses (Updated)**

Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	13	5.5	2	11	6.75	1	23
Aluminum	mg/L	0.005	SEQG	0.0022	<b>0.0056</b>	0.0037	0.0039	<b>0.081</b>	<b>0.015</b>	0.0013	<b>0.006</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.014	<0.01	0.04	0.01375	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.005	0.036	0.0143	0.006	0.024	0.013	0.004	0.036
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0022	0.0035	0.00267	0.0019	0.0041	0.0026625	0.0025	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	16	6.7	2	13	8.125	1	28
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	0.000012	<1.0E-05	0.00002	0.0000125	1.00E-05	0.00002
Calcium	mg/L			1.3	1.7	1.4	1.2	1.7	1.3375	1.5	1.9
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.4	0.3125	0.5	0.7
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.000275	<0.0002	<0.0002
DOC	mg/L			1.7	2.4	2.13	1.9	2.5	2.225	1.7	2.6
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.026	0.01	0.03	0.01625	<0.01	0.07
Hardness	mg/L			5	6	5.3	4	6	4.75	5	7
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.031	<b>0.31</b>	0.1215	0.041	0.11	0.073875	0.036	0.13
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.000125	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	0.05	0.02375	<0.02	0.03
Magnesium	mg/L			0.3	0.7	0.43	0.3	0.6	0.375	0.4	0.5



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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Manganese	mg/L			0.0041	0.025	0.01467	0.0044	0.017	0.010325	0.0066	0.023
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.26	0.0714286	<0.04	0.31	0.094	<0.04	0.26
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.34</b>	6.99	6.75	6.58	7.01	6.7775	<b>6.42</b>	7.02
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.01	0.0054999	<0.005	<0.005	<0.005	<0.005	0.01
Potassium	mg/L			0.2	0.5	0.36	0.1	0.4	0.3375	0.3	0.5
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.0061	<0.005	0.01	0.006125	<0.005	0.01
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.7	1.53	1.2	1.8	1.45	1.4	1.8
Conductivity	µS/cm			16	22	18.2	14	22	17	18	24
Strontium	mg/L			0.011	0.015	0.0127	0.011	0.015	0.012125	0.013	0.018
Sulphate	mg/L	128	SSWQO	0.4	0.9	0.71	<0.2	0.7	0.5875	0.4	0.8
Sum of Ions				6	22	11.5	6	19	12.5	6	33
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.01125	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0015	0.000375	<0.0002	<0.0002
TDS	mg/L			18	25	21.7	13	30	21.25	17	26
TKN	mg/L			0.11	0.3	0.241	<0.05	0.31	<0.195	0.13	0.3
TOC	mg/L			1.8	2.6	2.25	2.1	2.4	2.2875	1.8	2.6
TSS	mg/L			<1	3	2.2	1	3	1.5	<1	2

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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0028	0.00074	<0.0005	0.0096	0.001675	<0.0005	0.0011

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	15	7.5	2	8	5.2222	3	13
Aluminum	mg/L	0.005	SEQG	0.0025	<b>0.0099</b>	<b>0.0053</b>	0.004	<b>0.014</b>	<b>0.0065</b>	0.0032	<b>0.02</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.015	<0.01	0.05	0.01444	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.007	0.065	0.0194	0.002	0.04	0.0137	0.006	0.04
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0021	0.0032	0.0025625	0.0021	0.0031	0.0025556	0.0023	0.0032
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	18	9.125	2	10	6.2222	4	16
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	1.00E-05	<b>0.00007</b>	0.0000175	1.00E-05	0.00004	1.44E-05	1.00E-05	<b>0.00005</b>
Calcium	mg/L			1.3	2	1.5625	1.2	1.4	1.2444	1.2	1.8
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.3	0.23333	0.3	0.5
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2	2.4	2.275	1.8	2.5	2.2667	1.9	2.5
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.02625	0.01	0.08	0.0233	<0.01	0.07

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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Hardness	mg/L			5	7	5.625	4	5	4.56	4	6
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.034	0.13	0.077375	0.03	0.11	0.071222	0.036	0.16
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	0.03	0.02125	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.4	0.6	0.4375	0.2	0.4	0.33333	0.3	0.5
Manganese	mg/L			0.0029	0.019	0.010625	0.0025	0.018	0.0083333	0.0037	0.029
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.35	0.112	<0.04	0.31	0.093	<0.04	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.58	7.16	6.8488	<b>6.17</b>	6.97	6.7233	<b>6.48</b>	7.07
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.007	0.0052	<0.005	<0.005	<0.005	<0.005	0.006
Potassium	mg/L			0.2	0.6	0.375	0.2	0.4	0.32222	0.2	0.4
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.00625	<0.005	0.007	0.00544	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	2.1	1.63	1.3	1.6	1.41	1.3	1.9
Conductivity	µS/cm			17	25	19.375	14	20	16.111	14	23
Strontium	mg/L			0.012	0.018	0.0141	0.011	0.013	0.0113	0.011	0.016
Sulphate	mg/L	128	SSWQO	0.4	0.7	0.525	0.4	0.8	0.63333	0.3	0.8
Sum of Ions				7	25	14.125	6	14	10.667	8	22
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Tin	mg/L			<0.0001	0.0002	0.0001125	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
TDS	mg/L			21	32	25	13	28	20	15	28
TKN	mg/L			0.13	0.3	0.215	0.11	0.29	0.213	0.15	0.41
TOC	mg/L			2	2.6	2.325	1.9	2.7	2.3111	1.9	2.6
TSS	mg/L			1	3	2	<1	3	1.89	1	6
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.0006	<0.0005	0.0017	0.0007445	<0.0005	0.0006

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			<1	24	<6.7778	3	13	7.375
Aluminum	mg/L	0.005	SEQG	<b>0.0052</b>	<b>0.012</b>	<b>0.0089</b>	0.0016	<b>0.0086</b>	<b>0.0054</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.01333	<0.01	0.04	0.0138
Ammonia, *unionized	ug/L			0.003	0.024	0.012	0.005	0.032	0.0134
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0025	0.0041	0.0031111	0.0026	0.004	0.0030625
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			<1	29	<8.3333	4	16	9
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	1.11E-05	<1.0E-05	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.3778	1.2	1.7	1.3625
Carbonate	mg/L			<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.1	0.2	0.17778	<0.1	0.2	<0.175

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.2	3.4	3.0222	2.6	3.2	2.975
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.023333	0.01	0.07	0.02375
Hardness	mg/L			4	6	5.11	4	6	4.88
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.042	0.22	0.095111	0.036	0.16	0.098375
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.38889	0.2	0.5	0.375
Manganese	mg/L			0.0053	0.02	0.010633	0.0071	0.016	0.010325
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.4	0.115	<0.04	0.4	0.13
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.18</b>	6.99	6.7044	<b>6.47</b>	6.99	6.7288
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.008	0.0058	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.33333	0.2	0.5	0.3625
Radium-226	Bq/L	0.11	SEQG	<0.005	0.01	0.0059	<0.005	0.006	0.0051
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.2	1.7	1.4	1.3	1.7	1.44
Conductivity	µS/cm			15	22	16.778	15	23	17.25
Strontium	mg/L			0.011	0.015	0.0124	0.011	0.015	0.0119

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Sulphate	mg/L	128	SSWQO	0.3	0.9	0.68889	0.5	1	0.725
Sum of Ions				4	34	12.667	8	22	13.375
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			14	26	20.556	16	26	20.125
TKN	mg/L			0.16	0.34	0.256	0.18	0.33	0.27
TOC	mg/L			2.4	3.6	3.1111	2.7	3.2	3
TSS	mg/L			<1	4	2.56	<1	3	1.875
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.00059	<0.0005	0.0016	0.00065

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

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TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.



## Attachment: IR-114

Number	IR-114
Dept.	ECCC, CNSC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 and Section 8.2.4.2.4
Context and Rationale	<p>Context: Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field.</p> <p>General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p>Rationale: A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>

	<p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water.</p> <p>Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li> <li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li> <li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li> </ol>

Response:

1) Please see updated Tables 8.2-9 and 8.2-10 from the draft EIS below. Water quality predictions for the well mixed portion of LA-5 for each of the three flow scenarios (described in Section 8.2.4.2.3 and Table 8.2-7 of the draft EIS) are provided in the updated Table 8.2-10 below. Predicted site discharge concentrations that exceed respective receiver WQOs are bolded. Chloride, sulphate, TDS, arsenic, cadmium, chromium, cobalt, copper, selenium, and uranium, thorium-230, radium-226, lead-210, and polonium-210 predicted discharge concentrations are above receiver WQOs. However, under all three flow scenarios, the predicted water quality for all constituents is below respective WQOs within the well mixed portion of LA-5, indicating that sufficient dilution is present within LA-5 to meet objectives. Updated Table 8.2-13 is provided below. Water quality predictions have been added for MDMER constituents listed under Schedule 4 and Schedule 5. There are no predicted exceedances of water quality guidelines for any of the COPCs during Construction, Operation, or Decommissioning

2) The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The

effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.

3) The table below (IR-114 Table 1) shows a summary of baseline concentrations of total mercury in surface water within the LSA. Sediment was not analyzed for mercury during previous baseline surveys. Baseline water quality in the LSA and RSA showed no indication of total mercury present above detectable limits and as such, the potential for methyl-mercury to be detected was unlikely. Generally, 60 to 95% of total mercury concentrations in fish muscle tissues are present in the form of methyl-mercury. Table 8.5-2 of Section 8.5 of the EIS provides a full summary of tissue constituent concentrations for key species from the Icelander River and Russell Lake. A conservative approach of assuming 95% of mercury in the tissues is present in the methylated form could be used for comparative purposes. These data supplemented with more current baseline data for water, sediment and fish tissues specific to total and methyl-mercury prior to the onset of site development will provide a robust database for comparative purposes during the subsequent development and operation on site.

4) Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."

As baseline surface water did not identify measurable concentrations of total mercury in the LSA or RSA (See IR-114 Table 1 below) and deposition to large water bodies such as lakes is not likely to contribute to the methyl mercury concentration in the Wheeler River receiving waters, it is most reasonable to conclude that changes in total and methyl mercury can be adequately monitored in relation to sulphate inputs. Denison will undertake monitoring of total and methyl mercury as it relates to the discharge of sulphate to Whitefish Lake.

#### References:

Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I

Table 8.2-9: Predicted Effluent Water Quality (Updated to include MDMER Constituents)

Constituent	Unit	Discharge Concentration
		(max predicted)
Chloride	mg/L	<b>600</b>
Sulphate (Hardness)	mg/L	<b>3915</b>
Sulphate	mg/L	<b>3915</b>
TDS	mg/L	<b>6420</b>
TSS	mg/L	6
Arsenic	mg/L	<b>0.006</b>
Cadmium	mg/L	<b>0.0018</b>
Chromium	mg/L	<b>0.025</b>
Cobalt	mg/L	<b>0.0030</b>
Copper	mg/L	<b>0.022</b>
Lead	mg/L	0.0003
Molybdenum	mg/L	2.5
Nickel	mg/L	0.014
Selenium	mg/L	<b>0.042</b>
Uranium	mg/L	<b>0.057</b>
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Mercury	mg/L	0.000001
Ammonia (as N)	mg/L	3.9
Un-ionized Ammonia*	mg/L	0.0078
Phosphorus	mg/L	N/A
Thorium-230	Bq/L	<b>0.9</b>
Radium-226	Bq/L	<b>0.15</b>
Lead-210	Bq/L	<b>0.419</b>
Polonium-210	Bq/L	<b>0.15</b>

Note:

\* - Calculated value

Table 8.2-10: Near-field Receiving Water Quality Results (Updated to include MDMER Constituents)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
Chloride	mg/L	120	SEQG/CCME	<b>600</b>	10.06	6.18	4.69
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>	63.83	38.51	28.76
Sulphate	mg/L	128	BC MOE	<b>3915</b>	63.83	38.51	28.76
TDS	mg/L	500	SEQG	<b>6420</b>	131.41	90.06	74.13
TSS	mg/L	15	Schd 4 - MDMER	6	3.9	3.9	3.9
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>	0.00020	0.00016	0.00014
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>	0.00005	0.00004	0.00003
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>	0.00090	0.001	0.00068
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>	0.00015	0.00013	0.00012
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>	0.00055	0.00041	0.00036
Lead	mg/L	0.005	CCME	0.0003	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.07	WHO	2.5	0.040	0.024	0.018
Nickel	mg/L	0.07	WHO	0.014	0.0003	0.0002	0.0002
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>	0.0008	0.001	0.0004
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>	0.0010	0.0006	0.0005
Vanadium	mg/L	0.12	FEQG	0.059	0.0011	0.0007	0.0005
Zinc	mg/L	0.1	FEQG**	0.042	0.0018	0.0015	0.0014
Mercury	mg/L	0.000026	SEQG/CCME	0.000001	0.00001	0.00001	0.00001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9	0.13	0.11	0.10
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078	0.00008	0.00006	0.00006
Phosphorus	mg/L	0.015	BC MOE	N/A	0.01	0.01	0.01
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>	0.024	0.019	0.016
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>	0.008	0.007	0.007
Lead-210	Bq/L	0.2	HC	<b>0.419</b>	0.026	0.024	0.023
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>	0.007	0.006	0.006
Notes							

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Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
<p>(1) <b>Bolded values</b> are those that exceed the screening concentrations</p> <p>Un-ionized ammonia calculated value</p> <p>* Hardness induced guideline, assuming hardness &gt;250 mg/L</p> <p>** Hardness induced guideline, assuming hardness &gt;250 mg/L, pH=7.0, DOC = 5.26 mg/L</p>							

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated to include available MDMER Constituents)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Iceland River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	6.14	6.11	4.20	4.16	3.26	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.01	SEQG/CCME
Cadmium	mg/L	0.000024	0.000023	0.000040	0.000039	0.000033	0.000033	0.000030	0.0003	SEQG/CCME*
Chromium	mg/L	0.000530	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*
Lead	mg/L	0.000124	0.000114	0.000118	0.000130	0.000114	0.000114	0.000116	0.005	CCME
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.0240	0.0158	0.0156	0.0118	0.07	WHO
Nickel	mg/L	0.00039	0.00038	0.00051	0.00050	0.00046	0.00046	0.00044	0.07	WHO
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.00020	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG
Zinc	mg/L	0.00070	0.00069	0.00106	0.00103	0.00090	0.00090	0.00084	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.03950	0.03368	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.01430	0.6	HC
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5



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Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Iceland River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia represented by calculated values										

IR-114 Table 1: Total and Dissolved Mercury Concentrations in the LSA and RSA

Parameter	Total Mercury, Dissolved	Total Mercury
Units	mg/L	mg/L
Total Count	40	59
Count (<RDL)	39	46
Minimum	<1.00E-05	<1.00E-07
5th Percentile	<1.00E-05	<8.20E-07
50th Percentile	<1.00E-05	<1.00E-05
95th Percentile	<1.00E-05	<1.00E-05
Maximum	<1.00E-05	<1.00E-05
Arithmetic Mean	<1.00E-05	<7.63E-06
StdDev	2.76E-12	3.70E-06
Std Error	0	4.81E-07
Geometric Mean	<1.00E-05	<5.38E-06
Geometric StdDev	1.	3.281

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.
2. The reporting locations are: "LA-1", "LA-1-Bottom", "LA-5", "LA-6", "LAB-1", "LAB-2", "SA-1", "SA-2", "SA-3", "SA-6".

## Attachment: IR-115

Number	IR-115
Dept.	ECCC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 Aquatic Environment Appendix 10-A (ERA), Section 3.1.1.1
Context and Rationale	<p>Context: Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p>Rationale: ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li> <li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li> </ol>

### Table to support response:

Table 8.2-8 has been updated and provided below.

Constituent	Unit	LA-5 Background Concentration (95th percentile)	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.39	120	SEQG/CCME
Sulphate (Hardness)	mg/L	0.69	429	BC MOE*
Sulphate	mg/L	0.69	128	BC MOE
TDS	mg/L	28.3	500	SEQG
TSS	mg/L	3.9	15	Schd 4 - MDMER
Arsenic	mg/L	0.0001	0.01	SEQG/CCME
Cadmium	mg/L	0.000019	0.0003	SEQG/CCME*
Chromium	mg/L	<0.0005	0.001	SEQG/CCME
Cobalt	mg/L	<0.0001	0.0003	FEQG
Copper	mg/L	<0.0002	0.004	SEQG/CCME*
Lead	mg/L	<0.0001	0.005	CCME
Molybdenum	mg/L	<0.0001	0.07	WHO
Nickel	mg/L	<0.0001	0.07	WHO
Selenium	mg/L	<0.0001	0.001	SEQG/CCME
Uranium	mg/L	<0.0001	0.02	SEQG/CCME
Vanadium	mg/L	<0.0001	0.12	FEQG
Zinc	mg/L	0.0011	0.1	FEQG**
Mercury	mg/L	<0.00001	0.000026	SEQG/CCME
Ammonia (as N)	mg/L	0.068	5.74	SEQG/CCME
Phosphorus	mg/L	<0.01	0.015	BC MOE
Thorium-230	Bq/L	<0.01	0.6	HC
Radium-226	Bq/L	<0.0059	0.11	SEQG
Lead-210	Bq/L	<0.02	0.2	HC
Polonium-210	Bq/L	<0.005	0.1	HC

Notes

\* Hardness induced guideline, assuming hardness >250 mg/L

\*\* Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L

## Attachment: IR-116

Number	IR-116
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3
Context and Rationale	<p>Context: Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p>Rationale: It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>
Information Requirement	<p>Information Requirement:</p> <ol style="list-style-type: none"> <li>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</li> <li>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</li> </ol>

### Response:

- 1) The maximum concentrations of COPCs in surface water and sediment during the Future Centuries period are provided in IR-116 Table 1 and IR-116 Table 2, respectively.
- 2) The suite of COPCs that are provided in IR-116 Table 1 and IR-116 Table 2 are generally inclusive of those that have the potential for elevated concentrations in groundwater. However, estimates for pH, iron and manganese have not currently been modelled. These three parameters were identified in

Section 7.6.2.2.3 and Appendix 7-C as having the potential to be present in groundwater above the groundwater quality screening criteria (see Table 7.6-1 in the EIS and Table 3-4 in Appendix 7-C [existing conditions groundwater quality]).

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a pH ranging from 6.39 to 6.47, which is slightly below the screening criteria of 6.5 to 9. However, the range predicted is within the range of the local groundwater flow system of 5.9 to 7.5 (median of 6.5, as provided in Table 3-4 of Appendix 7-C). Therefore, no change from the current existing conditions is expected during future centuries.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have an iron concentration ranging from 0.0065 mg/L and 2.91 mg/L. The upper range of concentrations will exceed the Groundwater quality guideline of 0.3 mg/L. However, the range predicted is within the range of dissolved iron concentrations measured for groundwater in the local groundwater flow system, of 0.01 mg/L to 4.8 mg/L (median of 0.41). Therefore, no change from the current existing conditions is expected.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a manganese concentration ranging from 0.279 mg/L and 0.289 mg/L. The range of predicted concentrations will exceed the Groundwater quality guideline of 0.230 mg/L. However, the range predicted is only marginally above that of the local groundwater flow system of 0.04 mg/L and 0.2 mg/L (median of 0.1) and within a similar magnitude.

Arsenic concentrations in sediment have also been predicted based on mass-flux in a conservative manner and indicate potential exceedance of the CCME ISQG.

The modelled predictions of the future centuries groundwater are highly conservative. Continued monitoring of groundwater through the period of construction and initial operation will allow for refinement of the predictions for the future centuries scenario, thereby providing information for adaptive management.

IR-116 Table 1: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water During Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	0.41	0.41	0.39	0.39	0.38	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	0.72	0.72	0.71	0.71	0.71	128	BC MOE
Arsenic	mg/L	0.000103	0.000103	0.000107	0.000107	0.000105	0.000105	0.000104	0.01	SEQG/CCME
Cadmium	mg/L	0.0000232	0.0000232	0.0000233	0.0000233	0.0000233	0.0000233	0.0000232	0.0003	SEQG/CCME*
Chromium	mg/L	0.00052	0.00052	0.00053	0.00053	0.00052	0.00052	0.00052	0.001	SEQG/CCME
Cobalt	mg/L	0.00010	0.00010	0.00011	0.00011	0.00011	0.00010	0.00010	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00063	0.00063	0.00062	0.00062	0.00062	0.004	SEQG/CCME*
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.005	CCME
Molybdenum	mg/L	0.00011	0.00011	0.00012	0.00012	0.00011	0.00011	0.00011	0.07	WHO
Nickel	mg/L	0.00038	0.00038	0.00041	0.00041	0.00040	0.00040	0.00039	0.07	WHO
Selenium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00003	0.00003	0.00003	0.02	SEQG/CCME
Vanadium	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.12	FEQG
Zinc	mg/L	0.00068	0.00068	0.00074	0.00074	0.00072	0.00072	0.00071	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01010	0.01010	0.01036	0.01036	0.01030	0.01030	0.01025	0.6	HC
Radium-226	Bq/L	0.00557	0.00557	0.00639	0.00637	0.00615	0.00614	0.00600	0.11	SEQG
Lead-210	Bq/L	0.00527	0.00527	0.00605	0.00592	0.00557	0.00556	0.00545	0.2	HC
Polonium-210	Bq/L	0.00536	0.00536	0.00615	0.00602	0.00566	0.00564	0.00553	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5



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Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L										

IR-116 Table 2: Predicted Maximum Sediment Quality during Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake Inlet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Chloride	mg/kg(dw)	2.81	2.81	3.62	3.61	3.43	3.29	--	--	--	--	--	--
Sulphate	mg/kg(dw)	6.00	6.00	6.29	6.29	6.22	6.17	--	--	--	--	--	--
Arsenic	mg/kg(dw)	<b>8.35</b>	<b>8.35</b>	<b>8.66</b>	<b>8.62</b>	<b>8.48</b>	<b>8.43</b>	21	522	9.8	346.4	5.9	17
Cadmium	mg/kg(dw)	0.34	0.34	0.34	0.34	0.34	0.34	--	--	--	--	0.6	3.5
Chromium	mg/kg(dw)	5.86	5.86	5.94	5.93	5.91	5.90	31.5	26.2	47.6	115.4	37.3	90
Cobalt	mg/kg(dw)	0.25	0.25	0.27	0.26	0.26	0.26	--	--	--	--	--	--
Copper	mg/kg(dw)	1.85	1.85	1.87	1.87	1.87	1.86	9.1	11.3	22.2	268.8	35.7	197
Lead	mg/kg(dw)	10.21	10.21	10.34	10.31	10.26	10.24	16.3	19.7	36.7	412.4	35	91.3
Molybdenum	mg/kg(dw)	0.34	0.34	0.37	0.37	0.36	0.35	23	245	13.8	1,239	--	--
Nickel	mg/kg(dw)	3.32	3.32	3.53	3.52	3.47	3.43	21	326	23.4	484	--	--

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Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake InLet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Selenium	mg/kg(dw)	0.62	0.62	0.83	0.82	0.76	0.72	3.6	30	1.9	16.1	--	--
Uranium	mg/kg(dw)	0.58	0.58	0.71	0.70	0.66	0.64	97	2,296	104.4	5,874	--	--
Zinc	mg/kg(dw)	9.93	9.93	10.79	10.76	10.52	10.37	--	--	--	--	123	315
Total Ammonia (N)	mg/kg(dw)	0.13	0.13	0.13	0.13	0.13	0.13	--	--	--	--	--	--
Thorium-230	Bq/kg(dw)	23.19	23.19	23.80	23.79	23.64	23.54	--	--	--	--	--	--
Radium-226	Bq/kg(dw)	65.14	65.14	74.67	74.39	71.82	70.13	--	--	600	14,400	--	--
Lead-210	Bq/kg(dw)	373.84	373.84	428.83	419.39	394.66	386.43	--	--	900	20,800	--	--
Polonium-210	Bq/kg(dw)	380.31	380.31	436.25	426.65	401.49	393.07	--	--	800	12,100	--	--
Mercury	mg/kg(dw)	No background information or effluent concentration to model											
Aluminum	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Iron	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Thallium	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Manganese	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Phosphorus	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											

**Note:**

bolded values indicate exceedance of the CCME ISQG

## Attachment: IR-123

Number	IR-123
Dept.	ECCC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.4.3.2.3, Aquatic Environment Appendix 8-D, Table 3-5
Context and Rationale	<p><b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.</p> <p><b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.</li> <li>2. Provide data on baseline concentrations of mercury in sediment.</li> <li>3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.</li> </ol>

Table 1 is provided below to support the text response to IR-123 in the IR table:

Table 1: Baseline Sediment Quality Summary

Category	Parameter	Units	Total Count	Count (<RDL)	Min	5th Percentile	50th Percentile	95th Percentile	Max	Arithmetic Mean	StdDev	Std Error	Geometric Mean	Geometric StdDev	Sediment Quality Guidelines					
															Burnett-Seidel and Liber		Thompson et al.		CCME	
															REF	NE2	LEL	SEL	ISQG	PEL
Physical Tests	Moisture	%	22	0	24.59	28.934	94.81	96.858	97.24	74.715	31.256	6.6637	66.042	1.7444						
Total Metals	Aluminum	ug/g	22	0	920	1144	4645	9110.	9300	4391.82	2321.67	494.98	3723.16	1.8908	n/d	n/d	n/d	n/d	n/d	n/d
	Antimony	ug/g	22	17	<0.2	0.2	0.2	0.295	0.3	<0.20909	0.029425	0.0062733	<0.20751	1.1267	n/d	n/d	n/d	n/d	n/d	n/d
	Arsenic	ug/g	22	0	0.4	0.505	3.35	5.695	7.2	3.1909	2.0128	0.42913	2.3379	2.5249	21	522	9.8	346.4	5.9	17
	Barium	ug/g	22	0	19	21.25	42.5	70.45	100	43.727	17.694	3.7723	40.761	1.4647	n/d	n/d	n/d	n/d	n/d	n/d
	Beryllium	ug/g	22	7	<0.1	<0.1	0.3	0.395	0.5	<0.24545	0.11434	0.024377	<0.21531	1.747	n/d	n/d	n/d	n/d	n/d	n/d
	Boron	ug/g	22	7	<1	<1	5.5	11	12	<5.0455	3.5787	0.76299	<3.5672	2.5755	n/d	n/d	n/d	n/d	n/d	n/d
	Cadmium	ug/g	22	2	<0.1	<0.1	0.4	0.595	0.7	<0.35909	0.16521	0.035223	<0.31108	1.8383	n/d	n/d	n/d	n/d	0.6	3.5
	Chromium	ug/g	22	3	<0.5	<0.5	8.15	14.9	16	<7.55	4.7699	1.017	<5.0365	3.1656	31.5	26.2	47.6	115.4	37.3	90
	Cobalt	ug/g	22	5	<0.2	0.2	1.65	2.68	3.8	<1.4591	1.0051	0.21428	<0.96852	2.9677	n/d	n/d	n/d	n/d	n/d	n/d
	Copper	ug/g	22	7	<0.5	<0.5	1.65	4.565	5	<1.9136	1.3981	0.29807	<1.4281	2.2783	9.1	11.3	22.2	268.8	35.7	197
	Iron	ug/g	22	0	1410	1590.5	12650	32699.99	91300	16020	18960.23	4042.33	9545.32	3.0244	n/d	n/d	n/d	n/d	n/d	n/d
	Lead	ug/g	22	0	1	1	7.3	10	13	6.0545	3.6694	0.78232	4.4383	2.5369	16.3	19.7	36.7	412.4	35	91.3
	Manganese	ug/g	22	0	22	22.55	195	388.5	1270	237.41	253.54	54.056	159.75	2.6446	n/d	n/d	n/d	n/d	n/d	n/d
	Molybdenum	ug/g	22	2	<0.1	0.1	0.65	11.95	13	<2.4455	4.1007	0.87428	<0.83873	4.1956	23	245	13.8	1,239	n/d	n/d
	Nickel	ug/g	22	3	<0.1	<0.1	5.6	11.895	12	<5.1	3.6738	0.78327	<2.7847	4.651	21	326	23.4	484	n/d	n/d
	Selenium	ug/g	22	7	<0.1	<0.1	0.8	1.49	1.6	<0.73182	0.49989	0.10658	<0.4781	3.0508	3.6	30	1.9	16.1	n/d	n/d
	Silver	ug/g	22	11	<0.1	<0.1	<0.1	0.68	2	<0.25455	0.41142	0.087714	<0.16407	2.1254	n/d	n/d	n/d	n/d	n/d	n/d
	Strontium	ug/g	22	0	16	17	26.5	39.75	42	26.545	7.076	1.5086	25.66	1.3072	n/d	n/d	n/d	n/d	n/d	n/d
	Thallium	ug/g	22	22	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0	0	<0.2	1	n/d	n/d	n/d	n/d	n/d	n/d

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Radionuclides	Tin	ug/g	22	7	<0.1	<0.1	0.2	0.4	0.4	<0.19091	0.10193	0.021731	<0.16863	1.6518	n/d	n/d	n/d	n/d	n/d	n/d
	Titanium	ug/g	22	0	31	31.25	200	446.5	480	205.36	139.5	29.741	147.31	2.5607	n/d	n/d	n/d	n/d	n/d	n/d
	Uranium	ug/g	22	0	0.2	0.2	0.7	1.395	1.5	0.67727	0.38537	0.08216	0.56276	1.9464	97	2,296	104.4	5,874	n/d	n/d
	Vanadium	ug/g	22	0	1.2	1.3	18	26.75	30	14.223	9.3994	2.004	8.7761	3.4375	35.1	31.8	35.2	160	n/d	n/d
	Zinc	ug/g	22	5	<0.5	<0.5	24	43.3	62	<19.85	16.079	3.4281	<8.2122	6.2729	n/d	n/d	n/d	n/d	123	315
	Lead-210	Bq/g	22	7	<0.04	<0.04	0.415	0.725	0.75	<0.35273	0.24914	0.053116	<0.21687	3.3521	n/d	n/d	0.9	20.8	n/d	n/d
	Polonium-210	Bq/g	22	1	<0.01	0.02	0.41	0.678	0.76	<0.35136	0.25533	0.054436	<0.17468	4.8038	n/d	n/d	0.8	12.1	n/d	n/d
	Radium-226	Bq/g	22	6	<0.01	<0.01	0.03	0.0495	0.05	<0.025909	0.012968	0.0027649	<0.0225	1.7702	n/d	n/d	0.6	14.4	n/d	n/d
	Thorium-228	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-230	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	0.03	<0.020455	0.002132	0.00045455	<0.020372	1.0903	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-232	Bq/g	22	22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.

2. The reporting locations are: "LA-1-1", "LA-1-2", "LA-1-3", "LA-5-1", "LA-5-2", "LA-5-3", "LA-5-4", "LA-5-5", "LA-6-1", "LA-6-2", "LA-6-3", "LA-6-4", "LA-6-5", "LAB-1-1", "LAB-1-2", "LAB-1-3", "LAB-2-1", "LAB-2-2", "LAB-2-3", "LAB-2-CORE".

**0.7**

indicates exceedance of CCME ISQG

## Attachment: IR-131

Number	IR-131
Dept.	CNSC
Project effects link	Migratory birds, Wildlife and Wildlife Habitat
Reference to EIS, appendices, or supporting documentation	Section 9, Terrestrial Environment
Context and Rationale	<p>Context and Rationale: As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</p> <p>As per the CNSC's Generic Guidelines for the Preparation of an EIS pursuant to the Canadian Environmental Assessment Act, 2012: "The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan".</p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>
Information Requirement	Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.

### Response:

A new appendix to the final EIS (Appendix 9-D Species At Risk) is included below.



A circular frame containing a scenic landscape. In the foreground, there are tall, dark green evergreen trees. Behind them is a calm blue lake. In the middle ground, there is a strip of yellowish-brown reeds or grasses. The background is a dense forest of green trees, with a range of mountains visible in the distance under a clear blue sky.

 Denison Mines

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**PEOPLE, PARTNERSHIPS  
AND PASSION**



# Denison Mines Corp.

## **Appendix 9-D Wildlife Species At Risk**

**New Appendix to final EIS, Section 9**

**Version 1**

**July 2023**

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## Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	<i>Species at Risk Act</i>
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component

# 1 Introduction

## 1.1 Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 1.2 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 1.1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

**Table 1.1 Wildlife Species at Risk Listed by Environment and Climate Change Canada**

Common Name	Scientific Name	Discussed in the draft EIS
Nine-spotted lady beetle	<i>Coccinella ovemnotata</i>	No
Transverse lady beetle	<i>Coccinella transversoguttata</i>	No
Yellow-banded bumble bee	<i>Bombus terricola</i>	No
Northern leopard frog	<i>Lithobates pipiens</i>	No
Little brown myotis	<i>Myotis lucifugus</i>	No
Northern myotis	<i>Myotis septentrionalis</i>	No
Wolverine	<i>Gulo gulo</i>	Yes
Woodland caribou	<i>Rangifer tarandus caribou</i>	Yes
Bank Swallow	<i>Riparia riparia</i>	No
Barn Swallow	<i>Hirundo rustica</i>	No
Common Nighthawk	<i>Chordeiles minor</i>	Yes
Horned Grebe	<i>Podiceps auritus</i>	No
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes
Rusty Blackbird	<i>Euphagus carolinus</i>	Yes

Common Name	Scientific Name	Discussed in the draft EIS
Short-eared Owl	<i>Asio flammeus</i>	Yes
Yellow Rail	<i>Coturnicops noveboracensis</i>	Yes

Of the 16 species listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

## 1.2 Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 1.2 and Table 1.3, which formed the basis for the subsequent VC-specific assessment.

**Table 1.2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project**

Valued Component	Rationale
<b>Biophysical Environment</b>	
<b><i>Terrestrial Environment</i></b>	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., <i>Species at Risk Act</i> [SARA; Government of Canada 2022], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], <i>The Wildlife Act, 1998</i> [Government of Saskatchewan 2020]).
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], <i>Migratory Birds Convention Act 1994</i> [Government of Canada 2017], <i>Saskatchewan Activity Restriction Guidelines for</i>

Valued Component	Rationale
	<i>Sensitive Species</i> [Government of Saskatchewan 2017], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).

**Table 1.3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project**

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities. The number of Yellow Rail mortalities directly or indirectly attributable to the Project.



The five bird species identified in Table 1.3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

## 2 Supplemental Information

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As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 2.1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

**Table 2.1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement**

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Arthropods</b>						
Nine-spotted lady beetle	<i>Coccinella novemnotata</i>	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.1 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	<i>Coccinella transversoguttata</i>	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.2 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	<i>Bombus terricola</i>	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 2.1.3 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
<b>Amphibians</b>						
Northern leopard frog	<i>Lithobates pipiens</i>	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom; (2) breeding and larval waterbodies with	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow marshes, moist upland meadows where grass height is less than 1 m. See Section 2.2.1 for further details.	observations to date. Amphibian nocturnal call and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs ( <i>Pseudacris maculata</i> ) were detected (Appendix 9-C).	
<b>Bats</b>						
Little brown myotis	<i>Myotis lucifugus</i>	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.1 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	<i>Myotis septentrionalis</i>	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.2 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA (Appendix 9-C).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Terrestrial Wildlife Species</b>						
Wolverine	<i>Gulo gulo</i>	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	<i>Rangifer tarandus caribou</i>	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
<b>Avian Species</b>						
Bank Swallow	<i>Riparia riparia</i>	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of open habitats. See Section 2.4.1 for further details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Barn Swallow	<i>Hirundo rustica</i>	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of	Documented during the breeding bird surveys as part of the baseline field	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 2.4.2 for further details.	program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	<i>Chordeiles minor</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	<i>Podiceps auritus</i>	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 2.4.3 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5)..
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Rusty Blackbird	<i>Euphagus carolinus</i>	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	<i>Asio flammeus</i>	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	<i>Coturnicops noveboracensis</i>	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

- 1 Schedule 1 under the *Species at Risk Act*.
- 2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.



## 2.1 Arthropods

### 2.1.1 Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

### 2.1.2 Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



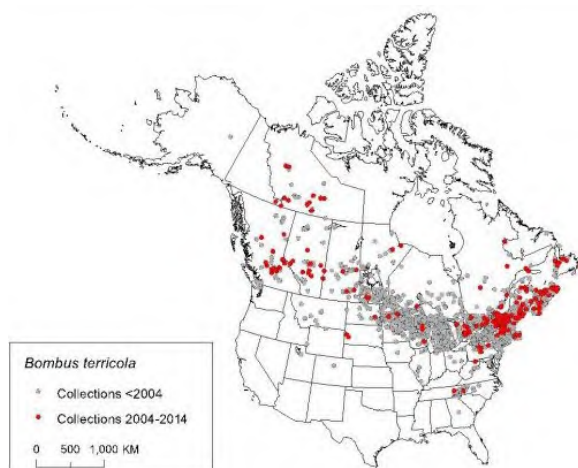
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section 2.1.1.

### 2.1.3 Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015). After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure)

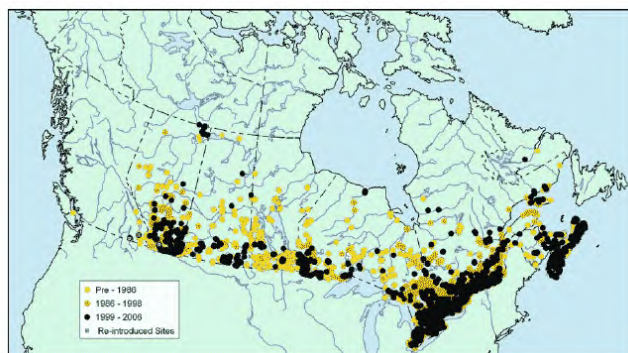
(Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015). The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

## 2.2 Amphibians

### 2.2.1 Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three distinct habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a,

NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

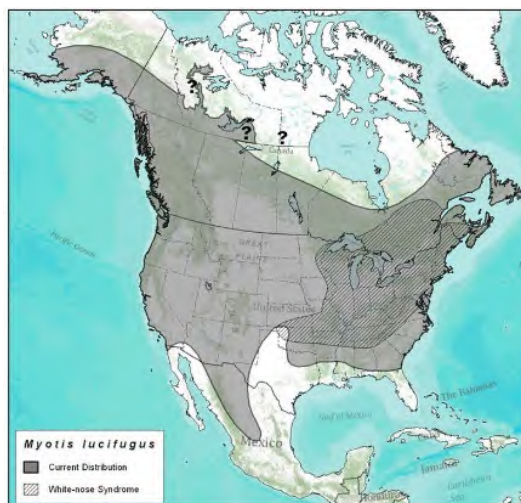
## 2.3 Bats

### 2.3.1 Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).



Source: COSEWIC (2013a).

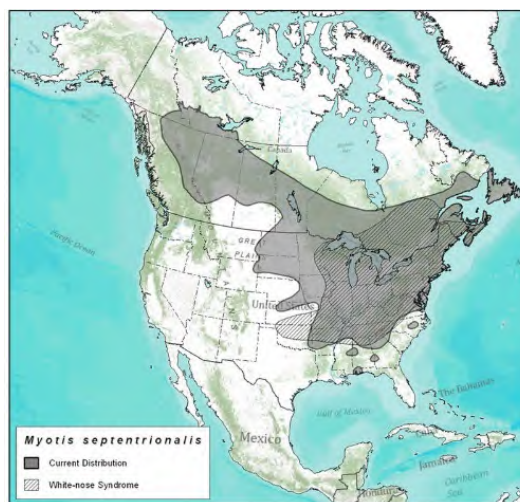


The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease that causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

### 2.3.2 Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).



Source: COSEWIC (2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has

been identified as the main threat for northern myotis populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a)

## 2.4 Avian Species

### 2.4.1 Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making



Source: COSEWIC (2013b).

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

## 2.4.2 Barn Swallow

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).

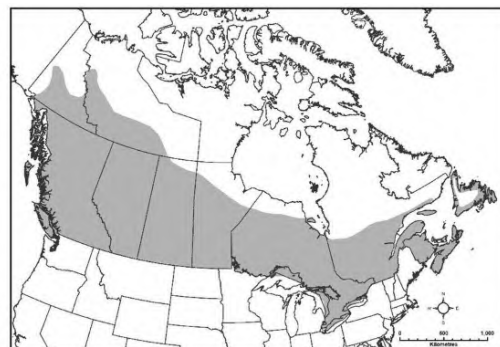
Historically, suitable nesting sites were likely provided by caves, cliff faces, rock ledges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021).

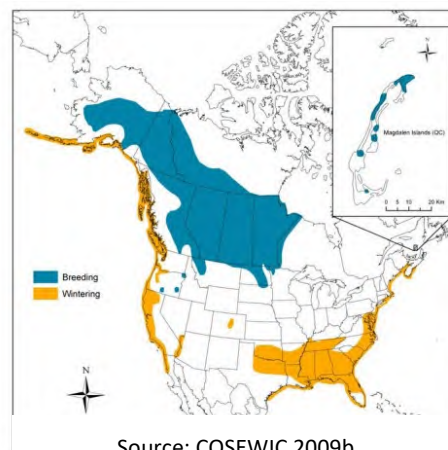
## 2.4.3 Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation,



Source: COSEWIC (2021).



Source: COSEWIC 2009b



anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

### 3 Mitigation Measures

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The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

#### 3.1 Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;

- controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.
- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
  - The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
  - Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
  - Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
  - A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
  - Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
  - Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
  - Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
  - The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.
  - All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

## 3.2 General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**.

### 3.2.1 Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.

### 3.2.2 Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- **Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.**

### 3.2.3 Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

### 3.2.4 Wildlife Deterrence and Prevention of Wildlife Entrapment

- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**
- **Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.**
- **Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).**
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- **Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.**

- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

### 3.2.5 Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- **Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.**
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

### 3.2.6 Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- **Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.**
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interact.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.

- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

### 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**. These will be added to the final EIS.

#### 3.3.1 Arthropod Species

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.



- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species.**

### 3.3.2 Amphibian Species

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).**
- **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.**
- **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.**

### 3.3.3 Bat Species

- Vegetation clearing activities will occur outside of roosting periods, when practical.
- **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**
- **In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.**

- Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

### 3.3.4 Avian Species

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.
- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.

## 4 Residual and Cumulative Effects Summary

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The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 4.1. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 4.2.

**Table 4.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk**

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
<b>Terrestrial Environment</b>	Nine-spotted lady beetle Transverse lady beetle Yellow-banded bumble bee	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>Waste management (composting, domestic and industrial landfill operation, recycling).</li> <li>Water management (including treatment).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on these species, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the arthropod SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to groundwater and/or surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			

<sup>1</sup> Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Site water management, treatment, and release</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<p>roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</p> <ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>		
			<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on arthropod species.</b></li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the arthropod SAR to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials</li> </ul>	Operation	<ul style="list-style-type: none"> <li>• <b>Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>Reclamation of disturbed areas).</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li>• <b>Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li>• <b>Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.</b></li> </ul>		



Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<ul style="list-style-type: none"> <li>Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.</li> </ul>		
Terrestrial Environment	Little brown myotis Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>Vegetation clearing activities will occur outside of roosting periods, when practical.</b></li> <li><b>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).</b></li> <li><b>In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat</b></li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bat species within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> </ul>	Construction		Change in mortality: predicted to be low	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		attributable to the Project.	<ul style="list-style-type: none"> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>		<p><b>exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.</b></p> <ul style="list-style-type: none"> <li><b>Locations of these site-specific habitat features used by bats will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li><b>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</b></li> </ul>	magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of the bat species to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
<b>Terrestrial Environment</b>	Bank Swallow Barn Swallow Common Nighthawk Horned Grebe Olive-sided Flycatcher Rusty Blackbird	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to</li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the avian SAR within the Terrestrial RSA to the

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
	Short-eared Owl Yellow Rail		<ul style="list-style-type: none"> <li>Air transportation for workers.</li> </ul>		<p>August 31; however, the dates differ for certain species.</p> <ul style="list-style-type: none"> <li><b>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.</b></li> <li><b>Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance</b></li> </ul>		point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the avian SAR to the point where they are not sustainable or available to
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"> <li>Air transportation for workers.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<p>and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</p> <ul style="list-style-type: none"> <li>Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li> <li>Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been previously described in Section 3.2.4 of the EIS.</li> <li>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible</li> </ul>		contribute to ecological functions.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<div>barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces</div> <ul style="list-style-type: none"><li>Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.</li></ul>		

**Table 4.2**      **Summary of Significance of the Cumulative Effects on Wildlife Species At Risk**

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	<ul style="list-style-type: none"> <li>Nine-spotted lady beetle</li> <li>Transverse lady beetle</li> <li>Yellow-banded bumble bee</li> <li>Northern leopard frog</li> <li>Little brown myotis</li> <li>Northern myotis</li> <li>Bank Swallow</li> <li>Barn Swallow</li> </ul>	Alteration and/or loss of habitat.	<b>Not significant:</b> The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
		<ul style="list-style-type: none"> <li>Common Nighthawk</li> <li>Horned Grebe</li> <li>Olive-sided Flycatcher</li> <li>Rusty Blackbird</li> <li>Short-eared Owl</li> <li>Yellow Rail</li> </ul>	Change in mortality.	<b>Not significant:</b> The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.

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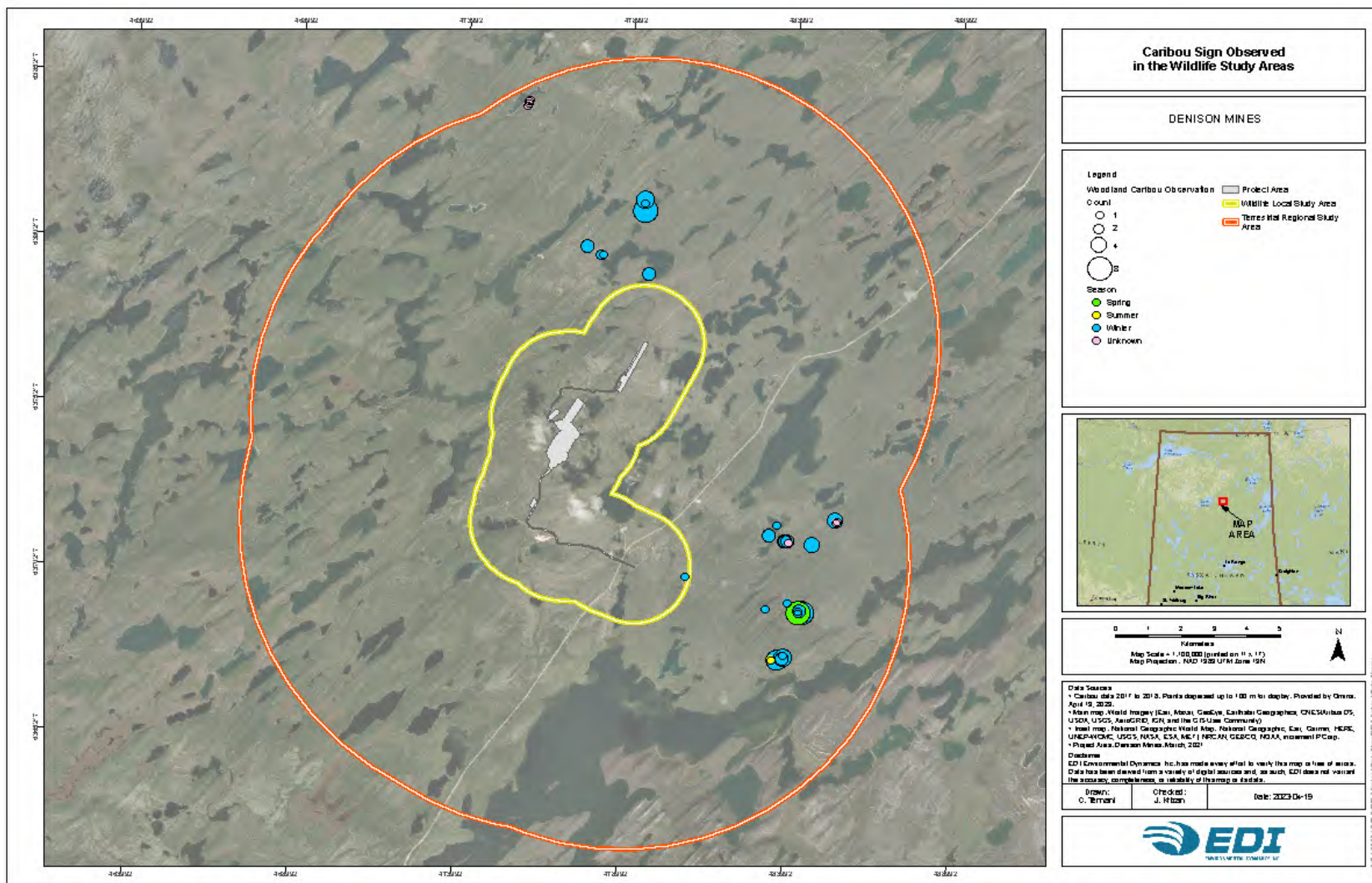


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## Attachment: IR-143

Number	IR-143
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Baseline Studies
Context and Rationale	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>
Information Requirement	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"> <li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li> <li>• Description of seasonal use of the LSA, RSA and caribou range.</li> <li>• Description of Project areas used by caribou.</li> <li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li> </ul> <p>Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).</p> <p>See also related: IR-152.</p>

Supporting figure to the response provided in table: revised Figure 9.3-8



Attachment IR-143 Figure 9.3-8 Caribou Sign Observations in the Wildlife Study Areas (updated)

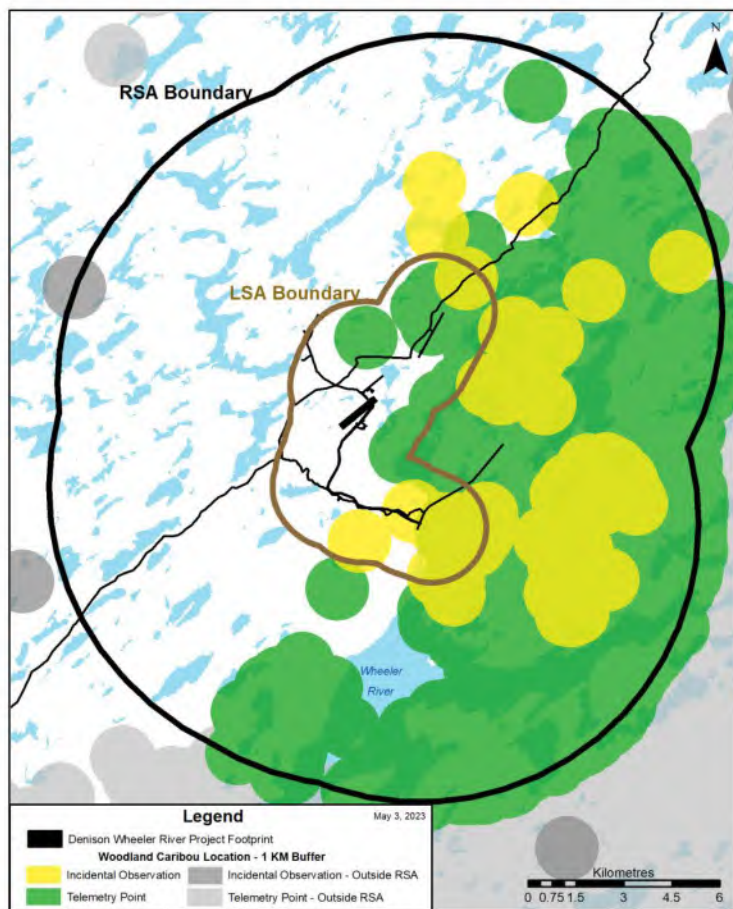
## Attachment: IR-145

Number	IR-145
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Woodland Caribou
Context and Rationale	<p>Context and Rationale: The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).</p> <p>The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.</p> <p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>

Information Requirement	<p>1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada:</p> <ul style="list-style-type: none"><li>• information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>• a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,</li><li>• mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul> <p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p>
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Supporting figure to the response provided in table:

**Denison-Wheeler Study Area - Woodland Caribou Location Data**



RSA Boundary		
<u>Data Type</u>	<u>Years</u>	<u>Number of Locations</u>
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
<u>Data Type</u>	<u>Years</u>	<u>Number of Locations</u>
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.



## Attachment: IR-149

Number	IR-149
Dept.	ECCC CNSC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures
Context and Rationale	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>
Information Requirement	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical</p>



	<p>habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"> <li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li> <li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li> <li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li> <li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li> <li>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</li> <li>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</li> </ol> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>
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Response:

Conceptual Caribou Mitigation Plan is included below.

A circular frame containing a scenic landscape. In the foreground, there are tall, dark green evergreen trees. Behind them is a calm blue lake. In the middle ground, there is a strip of yellowish-brown reeds or grasses. The background is a dense forest of green trees, with a range of mountains visible in the distance under a clear blue sky.

 Denison Mines

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AND PASSION**

# Denison Mines Corp.

## Conceptual Caribou Mitigation Plan

**Version 1**

**June 2023**

### Revision History

Version	Date	Description of Revision
1	June 30, 2023	Conceptual plan to support provincial and federal review of the draft environmental impact statement

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## Acronyms and Abbreviations

Term	Definition
Anthropogenic	Caused or produced by humans
BSCs	biological soil crusts
Boreal Caribou	The boreal ecotype of woodland caribou occurs within the boreal forest of Canada. These non-migratory caribou form small aggregations throughout the year and disperse for solitary calving.
Committee on the Status of Endangered Wildlife in Canada (COSEWIC)	A committee made up of experts from academic, government and non-government organizations that assess the conservation status of wildlife species that may be at risk of extinction in Canada.
Critical Habitat	The habitat that is necessary for the survival of a listed wildlife species and is identified as the species critical habitat in the recovery strategy or action plans for the species.
DERT Project	Developing Eco-Restoration Together Project
Disturbed habitat (per ECCC 2020)	Habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer).
ECCC	Environment and Climate Change Canada
EA	environmental assessment
EIS	environmental impact statement
EMS	environmental management system
ENV	Saskatchewan Ministry of Environment
ha	hectare
Local Populations (ECCC 2020)	Group of boreal caribou occupying a defined area distinguished spatially from areas occupied by other groups of boreal caribou. Local population dynamics are driven primarily by local factors affecting birth and death rates, rather than immigration or emigration among groups. In this recovery strategy, “local population” refers to a group of boreal caribou occupying any of the three types of boreal caribou ranges (i.e., conservation unit, improved conservation unit, local population unit).



Plan	Conceptual Caribou Mitigation Plan
Project	Wheeler River Project
Range (per ECCC 2020)	<p>The geographic area occupied by a group of individuals that are subject to similar factors affecting their demography and used to satisfy their life history processes (e.g., calving, rutting, wintering) over a defined time frame.</p> <p>Environment and Climate Change Canada (2011) identified three types of boreal caribou ranges categorized based on the degree of certainty in the delineated range boundaries (i.e., conservation unit, improved conservation unit, local population unit).</p>
Recovery strategy	A planning document that identifies what needs to be done to stop or reverse the decline of a species.
SARA	Species at Risk Act
Self-sustaining local population (ECCC 2020)	A local population of boreal caribou that on average demonstrates stable or positive population growth over the short-term ( $\leq 20$ years) and is large enough to withstand stochastic events and persist over the long-term ( $\geq 50$ years), without the need for ongoing active management intervention.
Threatened species	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Undisturbed habitat (per ECCC 2020)	Habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.



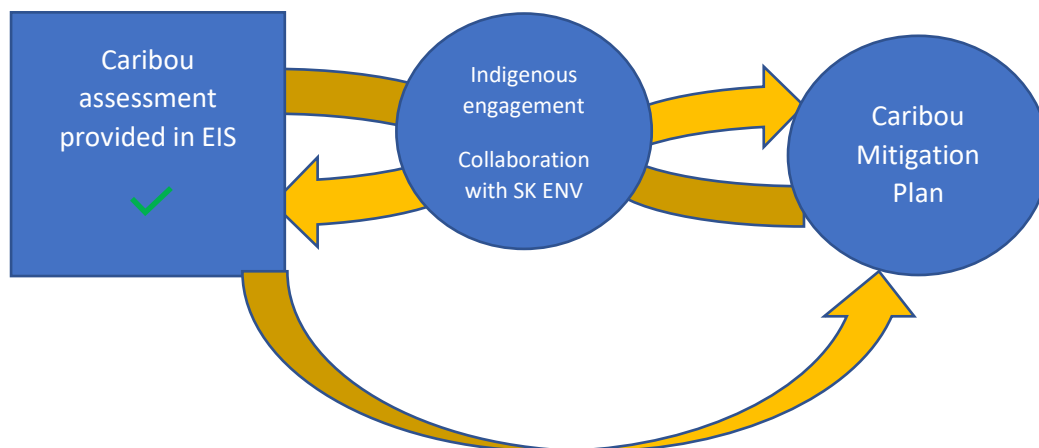
# 1 Introduction

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The Wheeler River Project (the Project) environmental impact statement (EIS) evaluates and assesses potential Project-related effects on the Boreal population of woodland caribou (*Rangifer tarandus caribou*; referred to herein as caribou or boreal caribou) following standard environmental assessment (EA) methodology. The assessment of potential effects considered both direct (i.e., habitat loss) and indirect effects (i.e., habitat alteration) on caribou and their habitat, while assuming that caribou were present year-round and during all of their life stages (i.e., calving, rearing, mating, over wintering). In this way, the EIS took a precautionary or conservative approach to understanding/addressing the likely residual effects (i.e., effects remaining after mitigation measures were considered) of the Project on caribou and their habitat and is using this approach as a planning tool to inform/support future Project-related regulatory approvals processes and follow-up monitoring. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.

This Conceptual Caribou Mitigation Plan (the Plan), developed proactively by Denison, has a different objective than the EIS. The Plan builds on the assessment of potential Project effects and commitments to mitigate such effects made in the EIS and is expected to be advanced with ongoing consultation with the Saskatchewan Ministry of Environment (ENV), as ENV finalize the caribou range plan for SK1. The EIS is a conservative planning tool, whereas the Plan is a practical, living document designed to define management works associated with caribou. The Plan is not a requirement for EA determination but is provided as a guidance document to help Denison proactively describe and inform the development and implementation of appropriate mitigation measures related to caribou and their habitat.

The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit, and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and regulators (e.g., ENV). As noted above, the boreal caribou range plan for SK-1 is under development and it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan is in part due to the absence of range plan priorities and reflects Denison's commitment to continue to work with the province to meet the management objectives and management strategies for the SK1 range.



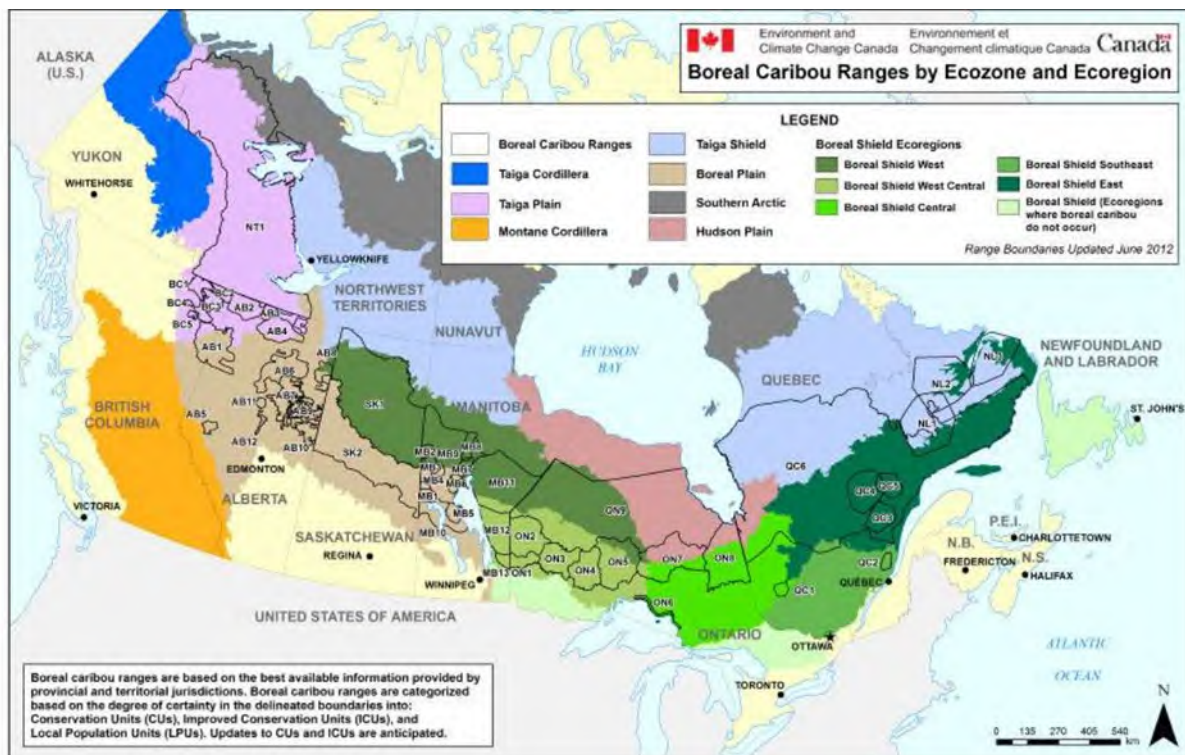
## 2 Guidance and Regulatory Framework

A brief review highlighting federal and provincial considerations of boreal caribou is provided below for reference.

### 2.1 Federal

Boreal caribou have been designated as *threatened* under the federal *Species at Risk Act* (SARA). Environment and Climate Change Canada (ECCC) released amended recovery strategy for woodland caribou in 2020 (ECCC 2020). A recovery strategy is a planning document that identifies what should be done to stop or reverse the decline of a species.

The Project is located in the Boreal Shield West ecoregion of the Boreal Shield ecozone. The Boreal Shield West ecoregion stretches from Alberta to Ontario (Figure 2-1).



**Figure 2-1: Boreal Caribou Distribution Across Ecozones and Ecoregions in Canada (source: ECCC 2020)**

The SK1 range comprises more than 18,000,000 hectares (ha) and is characterized by high fire disturbance and low anthropogenic disturbance (ECCC 2020). The likelihood of caribou self-sustainability in the boreal shield range in SK1 is “likely” (ECCC 2020). For SK1, the amended recovery strategy (ECCC 2020) identifies 40% undisturbed habitat in the range as the disturbance management threshold, which provides a measurable probability (71%) for the local population to be self-sustaining. This threshold is considered a minimum threshold because at 40% undisturbed habitat there remains a risk (29%) that the SK1 local population cannot be self-sustaining. Disturbed habitat (ECCC 2020) is habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the

anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Undisturbed habitat (ECCC 2020) is habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.

Studies (e.g., McLoughlin et al. 2019) indicate that the SK1 local caribou population is likely self-sustaining at current levels of disturbance (60% total disturbance), with a 71% probability of persistence. Environment and Climate Change Canada's analyses also indicate that the SK1 local population is sensitive to small increases anthropogenic disturbance and sensitive to small decreases in adult survival. For these reasons, a higher probability of persistence was selected for critical habitat identification in SK1 (71%) than was selected for the other 50 ranges across Canada (60%) (ECCC 2019).

The precise location of the 40% undisturbed habitat within the range is expected to vary over time. The habitat within the SK1 range should exist in an appropriate spatial configuration such that boreal caribou can move throughout the range and access required habitat when needed. The key to this habitat delineation is achieving and maintaining an overall, ongoing range condition that allows for the dynamic habitat supply system, containing the biophysical attributes upon which caribou depend, to remain sustainable. It is this dynamic habitat supply system within the SK1 range that is the habitat condition considered to be necessary for the caribou.

## 2.2 Provincial

The responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels.

The Saskatchewan Conservation Data Centre (SK-CDC) is responsible for evaluating and assigning a conservation rank to each taxon, resident or transient, found in the province. Woodland caribou's subnational or S-rank conservation rank is S3. This ranking indicates that, provincially, the species is vulnerable/rare to uncommon which is associated with a moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors. Currently, the caribou population in SK-1 is stable (ENV 2023) and the range plan is under development. Engagement is a key component of the range plan process and will be completed with representatives from First Nation, Métis, industry, non-governmental organizations, and communities.

The provincial goal is to sustain and enhance woodland caribou populations, and maintain the ecosystems they require, throughout their current range (ENV 2013). Through the woodland caribou range assessment and range planning program, the province is:

- Gaining a better understanding of woodland caribou ecology;
- Working toward meeting objectives identified in provincial and federal strategies; and
- Improving how the province manages the species and related habitat.

The province's woodland caribou range assessment and range planning program incorporates two key components:

- Woodland caribou range assessment, which enhances the understanding of woodland caribou populations and their interactions with the environment; and
- Woodland caribou range planning, which provides a framework, strategies and objectives that allow for better decisions involving habitat management and self-sustaining caribou populations.

Although the management objectives and management strategies for caribou in SK1 are not yet defined, Denison is committed to working with ENV as the range plan is developed. The Plan will be updated as the Project advances so that it aligns with the conservation objectives as determined by the province as the primary steward of caribou in the province.

## 3 SK 1 Caribou Population – Background Information

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Background information concerning the condition of the SK 1 caribou population is provided below.

### 3.1 Population Trends

The SK1 Boreal Shield management unit contains high-quality conifer-dominated caribou habitat with greater than 40-year-old stands of jack pine and black spruce forests suitable for lichen colonization, black spruce swamps, and open muskegs supporting relatively high densities of caribou, at 36.9 caribou/1,000 km<sup>2</sup> or approximately 4,000 caribou across the SK1 Boreal Shield Woodland Caribou Management Unit (McLoughlin et al. 2019).

Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens. If the quantity of available lichen forage is low, caribou can exist without relying entirely on lichens (McLoughlin et al. 2019). Due to their physiology, lichens are resilient to periods of drought and cold temperatures, but because of their slow growth rate, exhibit a slow recovery time after depletion and fire events. In the SK1 range, McLoughlin et al. (2019) found that stand types with the highest potential for adequate lichen biomass for caribou are jack pine and poorly drained black spruce sites.

McLoughlin et al. (2019) observed that, from 2014 to 2018, the caribou population exhibited a high average adult female survival rate and moderate recruitment (0.192 calves per cow in March), ranging from a low of 0.134 calves/cow in March 2016 to 0.244 calves/cow in March 2018. These demographic parameters led the authors to assess the SK1 Boreal Shield caribou population as being stable at the time of their study (McLoughlin et al. 2019).

While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).

Neufeld et al. (2021) summarized results from aerial surveys over a period of eight years in an 87,193 km<sup>2</sup> study area in the Athabasca Plain and Churchill River Upland ecoregions in the north, that are inclusive of the Terrestrial RSAs that were used in the EIS. During 11 of 16 aerial caribou surveys conducted between 2008 and 2015, woodland caribou were detected in the surveyed areas. The average density of the 16 surveys was estimated at 36.9 caribou/1,000 km<sup>2</sup> (95% CI = 26.7 to 47.2 caribou/1,000 km<sup>2</sup>). Across the Neufeld et al. (2021) study area and all years, estimated caribou densities were higher in comparison to averages reported for most other boreal woodland caribou ranges in Canada (i.e., caribou density reported in other areas ranged 4.3 to 18.7/1,000 km<sup>2</sup>) indicating that caribou can tolerate natural disturbance. One exception to the relatively high caribou densities in northern Saskatchewan was noted: the 2,285 km aerial the Millennium Project in March 2014, 10 km west of the Terrestrial RSA, resulted in lower woodland caribou densities at 5 caribou/1,000 km<sup>2</sup> (Neufeld et al. 2021).

Eight of the sixteen caribou surveys reported the ratios of male to female and calf to female in their results with the average male:female ratio calculated at 0.571 (95% CI = 0.444 to 0.699) and calf:female at 0.195 (0.158 to 0.232). Again, the 2014 Millennium survey reported a different male:female ratio, outside the reported range (1.6), concurring with the reported low caribou densities.

## 3.2 Predation

In addition to relatively low predator densities in their study area, McLoughlin et al. (2019) found some spatial separation between caribou and wolves. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>) (McLoughlin et al. 2019).

McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season and only 1 of 94 collared caribou was harvested by a hunter during the four years of the study.

While predation is believed to be a key limiting factor for woodland caribou (Bergerud 1974; Stuart-Smith et al. 1997, DeMars et al. 2011 from ECCC 2020), Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat- or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.

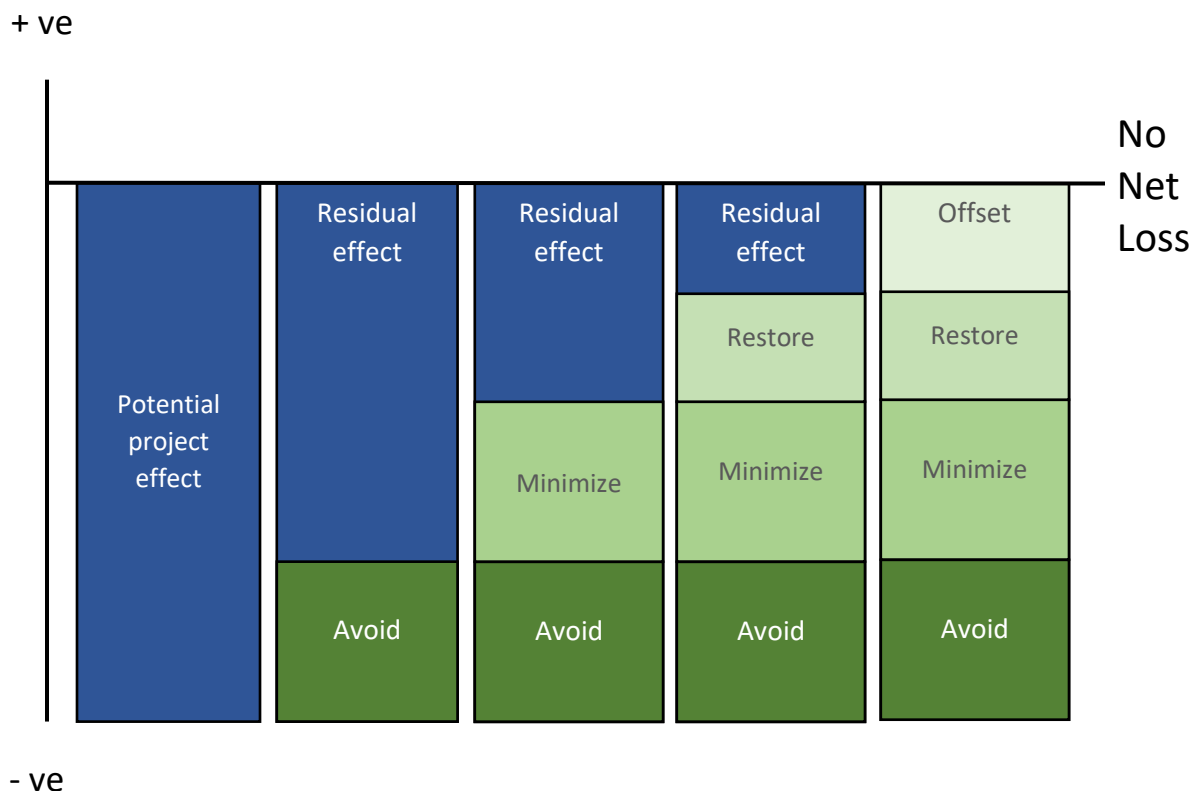
## 3.3 Harvest

Indigenous peoples in Saskatchewan have an inherent right to harvest woodland caribou for subsistence purposes (ENV 2013). No other harvest of woodland caribou is currently permitted. Under provincial and federal recovery planning and effective species management, self-sustaining caribou populations will support long-term subsistence use of the species and protect treaty rights. Subsistence harvest levels are assumed to be low but actual numbers are not available because most communities or Indigenous groups are not collecting and/or publishing this information.

## 4 No Net Loss and Mitigation Hierarchy

A generic biodiversity mitigation hierarchy (OECD 2016) to achieve no net loss is provided in Figure 4-1. As shown in the hierarchy, an offset can be used to achieve no net loss if residual effects remain following efforts to avoid, minimize, and restore potential project effects. This generic hierarchy is generally consistent with the approach of ENV to manage effects on caribou and their habitat.

The balance of Section 4 of this Plan outlines Denison's approach to avoid, minimize, and restore caribou habitat per commitments made in the draft EIS associated with the Wheeler River Project.



**Figure 4-1: Generic No Net Loss and Mitigation Hierarchy (modified from OECD 2016)**

### 4.1 Avoid

Potential adverse effects on the caribou have been avoided to the extent possible through Project design, including:

- Selection of in-situ recovery (ISR) mining avoids some direct and indirect effects compared to conventional underground or open-pit mining methods. ISR mining avoids the need for spatially expansive infrastructure such as waste rock piles and tailings management facilities reducing the Project footprint (i.e., avoids direct effects on caribou and their habitat). ISR mining also reduces the potential for interactions between caribou and Project components / activities as it concerns sensory disturbance as it is inherently a less intensive form of mining with reduced noise/light/vibration generation (i.e., avoids indirect effects on caribou and their habitat).



- Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for caribou (for example, outside of wintering/calving period from April 1-July 31, per ENV 2013), where practical, to avoid disturbance during sensitive time periods.
- Pre-disturbance wildlife surveys will be completed to identify caribou presence and work will be postponed if caribou are present.

## **4.2 Minimize**

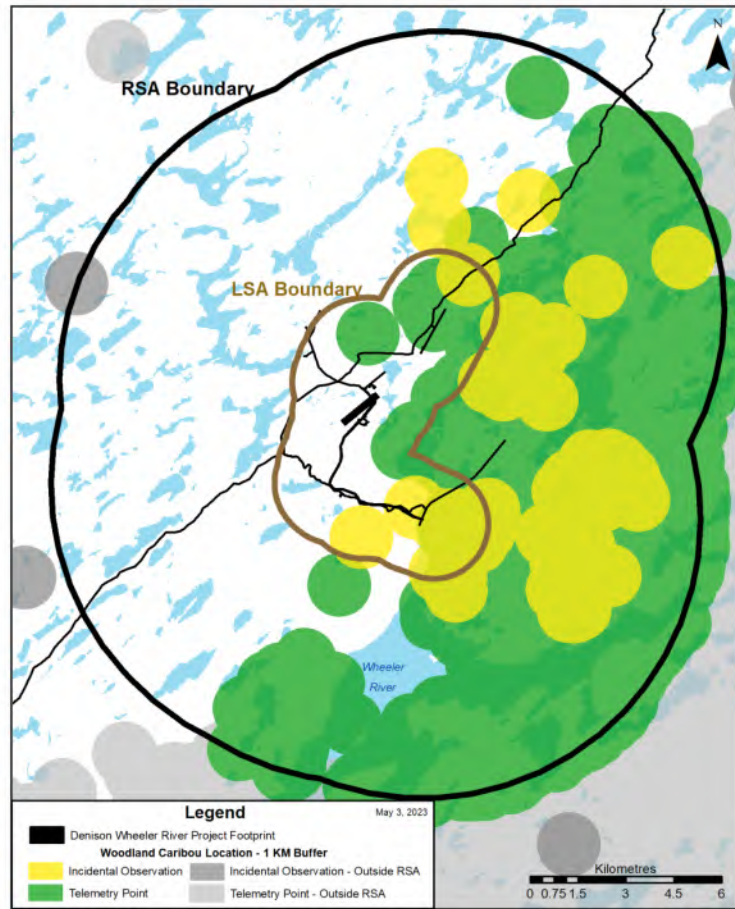
Additional mitigation measures to minimize effects on caribou and their habitat and tailored to Project features have been incorporated into the various Project management and monitoring plans within the Environmental Management System (EMS) including but limited to erosion and sediment controls, soil and vegetation monitoring, Decommissioning Plan, air quality monitoring, fuel spill control and response, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.

The Project's EMS plans provide direction on monitoring and adaptive management so that issues are identified and mitigation measures are developed and implemented in a timely and effective manner. Mitigation measures specific to caribou are applicable during all Project phases, within all seasons and expected to be effective following appropriate implementation. Examples of the measures to minimize Project effects on wildlife in general, and caribou in particular, are highlighted below.

### **4.2.1 Disturbance Footprint**

- Siting Project components in close proximity to the ISR mining area minimizes indirect effects on caribou and their habitat. The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area. . Appropriate siting is anticipated to minimize the potential for interactions with woodland caribou and Project activities.
- The Project footprint (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable, resulting in limited/minimal habitat loss/disturbance and noise propagation.
- Portions of the proposed Project footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.

# Denison-Wheeler Study Area - Woodland Caribou Location Data



RSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.

**Figure 4-2 Saskatchewan Ministry of Environment Woodland Caribou Location Data Provided to Denison**

#### **4.2.2 Wildlife and Habitat Protection**

- Project activities have been assessed for their potential to disturb or remove wildlife and/or wildlife habitat (e.g., site clearing, soil disturbance) to determine potential effects on wildlife and wildlife habitat and the assessment, including proposed mitigation measures, for the Project will guide Project activities.
- Pre-disturbance wildlife clearance surveys will be conducted within the Project Area; results of the clearance surveys will inform the development and implementation of appropriate mitigation (e.g., delay of work) to address the identified issue (e.g., presence of caribou).
- Personal firearms for employees and contractors will be prohibited within the Project Area to prevent hunting activities.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing wildlife species within the Project Area.
- To support wildlife habitat regeneration, progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Decommissioning Plan.

#### **4.2.3 Wildlife Deterrence and Prevention of Wildlife Entrapment**

- In addition to installing secure fencing around all contaminated areas to prevent accidental contaminant exposure, buildings and other Project components will be designed and maintained to exclude wildlife from using buildings for refuge or shelter, and to deter wildlife from potentially becoming entrapped.

#### **4.2.4 Sensory Disturbance**

- Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife, especially during sensitive time periods, such as calving. This would include:
  - locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;
  - directing the generator discharge openings away from sensitive locations; and
  - making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings).
- The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. Low sound emission equipment and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities. There will be regular maintenance of equipment to ensure it is in proper working order and not emitting noise unduly.

- Lighting will be focused on work sites and not surrounding areas, to minimize light trespass and other light-related pollution sources.
- Facilities will be illuminated only to meet standards set for the protection of workers to avoid over-illumination.
- Battery-powered, light vehicles and mobile equipment, and an AC powered dual rotary drill will be used for ISR wellfield development instead of a traditional diesel-powered unit, where practical, to reduce air emissions and noise levels and improve energy efficiency.
- Fugitive dust sources that could lead to deposition of dust on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - dust suppression techniques on site roadways, such as road watering and traffic management;
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;
  - making a wash bay available to clean items, equipment, and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge; and,
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area.

#### **4.2.5 Road and Traffic Management**

- Traffic and access control measures will be implemented, including managing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic) to the Project site and roads with both north and south security access gates. It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it was safe to do so given Project activities in the area.
- Appropriate road signage will be installed (e.g., speed limits, identification of wildlife crossings and areas of high activity) along Project roads to minimize the risk of wildlife-vehicle collisions.
- Speed limits will be implemented to reduce the risk of wildlife-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage caribou to move off Project roads and processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow caribou to move away or off the road before resuming normal road speeds for the area.

- Road watering and regular road maintenance to limit dust dispersion.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be promptly reported to ENV and disposed of as directed to prevent scavenging.
- Vegetation along Project roads will be managed to reduce attractiveness to wildlife (e.g., forage plants) and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable, to limit the use of specialty chemicals and potential exposure of wildlife including caribou to them.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate caribou crossing and escape and, with that, reducing their risk of vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water as roadside pools may attract caribou.

#### **4.2.6 Water Management, Waste Management, Emissions, and Hazardous Materials Management**

- Education on and enforcement of proper water, waste, emissions and hazardous materials management practices will be provided to employees and contractors.
- A freeze wall will be established around the uranium deposit to reduce potential for groundwater disturbance or contamination mitigating the likelihood of exposure of caribou to contaminants in local areas of groundwater discharge to surface.
- The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit, reducing water use requirements to the extent feasible. Make-up water will be preferentially sourced from site runoff (instead of freshwater) where possible.
- Contaminated wastes (e.g., mineralized drill cuttings, process precipitates) will be temporarily stored on double lined pads with leak detection capabilities and an associated monitoring program until final disposal at an approved facility. An adjacent pond will be used to collect contact water from these pads.
- All contact water will be routed to the Industrial Wastewater Treatment Plant for treatment and eventual release to the environment. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits. This will mitigate exposure of caribou to Project-related contaminants released to the environment.

- Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations to mitigate the likelihood of the release of such chemicals to the environment that could result in exposure of caribou to the chemicals.
- Double-walled high-density polyethylene (HDPE) or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement to mitigate the likelihood of the piping failure and the associated release of wellfield chemicals to the environment that could result in exposure of caribou to the chemicals.
- Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the domestic landfill generating odours and thereby minimizing wildlife attractants.
- Domestic waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting wildlife and reduce the risk for human-wildlife interactions. The wildlife-proof containers will be inspected regularly for evidence of wildlife presence or access to waste disposal facilities. If evidence of wildlife presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal/incineration frequencies will be increased.
- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- Air emissions will be reduced to the extent practical through implementation of the development of air emissions management and monitoring plans within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited to reduce emissions.
- The use of hazardous materials will be limited as much as possible.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines to minimize the risk of accidental spills or leakage. This will mitigate the likelihood of release to the environment that could result in exposure of caribou to the hazardous materials.
- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance to avoid attracting wildlife (e.g., wildlife-proof containers, exclusion fencing) to mitigate the likelihood of exposure of caribou to hazardous materials.
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use / interaction. The deterrents will be monitored and maintained .
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan to mitigate the likelihood of

the release of hazardous material to the environment that could result in exposure of caribou to the material.

- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan. This will mitigate the likelihood of a fuel spill to water that could result in exposure of caribou to fuel.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials and mitigate the likelihood of exposure of caribou to such chemicals.
- All vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.

#### **4.2.7 Wildlife Education**

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential caribou issues on site and training on the mitigation measures summarized with the EMS and specifically in this Plan to avoid or minimize potential Project effects on caribou and caribou habitat.
- Employees and contractors will be educated on waste and hazardous waste management practices / policies that limit human-wildlife interactions and the potential exposure of wildlife to those wastes.
- Designated employees will be trained in appropriate wildlife deterrent techniques to minimize wildlife interactions with the Project.
- Employees and contractors will be requested to report wildlife observations, including prompt reporting of caribou observations and immediate communication to on-site staff. Wildlife encounters and outcomes will be monitored, and logbooks will be used to record wildlife observations. Logbooks and reports will be available to employees. Incidental observations recorded by staff will be entered into Species Detection Loadforms and submitted to the Saskatchewan Conservation Data Centre annually.

### **4.3 Restore**

The temporal bounds for the Project as stated in the EIS are years 1 to 3 for construction, years 3 to 18 for operation, years 18 to 23 for decommissioning, and fifteen years of post-decommissioning monitoring and inspections from years 23 to 38. Importantly, during physical decommissioning the majority of Project components are scheduled to be removed from site which is expected to facilitate restoration activities. Also, because of the selected ISR mining method, there are no large, permanent Project components, such as waste rock piles or tailings management facilities, for which large scale and potentially complex restoration strategies are needed.



Denison's decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure. The Project's Conceptual Decommissioning Plan (CDP) is included in the draft EIS. The details of decommissioning and restoration will be refined over time as the Project proceeds. A Preliminary Decommissioning Plan (PDP) will be developed by Denison to support licensing and permitting applications. Prior to executing decommissioning activities, Denison will prepare and submit a Detailed Decommissioning Plan (DDP) to regulators for their review and acceptance, which builds on the PDP.

The CDP outlines plans for physical decommissioning (mining area remediation; asset removal; and decontamination, demolition, and disposal), followed by restoration. A summary of the CDP is provided here.

- Ongoing decommissioning of Project components will be completed when possible.
- Denison has committed to progressively restore areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Restoration of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed regularly at a schedule commensurate with the expectations of the activities per the decommissioning plan. Progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native species and in accordance with the decommissioning plan.
- Once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled, restoration activities, including planting, will take place. Currently this would largely be with jack pine seedlings, but the mix of plants will depend on location and available species. Restoration activities monitored until it is deemed self-sustaining and viable wildlife habitat.
- Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on results of these discussions, transportation corridors including roads or trails associated with the Project site that are no longer needed will be graded, scarified, and vegetated with native, self-sustaining species as required. Access to facilitate safe post-closure monitoring or requested by appropriate Interested Parties (e.g., to facilitate land use) may be left in place. Access to the site may be restricted by gates and/or berms.
- Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during restoration.
- Lessons learned from progressive decommissioning and any site-specific restoration studies will be incorporated into the DDP. Additionally, information from other northern Saskatchewan mine

sites will be examined to help Denison select the restoration tools, including revegetation options, that will contribute towards decommissioning success.

Closure of the entire Project will be completed in accordance with provincial and federal regulations and guidance documents with the fundamental considerations being to confirm physical and chemical stability of the site to protect human health and the environment.

Progressive decommissioning and restoration will be completed throughout the life of the Project, whenever feasible, and reported to the regulatory agencies as part of the annual reporting requirements throughout Operation. Associated activities will focus on the decontamination, demolition, and disposal of unused buildings and infrastructure, as well as the removal of unused equipment and machinery. Progressive decommissioning and restoration are expected to continue and result in positive effects as revegetation is continued and regeneration occurs. Following decommissioning and restoration, wildlife habitat is expected to recover to baseline conditions.

## 5 Habitat Loss Calculation

### 5.1 Habitat Loss in Context of the Disturbance Management Threshold for SK1

To support the Plan with respect to the calculation of habitat loss, a mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020).

#### 5.1.1 Approach

First the Project infrastructure footprint area was delineated and estimated to be 80 ha. Next, a 500 m buffer was applied to the Project footprint, resulting in a total potential disturbance area of 1,350 ha. This is consistent with the approach for determining direct and indirect effects, as outlined in ECCC (2020).

Finally, an analysis was undertaken to quantify the amount of caribou habitat that is currently disturbed within the Project footprint + 500 m buffer. According to ECCC (2020), there are two contributors to disturbed habitat in SK1: 1. anthropogenic disturbance + 500 m buffer and 2. fire disturbance in the last 40 years, without a buffer. The two factors for disturbed habitat were considered as follows:

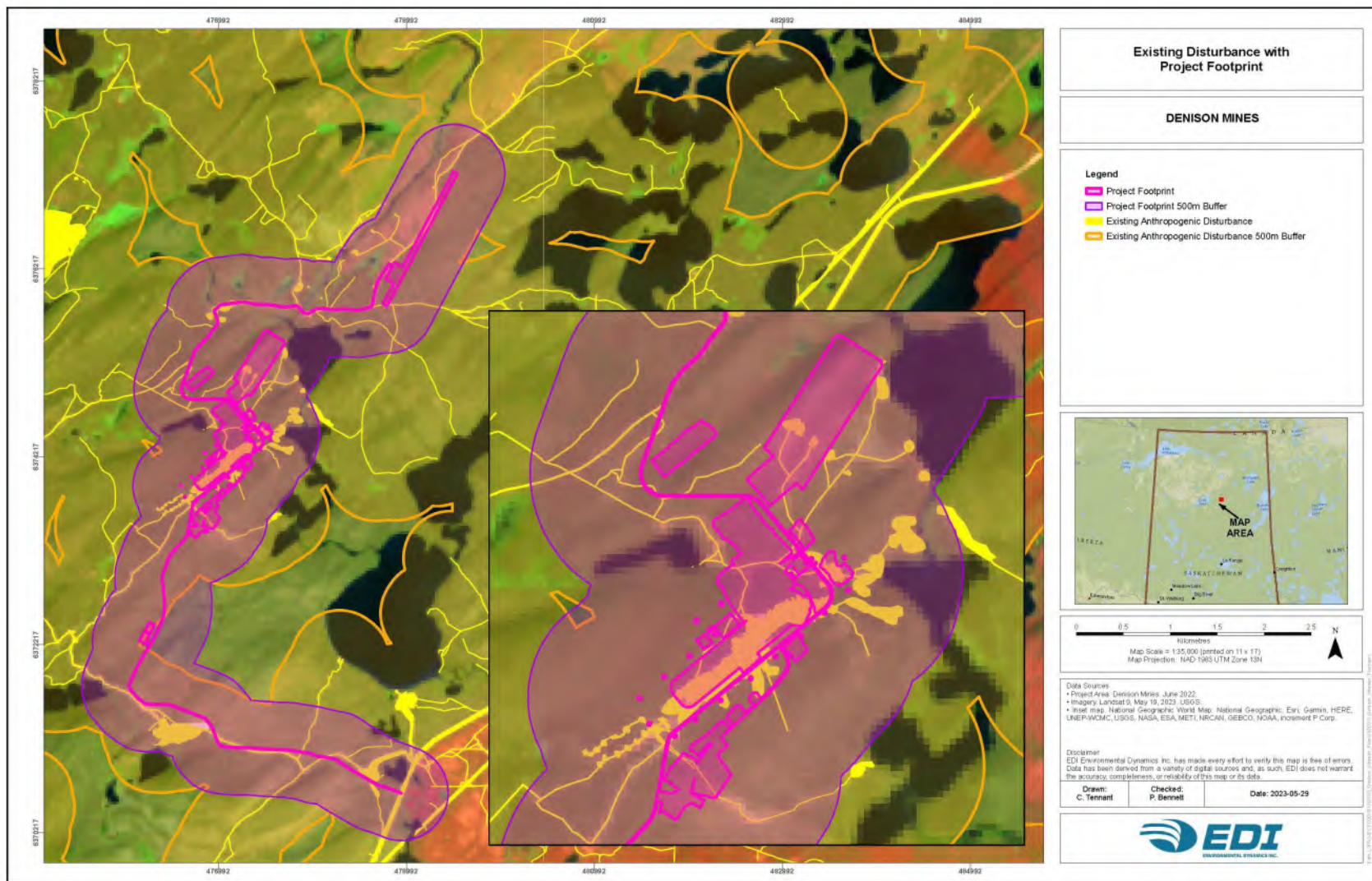
1. Existing anthropogenic disturbance + 500 m: For anthropogenic disturbance calculations to inform the Plan, mapping was completed and evaluated to determine the existing anthropogenic disturbance. Although the EIS considered anthropogenic disturbances on IKONOS imagery at the 1:5,000 scale, the mapping exercise to support habitat loss calculations in the Plan used anthropogenic disturbances visible on Landsat at the 1:50,000 scale, to be consistent with the definitions of disturbed habitat from the amended recovery strategy (ECCC 2020).
2. Fire disturbance in the last 40 years, without buffer: To determine ecosites that were in a regenerating phase or having experienced fire disturbance in the last 40 years, the ecosites BS3/BS7-Jack pine-blueberry/Black spruce-blueberry/lichen were used, based on previous ecosite classification work completed to support the EIS.

#### 5.1.2 Results

As shown in Table 5-1 and Figure 5-1, the proposed Project footprint + 500 m buffer is almost entirely located within existing, buffered anthropogenic disturbance. This means the Project footprint + 500 m buffer is located within already disturbed habitat, according to ECCC (2020). Additionally, the mapping exercise shows that approximately half of the Project footprint + 500 m buffer is located within regenerating forest, i.e., forest burned less than 40 years ago (Figure 5-2).

**Table 5-1: Existing Disturbed Habitat within Buffered Project Footprint**

Area within Project Footprint + 500 m buffer (1,350 ha)	
Existing anthropogenic disturbance (+ 500 m buffer)	1,298 ha
Regenerating forest (fire disturbance in the last 40 years; no buffer)	730 ha



**Figure 5-1: Proposed Project Footprint (+ 500 m buffer) with Existing Anthropogenic Disturbance (+ 500 m buffer) Visible on Landsat at 1:50,000**



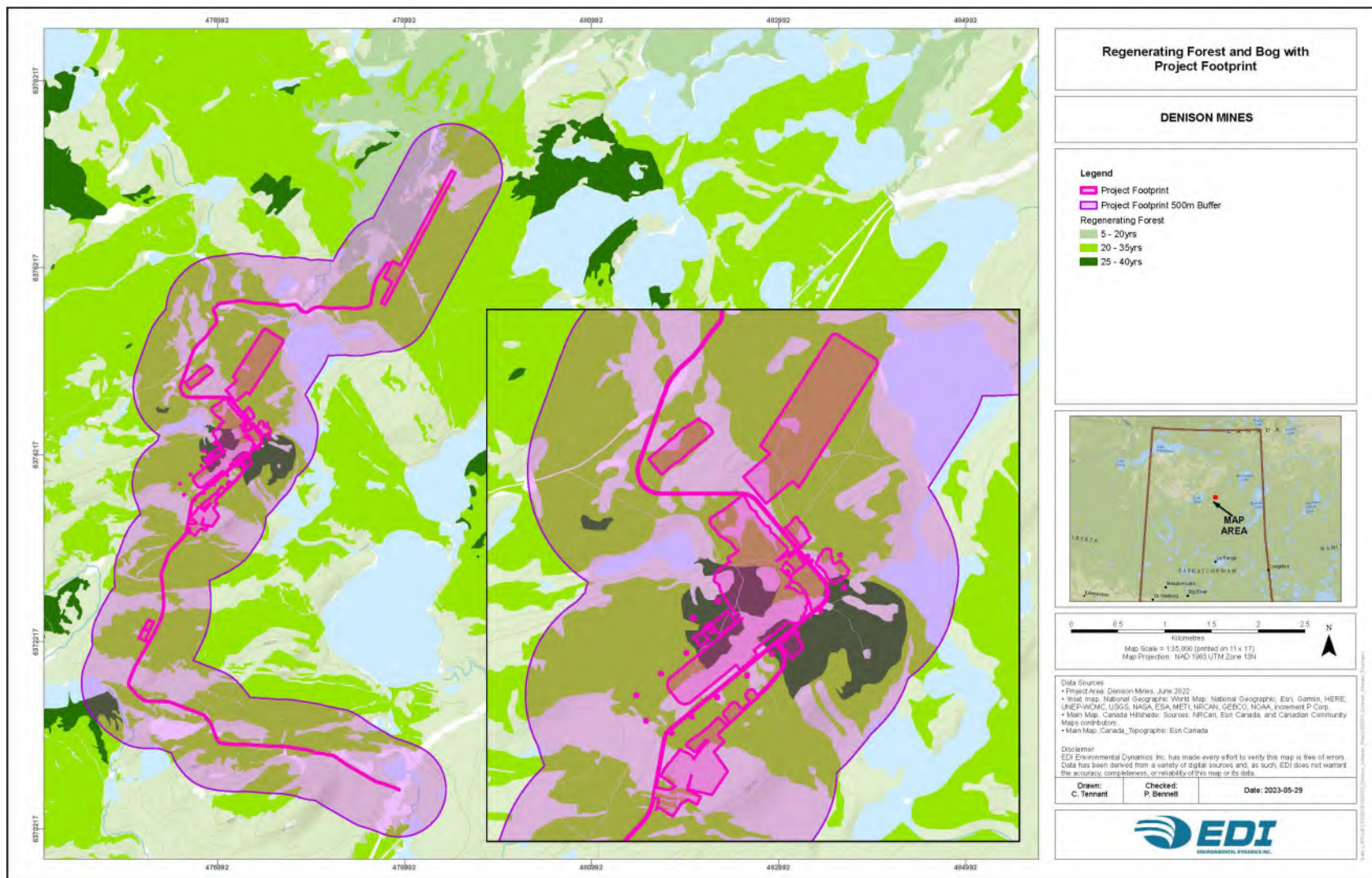


Figure 5-2: Proposed Project Footprint (+ 500 m buffer) with Regenerating Forest

Based on the above analysis using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.

Additionally, ECCC (2020) identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in the SK1 Boreal Shield range should not exceed 5% with the remainder (i.e., 55%) being attributed to natural disturbance (while maintaining a minimum of 40% undisturbed habitat in the range). ECCC (2020) calculated that approximately 58% of the SK1 Boreal Shield range is currently affected by past forest fires and 3% of the range is affected by anthropogenic disturbances. For additional context, the size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020). The Project footprint + 500 m buffer (1,350 ha) would represent an estimated Project-related disturbance of 0.007% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit.

## 5.2 Direct Loss Calculation

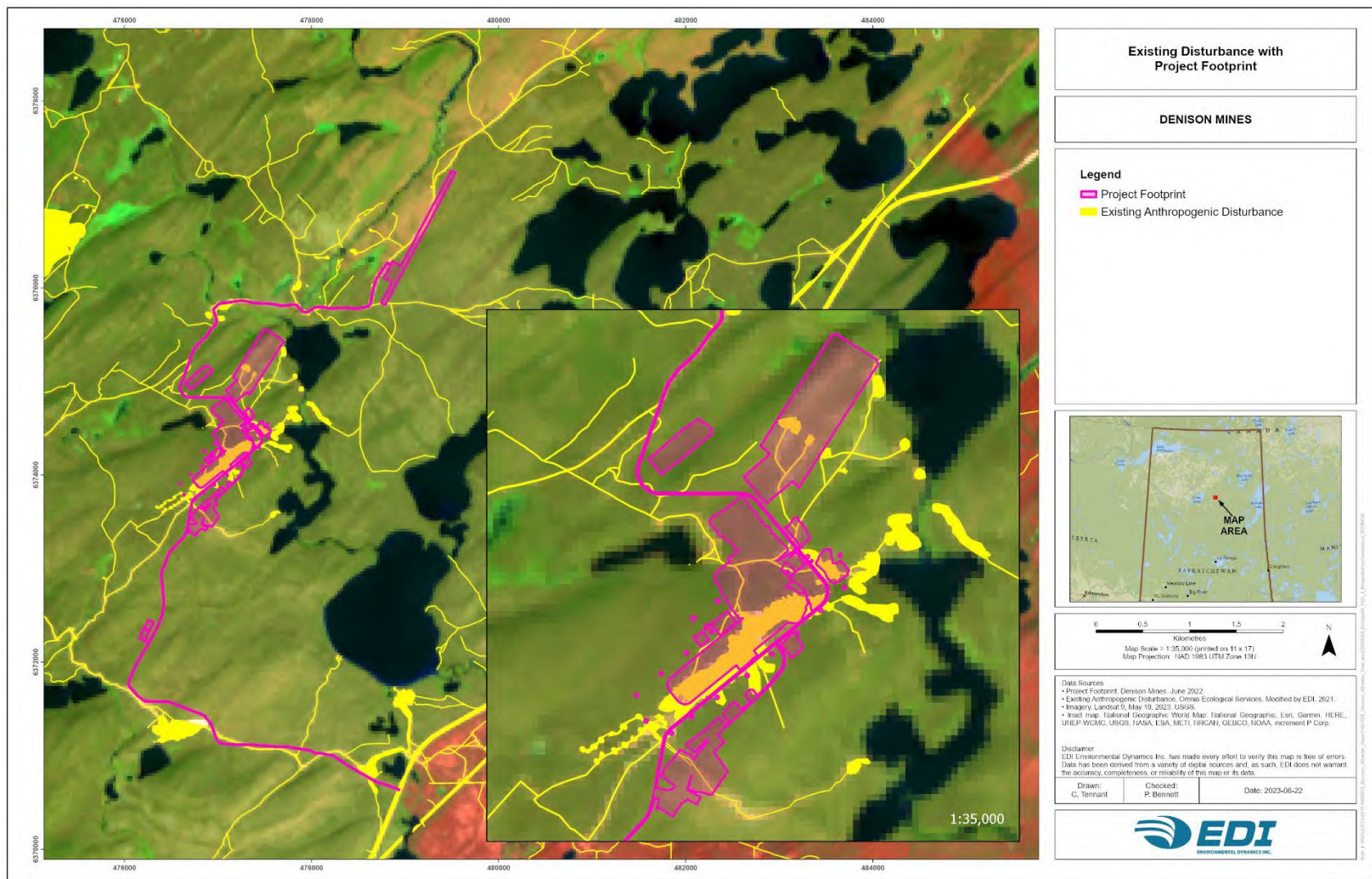
The Project infrastructure footprint has been delineated and the area was determined to be 80 ha. Of this area, 12 ha are comprised of previously disturbed land resulting from past activities (e.g., access, exploration camp and laydown areas). The remainder of the Project footprint is comprised of regenerating forest (forest less than 40 years old) habitat which is typically considered to be low quality habitat for caribou (Figure 5.3).

**Table 5-2: Land Cover Types within the Project Footprint**

Total Area	
Project footprint	80 ha
Existing anthropogenic disturbance	12 ha
Regenerating forest habitat (i.e., low quality caribou habitat)	68 ha

Denison understands that the Project will likely result in a limited residual effect on caribou and their habitat within the RSA; however, these effects are considered to be small in a relative sense when considered in the context of the SK1 range, as described in Section 5.1.





**Figure 5-3: Proposed Project Footprint with Existing Anthropogenic Disturbance Visible on Landsat at 1:50,000**



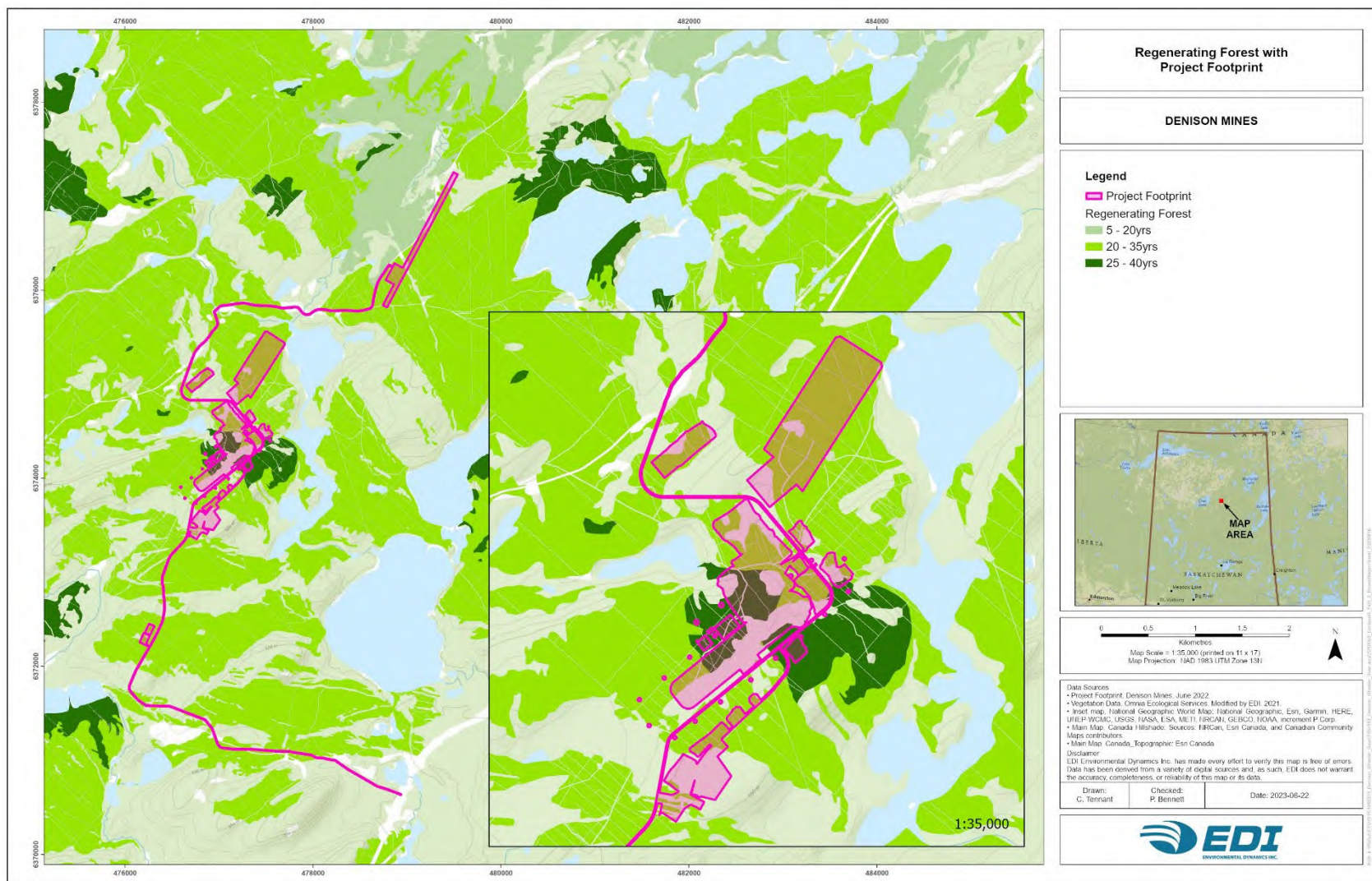
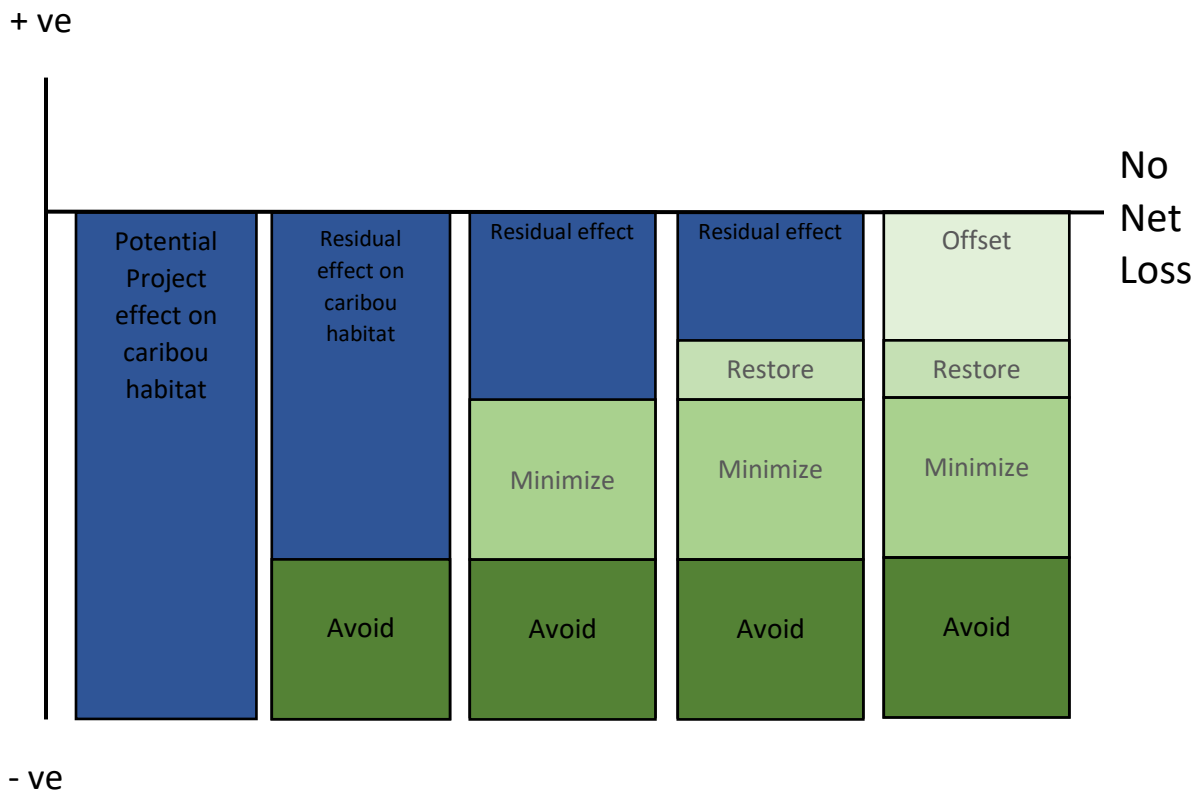


Figure 5-4: Proposed Project Footprint with Regenerating Forest

It is Denison's understanding that currently there are no provisions/requirements for caribou habitat offset by the ENV for projects within the SK1 range. Denison recognizes the importance of woodland caribou to Indigenous groups, the general public, other Interested Parties in Saskatchewan, and Canada. As such, as part of this Plan, Denison is proposing to continue to work with ENV to determine an appropriate offset based on the habitat loss as a result of the Project. Denison expects that the proposed offset calculations would likely include aspects of additionality, temporal considerations, spatial considerations, and other aspects, depending on the expectations/requirements of the caribou habitat offset process that the ENV is currently refining/finalizing. The proposed offset calculations are expected to be refined through ongoing communications with ENV to appropriately address issues at the provincial level related to caribou and habitat.

Future versions of the Plan will include detailed options to develop and advance restoration work and initiatives to provide responsible, proactive environmental stewardship. These offsets (Figure 5-5) are expected to be further refined/defined through Plan updates as the Project proceeds and consultations with ENV advance. Some initial options are presented at a conceptual level in Section 6.



**Figure 5-5: Wheeler River Project Conceptual Caribou Mitigation Plan to Achieve No Net Loss**

## 6 Offset Framework

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This section provides a discussion on offset options will become more defined as the Plan advances, in consultation with ENV. This is expected to offset residual effects over the life-of-the-Project and enhance the restoration activities occurring within the Project footprint to result in no net loss of habitat within the RSA as a result of the Project.

### 6.1 Conceptual Offset Opportunities

An opportunity that Denison has proactively identified is a combined linear feature mitigation and restoration option. Denison has implemented a practical and experimental pilot study to investigate the design, implementation, testing, and monitoring of several functional and structural habitat mitigation options. This opportunity involves two components: 1) applying treatments to address (i.e., reduce) lines-of-sight and discourage linear feature use by both caribou and their predators, and 2) restoration focused on re-establishing terrestrial lichen communities co-established with a biological soil crust (BSC) component.

Importantly, to complete this pilot program, Denison has partnered with the University of Saskatchewan and Northwest Communities Environmental Services (an Indigenous-owned environmental company) under the Developing Eco-Restoration Together (DERT) program. This unique project aims to co-create ecological restoration practices that centre Indigenous peoples, worldviews, and values while also braiding knowledge from the land, Indigenous knowledge, and western science. The project is supported by the three partners but is ultimately guided by the Indigenous Project Advisory Board, and the Community Liaison/Education Coordinator. Through restoration trials, community engagement, and various planting techniques, Denison, with their partners are seeking to return ecosystem functions in areas where they have been previously disturbed (e.g., exploration cutlines). Through collaboration with community members, University of Saskatchewan, industry partners, two graduate students, and local youth, this project is expected to ultimately inform the creation of a framework for effective restoration practices in northern Saskatchewan that centre on caribou and Indigenous communities.

#### 6.1.1 Caribou Trail Study

Wildlife, particularly bears, wolves, and woodland caribou, are using anthropogenic linear features to move throughout their habitat with greater ease. This can result in increased chance encounters between predators and prey and could contribute to the reduction in woodland caribou populations (Omnia 2022). Denison is conducting research on the use of linear features predators and prey in the Athabasca Basin to collect relevant data to inform an effective plan designed to disrupt the current risk related to predator/prey movements/interactions.

Currently, ENV has no guidelines or protocols for assessing the status of disturbance features or for evaluating the need for linear feature mitigation. Denison proactively initiated research to collect field-based findings on the effectiveness of linear disruption features on predator/prey movements in the vicinity of the Project. This field program was designed and implemented to deploy and monitor the effectiveness of five linear feature treatments across nine locations. Treatment types include, seeding and/or planting of jack pine, spreading coarse woody debris, tree tipping, constructing biodegradable fencing, and earth/debris mounding. Methods vary by location but have a common goal: to discourage prolonged disturbance and encourage new growth in areas of disturbance (Omnia 2022). Each

treatment area is monitored by game cameras year-round to determine how wildlife interact with the created physical and visual barriers. All treatments are temporary and biodegradable with the purpose of reducing trail use in the near-term so that the forest can regenerate naturally.

Preliminary results are encouraging and indicate that bear use of treated lines was reduced by 43% compared to untreated lines, caribou use was reduced by 95%, and wolf and moose use was reduced by approximately 94%. Overall, use of treated lines by species of interest was reduced by approximately 83% when compared to baseline monitoring rates. These successful preliminary results will guide future work to define potential offset options associated with linear feature mitigation and restoration.

### **6.1.2 Biological Soil Crust Research**

To support restoration planning, additional research will be designed to investigate BSCs and conducted by a soil science graduate student at the University of Saskatchewan. This research is expected to contribute to the goals of the Developing Eco-Restoration Together Project. BSCs are communities of lichen, bryophytes, cyanobacteria, and microorganisms found in the top layer of the soil (Heindel et al. 2019). These surface soil mats are rich in diversity, and play an important role in the broader ecosystem, especially in locations with extreme climate, little moisture, and nutrient-poor soil (Cowden et al., 2022). Research on BSCs has been focused on desert regions, and this research provides insight to BSC's role in boreal ecosystems, specifically in northern Saskatchewan. By gaining a better understanding of how to support BSC establishment and growth, it is expected that the findings can inform restoration activities that would ultimately benefit caribou.

Sampling of BSCs within the region will be based on a fire chronosequence. This is expected to provide a foundation to better understand the functions and species present in BSCs, and how they develop post-disturbance (Coxson and Marsh 2001). Understanding how these communities develop and interact is important, especially considering the gap in knowledge on soil microbial communities, non-vascular species, and their role in restoration techniques.

A critical element in supporting caribou populations is the consideration of caribou forage lichens. Due to the slow-growing nature of lichens, it can be difficult to include them in restoration activities (McMullin and Rapai 2020). Denison is planning to focus on caribou forage, primarily through transplanting and propagation of the appropriate lichen species. Natural regrowth of lichen communities after fires takes place in a complex setting, where BSCs and bryophyte communities stabilize soil surfaces, providing habitats where lichen propagules can establish and grow (Coxson and Marsh 2001). Denison hypothesizes that reestablishment of terrestrial lichen communities will have a better chance of success where these supporting BSC components can be co-established at the same time. The findings from the BSC research within post-fire environments is expected to support lichen communities, restoration activities for the DERT project, and ultimately caribou and caribou habitat within the Wheeler River Project area.



## 7 Monitoring and Adaptive Management Framework

An adaptive management framework will be developed to support the implementation of this Plan (Figure 7-1). In this context the adaptive management framework provides the means for the integration of Plan scope, management, and monitoring to systematically evaluate assumptions to adapt and learn. In practical terms the framework will consider the outcomes of actions taken/implemented, whether they have been successful and, if not, how can such actions be adapted to increase the likelihood of success. Outcomes of the Plan would be measured by establishing performance indicators as the way to define and measure progress toward achieving the objectives.

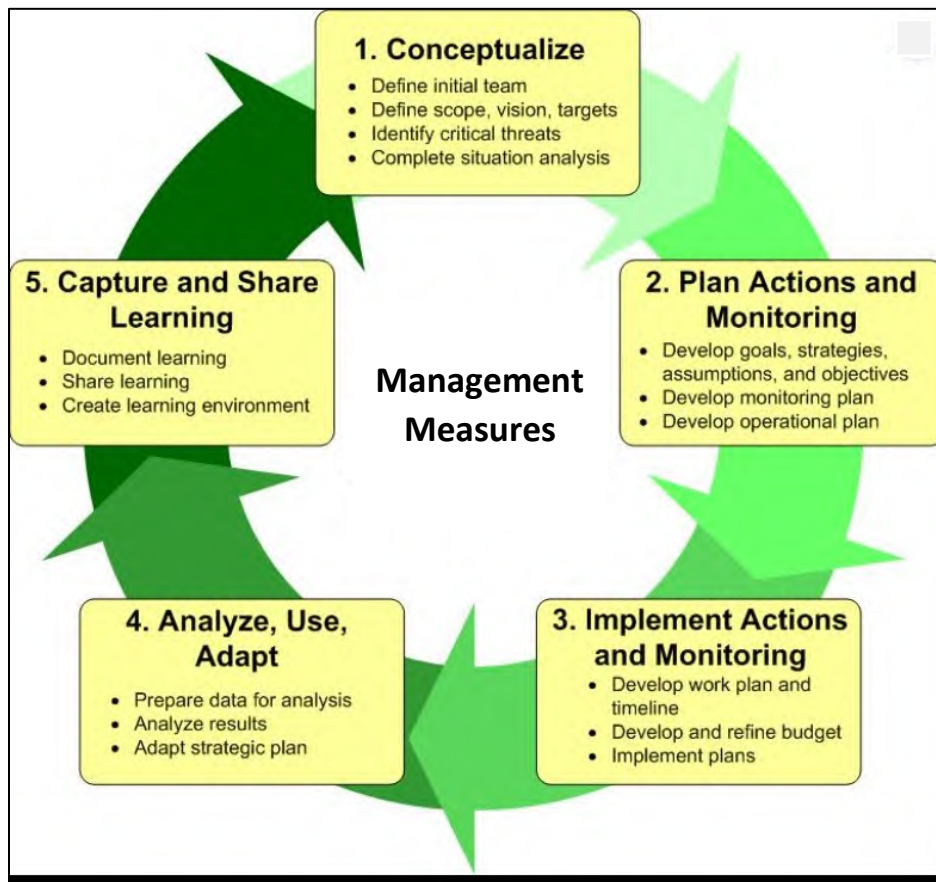


Figure 7-1: Adaptive Management Cycle

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## Attachment: IR-150

Number	IR-150
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan
Context and Rationale	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>
Information Requirement	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.

### Response:

The requested report titled *Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results* is included below.

**Denison Mines Corporation  
Wheeler River Project**

**Pilot Program: Linear Feature Mitigation  
Interim Report- Status Update and Preliminary Results**

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November 2022  
Omnia Project ID: 2103-01

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Denison Wheeler River Project.

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Table 4. Seedling health assessment results.

## 1 INTRODUCTION

Federal and provincial planning documents and woodland caribou (*Rangifer tarandus caribou*) population assessments have indicated that much of the Saskatchewan woodland caribou population is at risk from landscape-level disturbance. There exist no guidelines for evaluating reclamation requirements or outlining what the criteria for reclamation are. Omnia Ecological Services (Omnia) has been engaged by Denison Mines Corporation (Denison) to continue to support the project application (e.g., assessment of impacts and regional mapping/inventory) with respect to reclamation/offset planning to assist with developing potential woodland habitat reclamation selection and criteria protocol through the use of cost effective and practical functional habitat restoration/mitigation options. If successful, these mitigation techniques could be deployed at a larger scale within the SK Boreal Shield and may assist government in developing mitigation/reclamation criteria.

A pilot project of potential mitigation options to disrupt predator-prey movement patterns on linear features by creating a physical, visual, and/or line-of sight barriers has been deployed at 12 sites within the Wheeler River study area ([Figure 1](#)). Detailed background information and full details of site-specific treatments, including preliminary planning and consultation, can be accessed in Omnia (2022). Also included in that report are preliminary findings from the first five months of monitoring.

The objectives of this interim report are to outline preliminary results gathered from monitoring data thus far (year 1) and outline program follow-up requirements and recommendations for future consideration.

## 2 MONITORING

A site visit was completed in May 2022 as part of the planned bi-annual inspection/data collection with the following objectives:

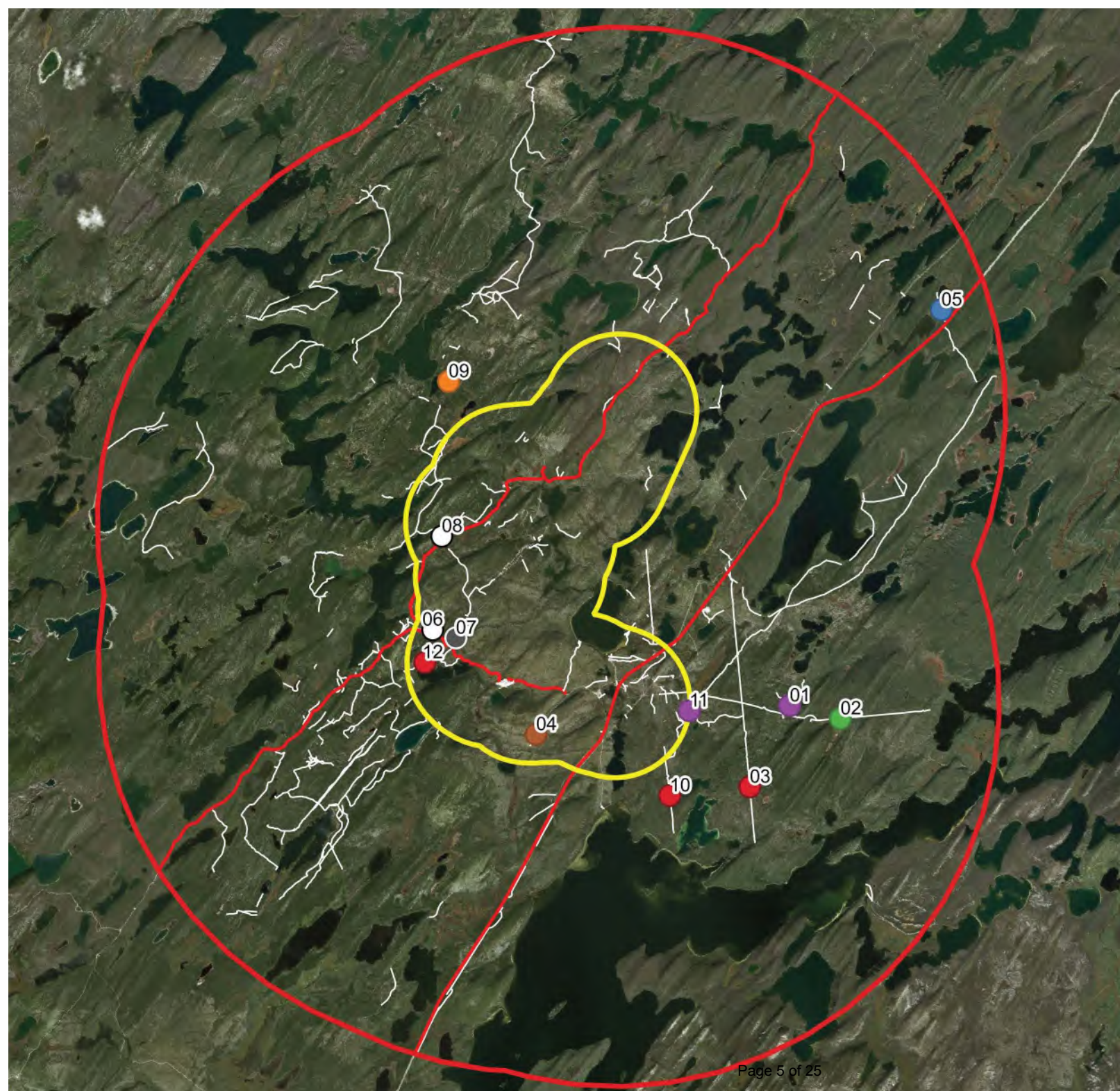
- Revisit and check the status of all 12 treatment sites.
- Make any repairs or modifications as required.
- Remove and replace covert camera memory cards to collect wildlife use data collected since deployment.
- Replace covert camera batteries to support ongoing monitoring.
- Measure height and assess health status of planted Jack pine seedlings.

### 2.1 Methods














The linear feature mitigation sites were visited from May 24-25, 2022. Photographs were taken at each site and notes were taken on overall conditions of the installation, durability, effect of snow cover/melt, issues encountered, and modifications or repairs conducted. Any signs of wildlife use in the area were also noted (i.e., tracks, pellets). Covert camera cards were replaced and camera setups were adjusted where required to prevent unnecessary false trigger events (such as from burlap flapping in the wind). All camera batteries were replaced. Camera photographs were retrieved and analyzed for wildlife use along the 12 treated linear features (LFs) and six reference/untreated parallel linear features.

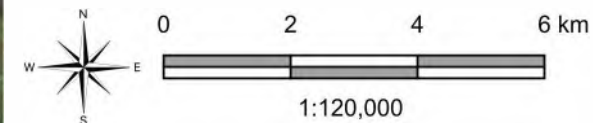


Figure 1. Installed mitigation features for the linear feature reclamation and mitigation trial.  
- Denison Wheeler River Project



### Legend

- |   |  |
|---|--|
|  Local Study Area (LSA)    |  Road       |
|  Regional Study Area (RSA) |  Rough Road |
|  Trail                     |  |
- 
- |   |
|---|
|  Burlap fence  |
|  Coarse Woody Debris + Planting                      |
|  Coarse Woody Debris + Planting + Burlap Fence       |
|  Tree Tip / Wood Structure                           |
|  Tree Tip / Wood Structure + Planting                |
|  Tree Tip / Wood Structure + Planting + Burlap Fence |
|  Trench Pile + Planting                              |
|  Trench Pile + Planting + Burlap Fence               |





For treated and untreated LFs, each wildlife trigger event was characterized as a “use” event if the animal appeared to be travelling on the line and/or displaying non-avoidance behavior, such as approaching/interacting with the burlap or other treatment features. Behavior such as crossing the LF, traveling in the adjacent forest, or paralleling the LF was characterized as “non-use” of the LF. Cameras were programmed to take five photographs per trigger event, often allowing for movement trajectory to be determined. However, if field of view was limited, body language and movement cues of the animals were used to best determine appropriate categorization, such as angle of head/body, no assumption of sharp turns, etc. Photograph analysis findings were compared to results gathered from multi-year baseline linear feature camera monitoring across the project area, and between treated and reference sites. Effects of treatments on wildlife use of LFs was then analyzed across all species of interest and between individual species types.

Each seedling that was planted when treatments were installed in July 2021 was measured for height, and a relative health score was assigned to each seedling: 1=healthy, 2=average, 3=poor 4=dead/missing. Evidence of browsing events by wildlife were also recorded.

## 2.2 Results

### 2.2.1 Treatment Visits

[Table 1](#) summarizes the overall status of the treatment types, wildlife sign observations and modifications completed. Coarse woody debris (CWD) treatments maintained reasonable coverage and withstood snow pack/snowmelt ([Photograph 1](#)). Tree hinging/structures treatments were holding up very well and only a few structures/tree hinges had fallen over and needed reinforcing ([Photograph 2](#)). Needles on the trees that were hinged were yellowing but remained intact ([Photograph 3](#)). Trench and pile treatments were holding up very well and didn't appear compressed following the winter snow ([Photographs 4](#)). Burlap installations, both on their own and when combined with other treatment types, required minimal repairs ([Photograph 5](#)).

Repairs consisted of:

- Replacement of ripped/ deteriorating burlap panels
- Replacing wooden lath ripped off by a bear (Site 10, [Photograph 6](#))
- Adding screws and staples to reinforce, where required

### 2.2.2 Wildlife Photograph Analysis

#### *Overall*

Photographs were analyzed from 18 different cameras totaling 4,861 camera days. One hundred-ninety-four (194) detections were recorded of 13 different species, averaging four detections per 100 cameras nights. The most commonly detected species from all cameras, treatment and reference, was snowshoe hare with 56 detections, followed by woodland caribou with 44 detections, and black bear with 25 detections ([Table 2](#)). [Table 2](#) summarizes the detections rates of species of interest (caribou, moose, black bear, wolf) by treatment type / reference linear feature. Detection rates of species of interest and human (ATV) use were compared with baseline covert camera results from multi-year linear feature monitoring conducted in the Denison Wheeler



River study area ([Table 2a](#)). Results were separated into desired non-use and use of linear feature type (treated versus untreated monitoring/reference trails). The results for trails (approximately 5m wide) were included for direct comparison and data from hand-cut lines and roads were excluded. A similar comparison was completed for treatments where no burlap was present, either on its own or in combination with other blocking techniques ([Table 2b](#)). This was to assess for trends without the potential wildlife attractant effects of the burlap. When treatments including burlap were included in the analysis, detection rates of all species of interest on treated lines are less than those of multi-year linear feature monitoring in the area. Bear use of treated lines was reduced with 61% compared with untreated lines, moose use was reduced with a 92%, and caribou use was reduced with 94% ([Table 2a](#)). No wolves were detected using treated lines. Overall use of treated lines by species of interest was reduced by approximately 85% when compared to monitoring rates. When installations including burlap are excluded from analysis, the reduction in detection rates along the treated sites are even more pronounced. No bears or wolves were observed using treated lines, while only a single caribou and moose were detected using treated lines.

#### *Treatment Sites*

[Figures 2 and 3](#) highlight the relative effectiveness of the individual treatment types on wildlife species of interest detections and their use of the treated linear features. Non-use of the treated line by wildlife via travel in the adjacent forest, crossing, or paralleling the line was the desired effect and was therefore rated as positive. Use of a treated LF via traveling down the line/interacting with the treatment features was an undesired effect and was therefore rated as negative.

[Figure 2](#) shows the results of the treatments for all species of interest combined. CWD treatment sites had the most wildlife detections (20) of three species, (bear, caribou and moose) and all interactions were positive (non-use of the line). Tree hinging/structures had ten detections of bear and caribou, 92% of these interactions were rated as positive. Trench and pile treatments had three moose detections; two thirds positive. Trench and pile + burlap had a split response between bears (all use) and moose (all non-use). CWD + burlap and burlap only had all negative interactions.

[Figure 3](#) shows the results of the treatments for each species of interest. Caribou showed positive interactions (avoidance) with CWD and tree hinging/structures (100% and 83% of detections, respectively) and a negative interaction with burlap (100% of detections). Moose response to CWD and trench and pile + burlap was 100% positive, and was two-thirds positively associated with trench and pile. Black bears responded positively to CWD and tree hinging/structures, and negatively to CWD + burlap, trench and pile + burlap, and burlap only. Wolf responded negatively to burlap.

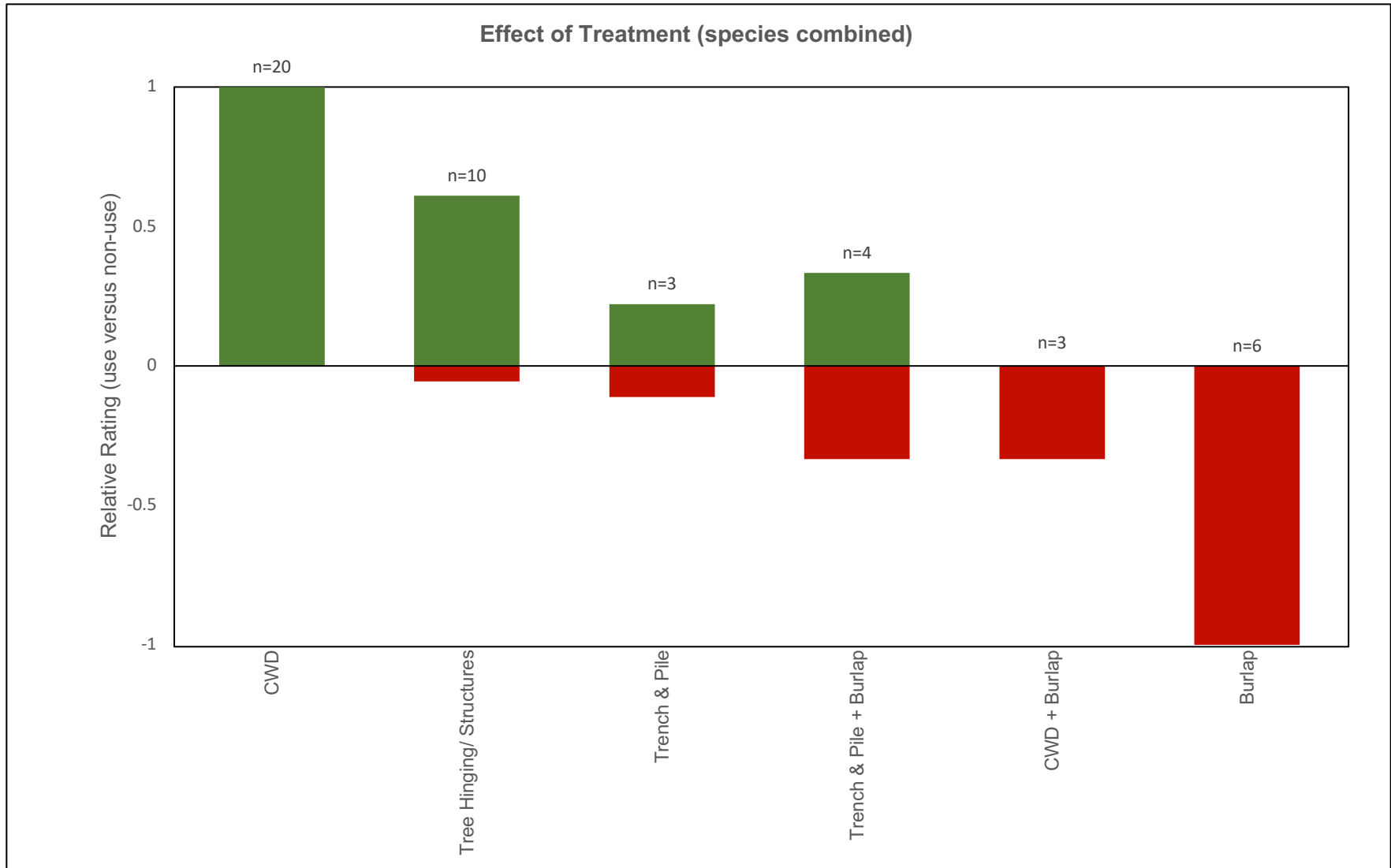


Figure 2. Wildlife detections by treatment type, all species combined (caribou, moose, black bear and wolf). Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

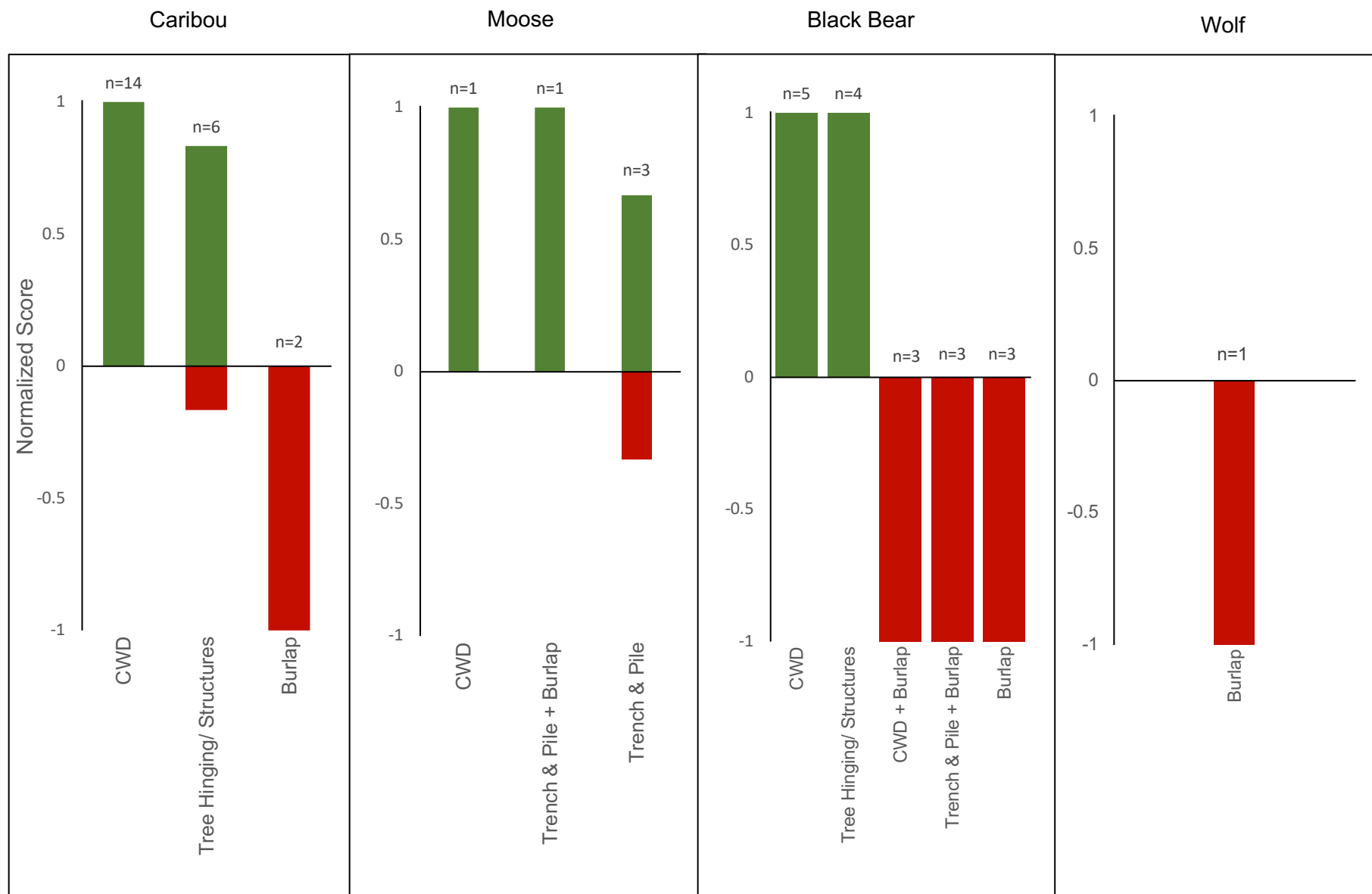


Figure 3. Caribou, moose, black bear and wolf detections by treatment type. Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

### 2.2.3 Seedling Health Assessment

A total of 476 seedlings were counted and measured, out of the initial 500 planted. Seedling height averaged 15cm (range 12-18cm) when planted and average height when measured in May 2022 was 18.8 cm ([Table 4.](#)). Average health status was 1.8. [Photograph 7](#) illustrates representative examples of each health status, ranging from 1-4, healthy, average, poor, and dead, respectively. Mortality/loss averaged 4.8%.

## 3 SUMMARY PRELIMINARY CONCLUSIONS – Year 1

- Detection rates of all species of interest on treated lines (including burlap) are less than those of multi-year linear feature monitoring in the area (bears 61% reduction, moose 92% reduction and caribou 94% reduction; no wolves). When burlap is removed from analysis, the frequency of detection on treated lines is further reduced (no bears or wolves; only 1 caribou and 1 moose)
- CWD, tree hinging/structures, and trench & pile treatments elicited all/mostly positive avoidance responses from species of interest.
- Burlap, when used alone or in combination with other treatments, elicited the most negative responses from species of interest. Although preliminary, early results indicate that burlap may act as an unwanted attractant for curious wildlife or is not perceived as a barrier to species movement ([Photograph 8](#)).
- Burlap remains the most labor-intensive treatment in terms of maintenance and repairs required.
- Overall planted seedling health was strong and growth progression is promising.

## 4 NEXT STEPS

- Continuation of multi-annual site visits to monitor the status of treatment types, make repairs or adjustments as necessary.
- Continuation of multi-annual inspection/service and data collection of covert cameras and analysis of covert camera photographs.
- Assess potential impacts of a 2022 forest fire on several treatment locations/cameras and determine suitability for continued monitoring and/or redeployment.
- Analysis of potential snow depth/weather effects on wildlife activity over time are anticipated as more winter data is collected.
- Evaluate seedling status once again in 2023 to ensure status.
- Verify tree-hinge/structure counts to ensure replicability at other sites.
- Quantify coarse woody debris (CWD) stem counts and volume estimates to ensure replicability at other sites.
- Monitoring is ongoing and an increased monitoring period, and associated sample size, will facilitate further analysis, including potential use of statistics.

## TABLES

**Table 1. Summary of treatment status, observations, and modifications.**

<b>Treatment</b>	<b># Linear Features</b>	<b>Overall</b>	<b>Wildlife Sign</b>	<b>Modifications</b>
CWD	2	Holding up well after snow melt, minor compression	Faint caribou tracks at start of treatment, appear to deflect away from treatment; other caribou tracks on edge	none
CWD + Burlap	1	CWD holding up well, burlap corners lifted	none	reinforced burlap
Tree Hinging/ Structures	3	In great shape; needles on tree hinges yellowing but intact	none	Lifted/ reinforced a few structures/hinges that had fallen
Trench & Pile	2	Holding up very well, no compression	moose tracks avoid treatment and stay on parallel trail	none
Trench & Pile + Burlap	1	Trenches in good shape, burlap had a few holes	none	replaced 2 burlap panels
Burlap	3	Repairs made in December 2021 held up well, minor repairs needed	none	reinforced stakes pulled off by a bear, added more screws/ fixed burlap holes where needed

**Table 2. Wildlife detection results by treatment type/ reference.**

Treatment	# Linear Features	Camera Days	Detections/ 100 Camera Nights												ATV	Comments
			Bear			Caribou			Wolf			Moose				
			Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total		
CWD	2	613	0.82	0	0.82	2.28	0	2.28	0	0	0	0.16	0	0.16	0	-
CWD + Burlap	1	306	0	0.98	2.27	0	0	0	0	0	0	0	0	0	0	-
Tree Hinging/ Structures	3	745	0.54	0	0.54	0.67	0.13	0.81	0	0	0	0	0	0	0	-
Trench & Pile	2	610	0	0	0	0	0	0	0	0	0	0.33	0.16	0.49	0	-
Trench & Pile + Burlap	1	305	0	0.98	0.98	0	0	0	0	0	0	0.33	0	0.33	0	-
Burlap	3	622	0	0.48	0.48	0	0.32	0.32	0	0.16	0.16	0	0	0	0	-
TOTAL Treatments	12	3201	0.28	0.28	0.56	0.59	0.09	0.69	0	0.03	0.03	0.12	0.03	0.16	0	-
TOTAL Reference	6	1660	0.24	0.18	0.42	0.60	0.72	1.33	0	0.18	0.18	0	0.12	0.12	1.02	removed site 6 reference camera Dec2021



**Table 3a. Comparison of caribou mitigation trial covert camera wildlife detections with baseline linear feature wildlife use inventory results.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	3201	9	0.28	19	0.59	1	0.03	4	0.12	33	1.03	89	2.78	0	0.00
	Treatment- Use		9	0.28	3	0.09	0	0.00	1	0.03	13	0.41	39	1.22	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc

**Table 3b. Comparison of caribou mitigation trial covert camera wildlife detections with linear feature monitoring results, all burlap installations excluded.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	1837	9	0.49	19	1.03	1	0.05	3	0.22	32	1.74	83	4.52	0	0.00
	Treatment- Use		0	0.00	1	0.05	0	0.00	1	0.05	2	0.11	19	1.03	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc.

**Table 4. Seedling health assessment results.**

Plot ID	Treatment	# Planted July 2021	# Seedlings May 2022	Average Height (cm)	Average Status <sup>a</sup>	% browsed	% Missing / Dead	Comments
1	CWD	65	61	19.9	1.5	36.1	6.2	
2	Tree Hinging/Structures	70	67	12.3	2.4	97.0	4.3	
4	CWD + Burlap	65	62	17.9	1.9	14.5	4.6	
6	Trench & Pile	60	57	22.2	1.54	33.3	5.0	
7	Trench & Pile + Burlap	60	60	21	1.2	1.7	0.0	
8	Trench & Pile	60	59	22.3	1.3	32.2	1.7	
9	Tree Hinging/Structures	60	53	12.7	2.2	88.7	11.7	lost ~5 due to burlap log being cut down and landing on seedlings
11	CWD	60	57	21.8	2	75.4	5.0	
<b>Total / Average</b>		<b>500</b>	<b>476</b>	<b>18.8</b>	<b>1.8</b>	<b>47.4</b>	<b>4.8</b>	

a: 1= healthy, 2=average, 3=poor, 4=dead

## REFERENCES

Omnia Ecological Services. 2022. Linear Feature Mitigation Trial. Project Update Report. Prepared for Denison Mines Corporation. 58pp.

## FIELD PROGRAM PHOTOGRAPHS



Photograph 1. Status of CWD treatment May 2022.





Photograph 2. Status of tree hinge/structures treatment May 2022.





Photograph 3. May 2022 status of needles on tree that was hinged.





Photograph 4. Status of trench & pile treatment May 2022.





Photograph 5. Burlap repairs May 2022, before and after.





Photograph 6. Wooden lath removed by bear.





Photograph 7. Seedling health assessment examples 1-4, left to right, respectively.





Photograph 8. Burlap challenges with wildlife.

## Attachment: IR-165

Number	IR-165
Dept.	CNSC ECCC
Project effects link	Birds (all species)
Reference to EIS, appendices, or supporting documentation	<p>Section 9.4.4.2.2</p> <p>Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment</p> <p>Appendix 10-A (ERA)</p>
Context and Rationale	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p> <p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>
Information Requirement	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:

	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p>Suggestions for mitigation and follow-up measures: CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>
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Response:

**Water Management Context and Risk of Exposure**

Details on water management and treatment facilities are provided in Section 2 Project Description, Section 2.2.3 Water Management. Importantly, the Project does not include a tailings management facility because of the nature of the proposed mining and processing methods. A summary of water management plans is provided herein; please refer to the marked-up Figure 2.2-15 below.

Clean, non-contact runoff will be diverted around Project components where possible. Contact water will be collected in various ponds and routed to the process water pond (shown in yellow in figure below). These contact water management ponds have been designed to manage event driven runoff and are not intended to be “wet” ponds. That is, the contact water ponds are not designed to hold standing water for long periods of time; rather, they would contain / manage runoff volumes up to the design event and subsequently be pumped down to ensure ongoing management capacity. As a result, the quality of water in these ponds is expected to be relatively good as it would largely comprise precipitation and runoff from natural surfaces.

Additionally, given the design basis of the contact water management ponds (i.e., they are not wet ponds that are meant to hold water at all times), birds and wildlife are not likely to interact with them in a material fashion from a contaminant exposure perspective.

Considering the Project design, the ponds with potential to contain water for any period of time in consideration of potential temporary use by avian species are:

- the process water pond, and the
- effluent monitoring and release ponds.

Process water pond

The process water pond can hold up to 30,000 m<sup>3</sup> of water. It will be a central pond collecting water from a variety of areas, including:

- water from the wash bay (shown in green in figure below),



- water from the domestic wastewater treatment plant,
- water from the dewatering of IWWTP precipitates (non-radioactive, gypsum type material), and
- precipitation-related contact water (shown in yellow in figure below; includes water from the wellfield runoff pond, clean waste rock pond, process precipitate pond, and landfill leachate collection [which is expected to be primarily surface contact water during the Operation phase]).

Water in the process water pond can be used directly in the processing plant or be directed to the industrial wastewater treatment plant (IWWTP) for treatment prior to release to Whitefish Lake. The majority of the flows into the process water pond during Operation (approximately 61% or 10.7 m<sup>3</sup>/hour out of total 17.5 m<sup>3</sup>/hour) are contact waters. As noted above, the quality of the contact water is expected to be relatively good given its sources. As such, a screening was conducted to evaluate the main non-contact water input to the pond, namely the water from the IWWTP precipitate pond. This input represents about 20% of the expected inflow to the process water pond and using this as an estimate for quality of the entire pond is considered conservative.

#### Effluent monitoring and release ponds

The effluent monitoring and release ponds will receive treated water from the IWWTP. Each of the three ponds will have capacity for 3,300 m<sup>3</sup> of water and a composite liner system. The ponds have been designed to hold effluent for a period of 80 hours for testing before discharge to the environment. Having three ponds allows for increased operational flexibility, as one pond can be undergoing maintenance when required. A minimum of two ponds are required to be operational at all times to make sure all effluent released to surface water meets federal and provincial discharge limits. Each pond will be operated with the following stages: 1) filling, 2) holding while awaiting quality confirmation; and 3) releasing to Whitefish Lake once water quality is confirmed to meet discharge limits. There is potential for wildlife to be in contact for short periods of time with the ponds during the holding stage. Table 2.2-1 outlines the upper bound effluent quality proposed for the Project.

In addition to the above that considers where exposure to water management facilities could reasonably occur on the Project site, the following is also relevant as it concerns the likelihood that such exposure would occur. During construction and operations, bird and other wildlife species are expected to avoid the Project Area and Local Study Area (LSA) because of sensory disturbance from project activities that generate noise, artificial light, vibration, dust, etc. and the presence of workers (Adams et al. 2019, Habib et al., 2007; Narins, 1990). While some habituation to sensory disturbance is anticipated that could result in individuals of some species returning to the LSA, generally it is expected that many individuals will be displaced into available habitat elsewhere outside the LSA in the Regional Study Area (RSA). The LSA is not within a major flyway and the LSA currently provides limited waterfowl habitat relative to the neighbouring parts of the RSA. Overall, based on these considerations we characterize the likelihood of bird and other wildlife species exposures to water management facilities on the site as low.

#### **Potential Toxicity to Aquatic Migratory Birds and Species at Risk (SAR)**

A comparison of the expected water quality from the IWWTP precipitate pond, a conservative representation of the process water pond, to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines (WQG) for the protection of livestock and considered protective of

animals potentially exposed to contaminated waste ponds on the Project site was completed. This comparison shows that the expected IWWTP precipitate pond water quality was below the CCME WQG for the protection of livestock for most constituents except selenium (**Table IR 165-1**), and as such, risks to birds, species at risk and other wildlife that may contact or ingest this water are not expected for those constituents below the CCME WQG protective of livestock.

Oviparous birds and fish are the most sensitive to selenium in aquatic environments with toxicity to birds and fish being associated with organic selenium primarily in the diets and tissues of exposed biota.<sup>3</sup> Selenium toxicity to these organisms is manifested through the maternal transfer of selenium which may cause embryotoxicity and teratogenicity<sup>4</sup>. Considering the mitigation measures described below to deter avian use of the ponds, including vegetation management such as managing areas around the waste ponds being free of vegetation to limit the attraction of waterfowl and other wildlife to these areas for foraging and/or breeding, potential risks to avian birds exposed to selenium at this pond would be low.

A CCME WQG protective of livestock was not available for antimony, barium, iron, manganese, silver, strontium, tin and titanium. Potential risks to avian species are unlikely for silver and titanium as these parameters were not detected in the IWWTP precipitate pond. Avian species and wildlife are not expected to be at increased risk for antimony, barium, iron, manganese, strontium and tin because the IWWTP precipitate pond water concentrations for these parameters represents about 20% of the expected inflow to the process, and the mitigation measures, discussed below, to deter avian species and wildlife from these ponds, will reduce the receptor's exposure to these constituents.

**Table IR165-1: Comparison of Expected IWWTP precipitate pond Water Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Aluminum, dissolved	mg/L	0.018	5
Antimony, dissolved	mg/L	0.0007	NV
Arsenic, dissolved	ug/L	0.4	25
Barium, dissolved	mg/L	0.097	NV
Beryllium, dissolved	mg/L	<0.0001	0.1
Boron, dissolved	mg/L	0.36	5
Cadmium, dissolved	mg/L	0.00045	0.08
Chromium, dissolved	mg/L	0.0064	0.05
Cobalt, dissolved	mg/L	0.0002	1
Copper, dissolved	mg/L	0.0021	0.5 <sup>a</sup>
Iron, dissolved	mg/L	0.001	NV
Lead, dissolved	mg/L	<0.0001	0.1
Manganese, dissolved	mg/L	0.0012	NV

<sup>3</sup> Young, T.F., Finley, K., Adams, W., Besser, J., Hopkins, W.A., Jolley, D., McNaughton, E., Presser, T.S., Shaw, D.P., & Unrine J.(2010). What You Need to Know about Selenium. In: P.M. Chapman, W.J. Adams, M.L. Brooks, C.G. Delos, S.N. Luoma, W.A. Maher, H.M. Ohlendorf, T.S. Presser & D.P. Shaw (Eds.), Ecological Assessment of Selenium in the Aquatic Environment. Boca Raton (FL): CRC. p 7–45.

<sup>4</sup> Ibid

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Molybdenum, dissolved	mg/L	0.018	0.5
Nickel, dissolved	mg/L	0.0004	1
Selenium, dissolved	mg/L	0.19	<b>0.05</b>
Silver, dissolved	mg/L	<0.00005	NV
Strontium, dissolved	mg/L	4.1	NV
Thallium, dissolved	mg/L	0.0007	1
Tin, dissolved	mg/L	0.0044	NV
Titanium, dissolved	mg/L	<0.0002	NV
Uranium, dissolved	ug/L	25	200
Vanadium, dissolved	mg/L	0.0064	0.1
Zinc, dissolved	mg/L	0.0027	50

Notes:

NV – no CCME WQG

a- lowest value between the sheep, cattle, swine and poultry value

**Bold indicates that the predicted water quality exceeds the CCME WQG for protection of livestock.**

A comparison of the proposed effluent quality in Table 2.2-1 of the EIS to the CCME WQG for the protection of livestock was also completed. This comparison shows that the proposed effluent quality was below the CCME WQG protective of livestock for most constituents except molybdenum and sulphate (**Table IR 165-2**). As such, birds, species at risk and other wildlife that may contact or ingest the proposed effluent quality are not expected to be at increased risk for those constituents below the CCME WQG protective of livestock.

**Table IR165-2: Comparison of Proposed Effluent Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
<b>General Chemistry</b>			
Chloride	mg/L	600	NV
Sulphate	mg/L	3915	<b>1000</b>
Total Dissolved Solids	mg/L	6420	NA
<b>Metals and Metalloids (Dissolved)</b>			
Arsenic	mg/L	0.006	0.025
Cadmium	mg/L	0.0018	0.08
Chromium	mg/L	0.025	0.05
Cobalt	mg/L	0.003	1
Copper	mg/L	0.022	0.5 <sup>a</sup>
Molybdenum	mg/L	2.5	<b>0.5</b>
Selenium	mg/L	0.042	0.05
Uranium	mg/L	0.057	0.2
Zinc	mg/L	0.042	50
<b>Radionuclides</b>			

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
Uranium-238	Bq/L	0.7	0.2 <sup>b</sup>
Uranium-234	Bq/L	0.7	95 <sup>b</sup>
Thorium-230	Bq/L	0.9	22 <sup>b</sup>
Radium-226	Bq/L	0.15	13.5 <sup>b</sup>
Lead-210	Bq/L	0.419	8 <sup>b</sup>
Polonium-210	Bq/L	0.15	7 <sup>b</sup>

Notes:

NV – no CCME WQG

NA- not applicable.

a - lowest value between the sheep, cattle, swine and poultry value

b - US DOE Standard (2019) for aquatic biota, including riparian animals

**Bold indicates that the proposed effluent quality exceeds the CCME WQG for protection of livestock.**

For molybdenum and sulphate increased risks to avian species and wildlife exposed to effluent in the ponds are not expected as the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the potential receptor's exposure to these constituents.

A CCME WQG protective of livestock was not available for chloride and for the radionuclides. Avian species and wildlife are not expected to be at increased risk to those constituents without a CCME WQG protection of livestock because the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the receptor's exposure to these constituents.

A comparison of the proposed effluent quality for radionuclides to the US Department of Energy (DOE) Standard<sup>5</sup> for *a graded approach for evaluating radiation doses to aquatic and terrestrial biota* (Table IR165-2), that is protective of wildlife exposed to radionuclides, suggests that wildlife are not expected to be at increased risks to these radionuclides, as the proposed effluent quality for these radionuclides were below the US DOE Standard. As such, increased risk are not expected to avian species, species at risk and other wildlife exposed to constituents in contaminated waste ponds on the Project site.

## Mitigation Measures

Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.

<sup>5</sup> US Department of Energy. 2019. DOE Standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. U.S. Department of Energy, Washington, DC. DOE-STD-1153-2019.

- Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.
- Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.
- Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.

Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:

- Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020<sup>6</sup>) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.
- Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012<sup>7</sup>). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006<sup>8</sup>), as birds can habituate to a timely, consistent firing/noise event.

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<sup>6</sup> Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.

<sup>7</sup> Ezeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.

<sup>8</sup> Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119

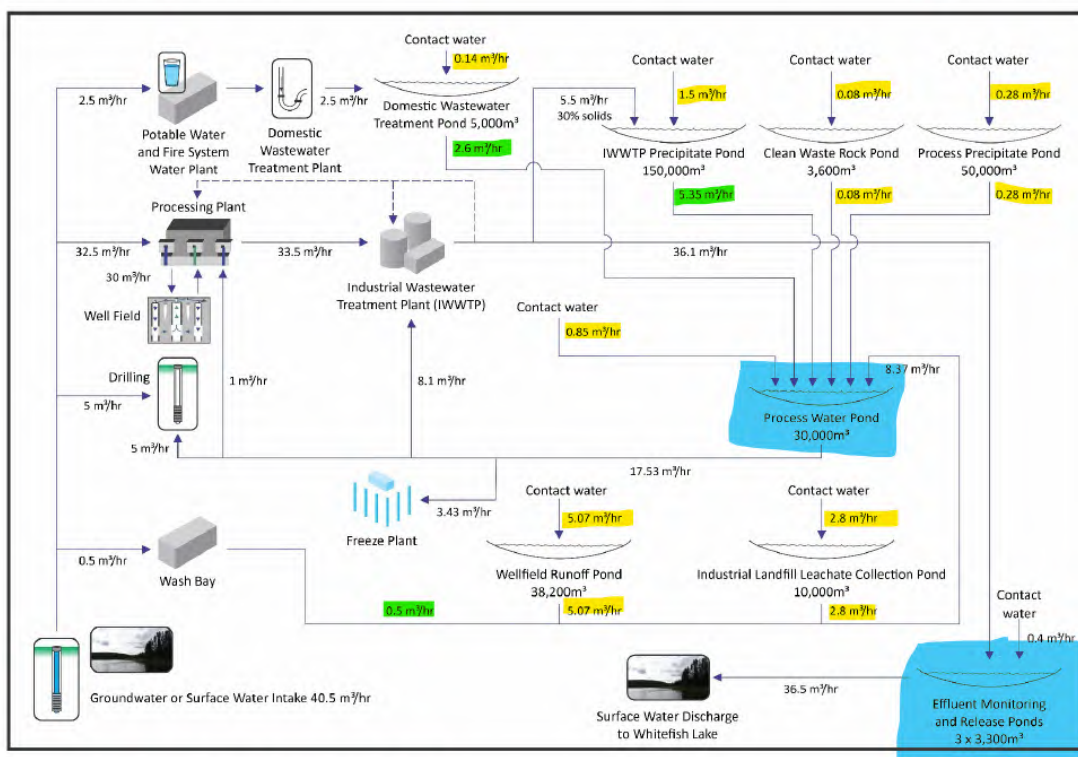


Figure 2.2-15: Operation Water Balance for the Project

## References

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## Attachment: IR-183 to 187

Number	IR-183
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C
Context and Rationale	<p>Context: Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p>Rationale: The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>
Information Requirement	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

Number	IR-184
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C, 2.0
Context and Rationale	<p>Context: It is stated in Appendix 10-C, section 2.0 that: “In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p>



	Rationale: The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.
Information Requirement	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

Number	IR-185
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2 Appendix 10-C Table 3.10-3.12
Context and Rationale	Context: The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.  Rationale: The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.
Information Requirement	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

Number	IR-186
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2.4, Section 10.2.3.2.6, Section 10.2.4 Appendix 10-C, Section 3.2
Context and Rationale	Context: In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.

	<p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: “For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA.”</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>

Number	IR-187
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	<p>Section 10.2.3.2.4, Section 10.2.3.2.6</p> <p>Appendix 10-C, Section 3.3, 6.0</p>

Context and Rationale	<p>Context: The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, Radiation Protection.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>

### **Summary of IRs 183 to 187 and Responses:**

**IR-183 (CNSC):** Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

**Response:** *Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the EIS. As noted in response to IRs 185, 186, and 187, some revisions to Appendix A are detailed in an attached memo.*

**IR-184 (CNSC).** As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period. The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

**Response:** *The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation.*

**IR-185 (CNSC).** The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

**Response:** *The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the EIS.*

*The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3, and have changed inputs for drying and packaging in response to IR-186, a revised table is provided (see Table A.3 below).*

**IR-186 (CNSC).** Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant. Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant. Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.

**Response:** *We had used a very conservative dust level in drying and packaging areas (representing equipment sources of dust to the exhaust system). While the hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below).*

**IR-187 (CNSC).** Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility. Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle. Identify mitigation measures as per the hierarchy of control for radiological protection.

**Response:** *As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.*

#### **Changes to the Worker Dose Calculations and Report:**

The Worker Dose Assessment (Appendix 10-C of the EIS) will be revised to reflect the information provided in Responses to IRs above. References to routine use of PAPR as an exposure control will be deleted. The primary engineering controls on dust exposure in the drying and packaging areas will be explained. Section 6.0 (Radiation Protection Strategies) will be updated to reflect the hierarchy of controls – elimination > substitution > engineering > administrative > PPE. Neither elimination nor substitution of the hazard are feasible controls for the Project, given its purpose to produce uranium

concentrate, and given the radioactive nature of uranium. Elimination of an exposure pathway would typically involve engineering controls. Engineering controls will be utilized as a first line of defense.

As noted in the responses, a design estimate has been obtained for dust levels in the main room for the drying area and the packaging/loading area. This value of 0.5 mg/m<sup>3</sup> is a conservative representation of potential dust levels for workers under normal operations. It translates to a respirable dust value of 0.4 mg/m<sup>3</sup> and a U-238 activity of 3.9 Bq/m<sup>3</sup>. This value has been used in revised calculations of the dust inhalation dose (presented herein). In addition, time spent in the room has been reduced from 8 to 4 hours per day. The revised dose calculations show that the CNSC regulatory dose limits can be met without use of PAPR.

Because the dust sources (dryer and calciner in the drying area; drum loader in the packaging area) will be fully enclosed under negative pressure, workers will not be in the enclosure, and time spent at 1 m from source will be zero. The time at distance allocation has been revised to:

0 h/d at 1 m, 3 h/d at 5 m, and 1 h/d at 10 m

This time at distance allocation is relevant to the external dose, which is a minor dose component for the drying and packaging/loading areas.

To accommodate these new assumptions, the worker dose calculations have been revised. In addition, several typos in the tables of the June 2022 Worker Dose Assessment have been corrected. For completeness, all the tables from the report that have any changes are provided below, including the example calculations from Appendix A of the Worker Dose Assessment. Any word or numeric value that has changed is shown in red font.

The revised effective dose from dust inhalation, in both drying and packaging areas, without use of PAPR, is calculated to be 11.7 mSv/a (Table 5.1 and Table A.1) well below the 5-year average effective dose limit of 20 mSv/a. Actual dust levels will be confirmed during the commissioning phase, using both area monitoring and sampling pumps worn by workers, and the control system will be optimized to ensure that doses are ALARA. Monitoring will continue through the operations phase, in accordance with the Radiation Protection Program.

**Section 2.0 of the Worker Dose Assessment** (on Regulatory Context) will be updated to align with the Radiation Protection Regulations, by deleting the following text:

~~“In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”~~

**Section 6.0 of the Worker Dose Assessment** (on Radiation Protection Strategies) will be updated to describe the planned mitigations, consistent with the hierarchy of controls. Text in this section relevant to dust exposure will be revised as follows:

“Doses to workers at the Wheeler River Project are expected to be maintained below the average annual dose limit of 20 mSv/a for NEWs. Several mitigations have been assumed and will be important

in keeping doses ALARA. For the drying and packaging/loading areas of the ISR Plant, ~~the engineering controls will include negative pressure enclosures around source equipment and exhaust, as well as ventilation controls in the main rooms (beyond enclosures). Administrative controls will include area and individual monitoring and time-exposure management. Actual dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. Use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce dose from inhalation of uranium dust. Dust levels in these areas should be monitored and kept as low as reasonably achievable.”~~

~~“Powered Air Purifying Respirators (PAPR) should be available in these areas in case of need for any non-routine work that may involve high dust exposures. However, PAPR is a control of last resort. Under the Radiation Protection Program, a radiation work permit process will be in place for any non-routine work that may involve unusually high exposures, ensuring that risks are assessed and exposure controls are optimized in accordance with the ALARA principle. protection factor of 1000 is provided by several types of respirators such as Powered Air Purifying Respirators (PAPR) with a full facepiece or hood, and Supplied-Air Respirators (SAR) in positive-pressure mode or continuous flow mode. Alternatively, a Self-Contained Breathing Apparatus will provide protection factors over 10,000 if used in positive-pressure mode. It should be noted that Air Purifying Respirators will not offer protection against radioactive gases such as radon.”~~

~~“Dust inhalation is also a potentially significant component of dose at the core shack. At this location, PAPR will not be required; however, dust levels should be monitored here too. An administrative level of respirable dust equal to ¼ of the ACGIH TLV of 0.27 mg/m<sup>3</sup> has been assumed. Again, dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. It may be possible to increase air exchange in the core shack, above the planned 6 exchanges per hour, should this be necessary. This would help also with radon exposure in the core shack.”~~

Radiation Protection Program documents, now in preparation, to be completed during licensing, will provide more detail regarding radiation protection processes and procedures.

**Tables of the Worker Dose Assessment** (in Section 3, Section 5, and Appendix A) will be revised as discussed above. The revised tables are shown below.

**Table 3.1: Exposure Locations and Sources**

Location	Work Area	Source	Worker Function
Wellfield	Wellfield drilling	Cuttings in drum	Driller 1
	Pump houses	UBS in pump house piping	Wellfield Operator 1
	UBS Pond	UBS in storage pond	Wellfield Operator 1
	Wellfield piping	UBS in piping	Wellfield Operator 2 <sup>a</sup>
ISR Plant	Process Precipitate Removal Area	UBS feed tank	Plant Operator 1 <sup>a</sup>
		Totes of filter cake	
		Precipitate thickener	
	Yellowcake Precipitation Area	Yellowcake precipitation tank	Plant Operator 2 <sup>a</sup>
		Yellowcake conveyor	
		Yellowcake thickener	
	Water Treatment Area	WTP clarifier	Plant Operator 3 <sup>a</sup>
	Drying Area	Yellowcake	Plant Operator 4 <sup>a</sup>
	Packaging Loading Area	Yellowcake	Plant Operator 5 <sup>a</sup>
Site Ponds Pads	Special Waste Pad	Drill cuttings	Equipment Operator 1
	Contaminated Landfill	none	Equipment Operator 1
	Process Precipitate Pond	Process precipitate	Equipment Operator 1
Site infrastructure	Core Shack	3 cores	Geologist/Geotech Loggers

(a) Operator and Maintenance worker have the same exposure characteristics



**Table 3.2: Concentrations in Dust and Occupancy in Work Area for the Indoor and Outdoor Dust Inhalation Scenarios**

Work Area	Worker	Respirable Dust in Air (kg/m <sup>3</sup> )	U-238 in Dust (Bq/kg)	Ra-226 in Dust (Bq/kg)	U-238 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>d</sup>
Wellfield	Driller 1	-	-		9.49E-04 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	-	-		9.49E-04 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	-	-		3.41E-03 <sup>a</sup>	8	12
Yellowcake Precip Area	Plant Operator 2	-	-		3.41E-03 <sup>a</sup>	8	12
Water Treatment Area	Plant Operator 3	-	-		3.41E-03 <sup>a</sup>	8	12
Drying Area	Plant Operator 4	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Packaging Loading Area	Plant Operator 5	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Special Waste Pad	Equipment Operator 1	-	-		6.83E-03 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	-	-		9.95E-04 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	-	-		4.25E-04 <sup>a</sup>	3	12
Core Shack	Geologist/	6.75E-08	2.99E+06	2.06E+06	2.02E-01 <sup>c</sup>	11	6
	Geotech Logger						

(a) U-238 (Bq/m<sup>3</sup>) in air calculated from IEC (2022) µg/m<sup>3</sup> in outdoor air at each location, operations phase, with calciner

(b) U-238 in air shown for drying and packaging areas is an ambient concentration, based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

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- (c) U-238 in air for core shack based on an administrative level for respirable dust equal to ¼ of the ACGIH Threshold Limit Value (TLV); U-238 concentration in dust from ore assays by R and D Enterprises (2018)
- (d) Workers are assumed to work 20 days per month

**Table 3.3: Concentrations of Radon and Occupancy in Work Area for the Indoor and Outdoor Radon Inhalation Scenarios**

Work Area	Worker	Source	Rn-222 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>b</sup>
Wellfield	Driller 1	Outdoor	6.75E+01 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Cake	2.72E+01		
		Thickener	7.35E+02		
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Thickener	4.96E+02		
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Clarifier	1.28E+02		
Drying Area	Plant Operator 4	Outdoor	1.17E+02 <sup>a</sup>	4	12
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02 <sup>a</sup>	4	12
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01 <sup>a</sup>	3	12
Core Shack	Geologist/Geotech Logger	Outdoor	6.75E+01 <sup>a</sup>	11	6
		Cores	1.18E+03		

(a) Rn-222 (Bq/m<sup>3</sup>) in air taken from IEC (2022) value in outdoor air at each location, operations phase, with calciner

(b) Workers are assumed to work 20 days per month

**Table 3.9: Exposure Factors for External Exposures.**

Location	Source <sup>a</sup>	Worker Function	h/d in area	h/d at 1 m	h/d at 5 m	h/d at 10 m	active months per year
Wellfield	Cuttings in Drum	Driller 1	11	2	4	5	8
	UBS Solution in pump house piping	Wellfield Operator 1	4	2	1	1	12
	UBS solution in storage pond	Wellfield Operator 1	4	2	1	1	12
	UBS Solution in piping	Wellfield Operator 2	8	4	2	2	12
ISR Plant	UBS feed tank	Plant Operator 1	8	6	1	1	12
	Totes of filter cake						
	Precipitate Thickener						
	Yellowcake precipitation tank	Plant Operator 2	8	6	1	1	12
	Yellowcake conveyor						
	Yellowcake Thickener						
	WTP Clarifier	Plant Operator 3	8	6	1	1	12
	Drying Area, Dryer	Plant Operator 4	4	0	3	1	12
	Drying Area, Calciner						
	Packaging/Loading Area	Plant Operator 5	4	0	3	1	12
Site Ponds Pads	Special Waste Pad	Equipment Operator 1	2	0	2	0	12
	none	Equipment Operator 1	3	0	2	1	12
	Process Precipitate Pond	Equipment Operator 1	4	0	3	1	12

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Core Shack	3 cores	Geologist/Geotech Loggers	11	2	8	1	6
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(a) When there are several sources in one work area, the worker is assumed to divide his time roughly equally among those sources (see Appendix Table A.3).

Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant



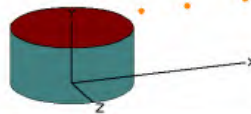

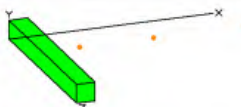
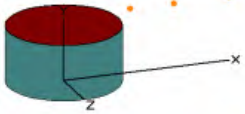
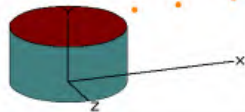
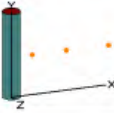

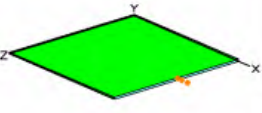
Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
UBS Feed Tank	Height: 5.2m, diameter: 3.3m	UBS Feed		4.45E+01	6.35	Steel	Liquid	1.00E+03
Totes of Filter Cake	3 totes of filter cake, each 1m height, 1m diameter	Process Precipitates		3.00E+00	6.35	PET	Cake	1.88E+03
Precipitate Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	Process Precipitates		3.93E+02	6.35	Steel	Slurry	1.30E+03
Precipitation Tank	Height: 5.2m, Diameter: 3.3m	Yellowcake Precipitation Solution		4.45E+01	6.35	Steel	Liquid	1.00E+03
Yellowcake in Screw conveyor	Height: 1m, Length: 10m, Width: 1m	UO <sub>4</sub>		1.00E+01	6.35	Steel	Cake	2.40E+03

Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant (continued)

Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
Yellowcake Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	UO <sub>4</sub>		3.93E+02	6.35	Steel	Slurry	1.30E+03
WTP Clarifier	Height: 5m, Diameter: 10m, drum 1.7m above the floor	NA		3.93E+02	6.35	Steel	Slurry	1.00E+03
Dryer	Horizontal cylinder, Length: 10m, Diameter: 2m	UO <sub>4</sub>		3.14E+01	6.35	Steel	powder	2.03E+03
Calciner	Horizontal cylinder, Length: 20m, Diameter: 2m	UO <sub>4</sub>		6.28E+01	6.35	Steel	powder	2.03E+03
Drum Storage	350 barrels on a pad, each height: 0.89m, diameter: 0.58m	UO <sub>4</sub>		1.08E+02	1.20	Steel	powder	1.71E+03



**Table 5.1: Internal Annual Dose from Dust Inhalation**

Work Area	Worker	Effective Dose from Inhalation U-238 <sup>+</sup> (mSv/a)	Effective Dose from Inhalation Ra-226 <sup>+</sup> (mSv/a)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	5.21E-03	-	5.21E-03 <sup>a</sup>
Wellfield	Wellfield Operator 1, 2	5.68E-03	-	5.68E-03 <sup>a</sup>
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	-	2.04E-02 <sup>a</sup>
Yellowcake Precip Area	Plant Operator 2	2.04E-02	-	2.04E-02 <sup>a</sup>
Water Treatment Area	Plant Operator 3	2.04E-02	-	2.04E-02 <sup>a</sup>
Drying Area	Plant Operator 4	1.17E+01	-	1.17E+01 <sup>b</sup>
Packaging Loading Area	Plant Operator 5	1.17E+01	-	1.17E+01 <sup>b</sup>
Special Waste Pad	Equipment Operator 1	1.02E-02	-	1.02E-02 <sup>ac</sup>
Process Precipitate Pond	Equipment Operator 1	2.98E-03	-	2.98E-03 <sup>ac</sup>
Contaminated Landfill	Equipment Operator 1	9.54E-04	-	9.54E-04 <sup>ac</sup>
Core Shack	Geologist/	5.63E+00	1.02E+00	6.65E-00 <sup>d</sup>
	Geotech Logger			

(a) Based on outdoor concentration of U dust from IEC (2022); U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(b) Based on indoor concentration of U dust, which dominates; U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(c) Equipment Operator 1 frequents 3 locations; the 3 doses must be added for this worker

(d) Based on indoor concentration of ore dust, which dominates; U-238<sup>+</sup> DCF 2.08E-05 Sv/Bq from ICRP 137 includes the entire U-238 series; doses shown for U-238<sup>+</sup> and Ra-226<sup>+</sup> reflect the portions from U-238 to Th-230, and from Ra-226 to Po-210, respectively.

Table 5.2: Internal Annual Dose from Radon Inhalation

Work Area	Worker	Source	Dose from Radon in Air (mSv/a)	Total Radon Dose for Worker (mSv/a)
Wellfield	Driller 1	Outdoor	9.44E-02 <sup>a</sup>	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	1.03E-01 <sup>a</sup>	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.78E-01 <sup>a</sup>	2.27E+00
		Cake	7.47E-02 <sup>b</sup>	
		Thickener	2.02E+00 <sup>b</sup>	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.78E-01 <sup>a</sup>	1.54E+00
		Thickener	1.36E+00 <sup>b</sup>	
Water Treatment Area	Plant Operator 3	Outdoor	1.78E-01 <sup>a</sup>	5.30E-01
		Clarifier	3.52E-01 <sup>b</sup>	
Drying Area	Plant Operator 4	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	3.37E-01 <sup>a</sup>	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	6.89E-02 <sup>a</sup>	
Contaminated Landfill	Equipment Operator 1	Outdoor	1.70E-02 <sup>a</sup>	
Core Shack	Geologist/	Outdoor	7.08E-02 <sup>a</sup>	2.30E+00
	Geotech Logger	Cores	2.23E+00 <sup>b</sup>	

(a) Based on outdoor concentration of radon from IEC (2022)

(b) Based on an indoor source of radon to indoor air

**Table 5.3: Effective Dose and Equivalent Dose to the Lens of the Eye for Workers from External Exposure**

Work Area	Worker	Source	By Exposure Scenario		By Worker	
			External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)	External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	10.16	16.40	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	0.05	0.07	0.05	0.07
	Wellfield Operator 1	Pump House Piping	0.24	0.34	0.53	0.81
		UBS Pond	0.29	0.47		
Process Precipitate Removal Area	Plant Operator 1	Feed Tank	0.24	0.39	12.59	20.40
		Cake	8.19	13.15		
		Thickener	4.16	6.86		
Yellowcake Precip Area	Plant Operator 2	Precip Tank	0.08	0.13	0.10	0.15
		Cake	0.02	0.02		
		Thickener	0.001	0.001		
Water Treatment Area	Plant Operator 3	Clarifier	1.70	2.61	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0.002	0.002	0.004	0.004
		Calciner	0.002	0.002		
Packaging Loading Area	Plant Operator 5	Drums	0.009	0.009	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	<0.0001 <sup>a</sup>	0.0001 <sup>a</sup>	5.68	9.33
Process Precipitate Pond	Equipment Operator 1	Precip Pond	5.68	9.33		
Contaminated Landfill	Equipment Operator 1	No source	0.000	0.000		

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Core Shack	Geologist/ Geotech Logger	Cores	2.02	3.25	2.02	3.25
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(a) Dose to Equipment Operator 1 at the Special Waste Pad is mitigated by a 2m wide berm, which provides shielding.

**Table 5.4: Total Dose from Internal and External Pathways for Workers**

Work Area	Worker	Internal Dose (mSv/a)		External Dose (mSv/a)	Total Effective Dose (mSv/a)
		Dust	Radon		
Wellfield	Driller 1	5.21E-03	9.44E-02	10.16	10.26
Wellfield	Wellfield Operator 2	5.68E-03	1.03E-01	0.05	0.16
	Wellfield Operator 1	5.68E-03	1.03E-01	0.53	0.64
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	2.27E+00	12.59	14.88
Yellowcake Precip Area	Plant Operator 2	2.04E-02	1.54E+00	0.10	1.66
Water Treatment Area	Plant Operator 3	2.04E-02	5.30E-01	1.70	2.25
Drying Area	Plant Operator 4	1.17E+00 <sup>a</sup>	8.92E-02	0.004	11.77
Packaging Loading Area	Plant Operator 5	1.17E+00 <sup>a</sup>	8.92E-02	0.009	11.78
Special Waste Pad	Equipment Operator 1	1.02E-02	3.37E-01	- <sup>b</sup>	6.11
Process Precipitate Pond	Equipment Operator 1	2.98E-03	6.89E-02	5.68	
Contaminated Landfill	Equipment Operator 1	9.54E-04	1.70E-02	-	
Core Shack	Geologist/	6.65E+00 <sup>a</sup>	2.30E+00	2.02	10.97
	Geotech Logger				

(a) Dust exposures in work area to be monitored and kept ALARA.

(b) External dose mitigated by a berm around the Special Waste Pad, which provides shielding

## Appendix A Example Calculations

**Table A.1: Dust Inhalation Dose Calculation**

Work Area	Worker	U-238 in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	DCF (Sv/Bq)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	9.49E-04	1760	2.60E-06	5.21E-03
Wellfield	Wellfield Operator 1, 2	9.49E-04	1920	2.60E-06	5.68E-03
Precipitate Removal Area	Plant Operator 1	3.41E-03	1920	2.60E-06	2.04E-02
Yellowcake Precip Area	Plant Operator 2	3.41E-03	1920	2.60E-06	2.04E-02
Water Treatment Area	Plant Operator 3	3.41E-03	1920	2.60E-06	2.04E-02
Drying Area	Plant Operator 4	3.90E+00	960	2.60E-06	1.17E+01
Packaging Loading Area	Plant Operator 5	3.90E+00	960	2.60E-06	1.17E+01
Special Waste Pad	Equipment Operator 1	6.83E-03	480	2.60E-06	1.02E-02
Precipitate Pond	Equipment Operator 1	9.95E-04	960	2.60E-06	2.98E-03
Industrial Landfill	Equipment Operator 1	4.25E-04	720	2.60E-06	9.54E-04
Core Shack	Geologist/	2.02E-01	1320	2.08E-05	6.65E+00
	Geotech Logger				

Total Effective Dose (mSv/a) = C<sub>air</sub> (Bq/m<sup>3</sup>) x I (m<sup>3</sup>/h) x ET (h/a) x DCF (Sv/Bq) x 1000 (mSv/Sv)

### Notes:

Concentrations from indoor sources for Drying/Packaging and Core Shack

Concentrations in Drying and Packaging are respirable activity based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

DCFs (Sv/Bq) from ICRP 137: U238+U234 (2.60E-6); U238 to Po-210 (2.08E-5)

Inhalation Rate (I) from ICRP 119 is 1.2 m<sup>3</sup>/h

**Table A.2: Radon Dose Calculation**

Work Area	Worker	Source	Radon in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	Equilibrium Factor F	Radon Dose (mSv/a)	Total (mSv/a)
Wellfield	Driller 1	Outdoor	6.75E+01	1760	0.10	9.44E-02	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01	1920	0.10	1.03E-01	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02	1920	0.10	1.78E-01	2.27E+00
		Cake	2.72E+01	1920	0.18	7.47E-02	
		Thickener	7.35E+02	1920	0.18	2.02E+00	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02	1920	0.10	1.78E-01	1.54E+00
		Thickener	4.96E+02	1920	0.18	1.36E+00	
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02	1920	0.10	1.78E-01	5.30E-01
		Clarifier	1.28E+02	1920	0.18	3.52E-01	
Drying Area	Plant Operator 4	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02	480	0.10	3.37E-01	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01	960	0.10	6.89E-02	
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01	720	0.10	1.70E-02	
Core Shack	Geologist/ Geotech Logger	Outdoor	6.75E+01	1320	0.10	7.08E-02	2.30E+00
		Cores	1.18E+03	1320	0.18	2.23E+00	

Radon Dose (mSv/a) = (C<sub>air</sub> (Bq/m<sup>3</sup>)/3700 Bq/m<sup>3</sup> per WL) x F x (ET (h/a)/170 h per WL) \* 5 (mSv/a per WL)



**Table A.3: External Dose Calculation**

Work Area	Worker	Source	Exposure Time (h/d) at:			Max Effective Dose (mSv/h)			Max Lens Dose (mSv/h)			Exp Days (d/a)	By Exposure Scenario	
			1m	5m	10m	1m	5m	10m	1m	5m	10m		External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	2	4	5	2.68E-02	1.86E-03	4.84E-04	4.33E-02	3.01E-03	7.82E-04	160	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	4	2	2	4.91E-05	9.10E-06	3.40E-06	6.85E-05	1.26E-05	4.68E-06	240	0.05	0.07
	Wellfield Operator 1	Pump House Piping	2	1	1	4.74E-04	4.13E-05	1.08E-05	6.74E-04	5.81E-05	1.52E-05	240	0.24	0.34
		UBS Pond	2	1	1	4.63E-04	1.80E-04	8.75E-05	7.59E-04	2.94E-04	1.43E-04	240	0.29	0.47
Precipitate Removal Area	Plant Operator 1	Feed Tank	2.2	0.33	0.33	4.35E-04	8.51E-05	2.82E-05	7.13E-04	1.39E-04	4.60E-05	240	0.24	0.39
		Cake	1.6	0.33	0.33	2.08E-02	1.92E-03	5.06E-04	3.34E-02	3.09E-03	8.14E-04	240	8.19	13.15
		Thickener	2.2	0.33	0.33	7.17E-03	3.26E-03	1.43E-03	1.18E-02	5.34E-03	2.34E-03	240	4.16	6.86
Yellowcake Precip Area	Plant Operator 2	Precip Tank	2	0.33	0.33	1.63E-04	3.18E-05	1.05E-05	2.65E-04	5.17E-05	1.71E-05	240	0.08	0.13
		Cake	2	0.33	0.33	3.69E-05	7.89E-06	2.50E-06	3.69E-05	7.89E-06	2.50E-06	240	0.02	0.02
		Thickener	2	0.33	0.33	2.33E-06	1.87E-06	8.74E-07	2.33E-06	1.87E-06	8.74E-07	240	0.001	0.001
Water Treatment Area	Plant Operator 3	Clarifier	6	1	1	1.06E-03	5.03E-04	2.22E-04	1.63E-03	7.51E-04	3.30E-04	240	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0	1.5	0.5	9.12E-06	4.37E-06	1.55E-06	1.51E-05	4.37E-06	1.55E-06	240	0.002	0.002
		Calciner	0	1.5	0.5	1.52E-05	5.10E-06	2.30E-06	1.52E-05	5.10E-06	2.30E-06	240	0.002	0.002
Packaging Loading Area	Plant Operator 5	Drums	0	3	1	5.91E-05	1.19E-05	3.79E-06	5.91E-05	1.19E-05	3.79E-06	240	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	0	2	0	1.02E-07	8.54E-08	5.86E-08	1.84E-07	1.55E-07	1.06E-07	240	4.10E-05	0.0001
Precipitate Pond	Equipment Operator 1	Waste Pond	0	3	1	1.49E-02	6.78E-03	3.31E-03	2.45E-02	1.12E-02	5.43E-03	240	5.68	9.33
Industrial Landfill	Equipment Operator 1	No source	0	3	0	-	-	-	-	-	-	240	0	0
Core Shack	Geologist/ Geotech Logger	Cores	2	8	1	6.59E-03	4.39E-04	1.12E-04	1.06E-02	7.09E-04	1.81E-04	120	2.02	3.25

External Dose (mSv/a) = [  $\Sigma$  ET (h/d) x Max Effective Dose (mSv/h) ] x ED (d/a)

Dose to Lens (mSv/a) = [  $\Sigma$  ET (h/d) x Max Lens Dose (mSv/h) ] x ED (d/a)

**Notes:**

Maximum dose rates at distance (mSv/h) are output from Microshield scenarios; highest value considering all possible orientations.

Skin dose was less than or equal to lens dose, depending on the scenario.

## Attachment: IR-195

Number	IR-195
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.1
Context and Rationale	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</li> <li>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</li> <li>3. Update ERA figures and conclusions as needed.</li> </ol>

Figures and tables to support response in IR table:

**Table IR195-1: Modelled Maximum COPC Concentrations in Water by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	3.28E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	3.26E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	2.68E-04	8.40E-04
	Non-radionuclides during Decommissioning Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.14E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	3.87E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.11E+00	1.28E-04	7.30E-04	8.17E-04	2.40E-02	3.85E+01	4.12E-04	5.47E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.28E-05	4.20E+00	1.19E-04	6.54E-04	7.50E-04	1.58E-02	2.60E+01	2.59E-04	3.38E-04	3.28E-04	9.01E-04
Icelander River	1.26E-04	3.26E-05	4.16E+00	1.19E-04	6.52E-04	7.49E-04	1.56E-02	2.57E+01	2.56E-04	3.34E-04	3.26E-04	8.99E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.26E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	1.99E+01	1.95E-04	2.52E-04	2.69E-04	8.40E-04
	Radionuclides during Operations Phase (Bq/L)											
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210	
Kratchkowsky Lake	3.85E-04		3.85E-04		1.01E-02		5.70E-03		6.22E-03		6.33E-03	
Whitefish Lake North	3.77E-04		3.77E-04		1.01E-02		5.63E-03		5.68E-03		5.78E-03	

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Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/L)</b>					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.36E-03	6.71E-03
Whitefish Lake South	6.72E-03	6.72E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.15E-03	4.15E-03	1.57E-02	6.33E-03	6.68E-03	6.23E-03
Icelander River	4.11E-03	4.11E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.09E-03	3.09E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03

**Table IR195-2: Modelled Maximum COPC Concentrations in Sediment by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/kg dw)										
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.07E+01	4.79E-01	-	3.02E-01	7.41E+00	2.28E+00	5.40E+01	4.90E+00	6.39E+00	3.40E+01	1.32E+01
Whitefish Lake South	1.03E+01	4.73E-01	-	3.02E-01	7.35E+00	2.28E+00	5.30E+01	4.70E+00	6.12E+00	3.06E+01	1.31E+01
McGowan Lake	9.33E+00	4.30E-01	-	2.88E-01	6.90E+00	2.16E+00	3.88E+01	3.33E+00	4.26E+00	2.08E+01	1.21E+01
Russell Lake Inlet	8.95E+00	4.06E-01	-	2.80E-01	6.63E+00	2.09E+00	2.95E+01	2.60E+00	3.26E+00	1.73E+01	1.15E+01
Location	Non-radionuclides during Decommissioning Phase (mg/kg dw)										
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.10E+01	4.97E-01	-	3.05E-01	7.59E+00	2.31E+00	5.72E+01	5.48E+00	7.18E+00	3.72E+01	1.36E+01
Whitefish Lake South	1.05E+01	4.90E-01	-	3.04E-01	7.53E+00	2.30E+00	5.62E+01	5.26E+00	6.87E+00	3.33E+01	1.35E+01
McGowan Lake	9.47E+00	4.43E-01	-	2.90E-01	7.03E+00	2.18E+00	4.11E+01	3.71E+00	4.78E+00	2.22E+01	1.24E+01
Russell Lake Inlet	9.04E+00	4.15E-01	-	2.81E-01	6.73E+00	2.10E+00	3.13E+01	2.88E+00	3.64E+00	1.82E+01	1.17E+01
	Radionuclides during Operations Phase (Bq/kg dw)										
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210
Kratchkowsky Lake	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake North	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake Middle	7.85E+01		7.85E+01		3.77E+01		7.46E+01		5.41E+02		5.42E+02
Whitefish Lake South	7.51E+01		7.51E+01		3.75E+01		7.41E+01		5.07E+02		5.09E+02

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Denison Response – August 18<sup>th</sup>, 2023

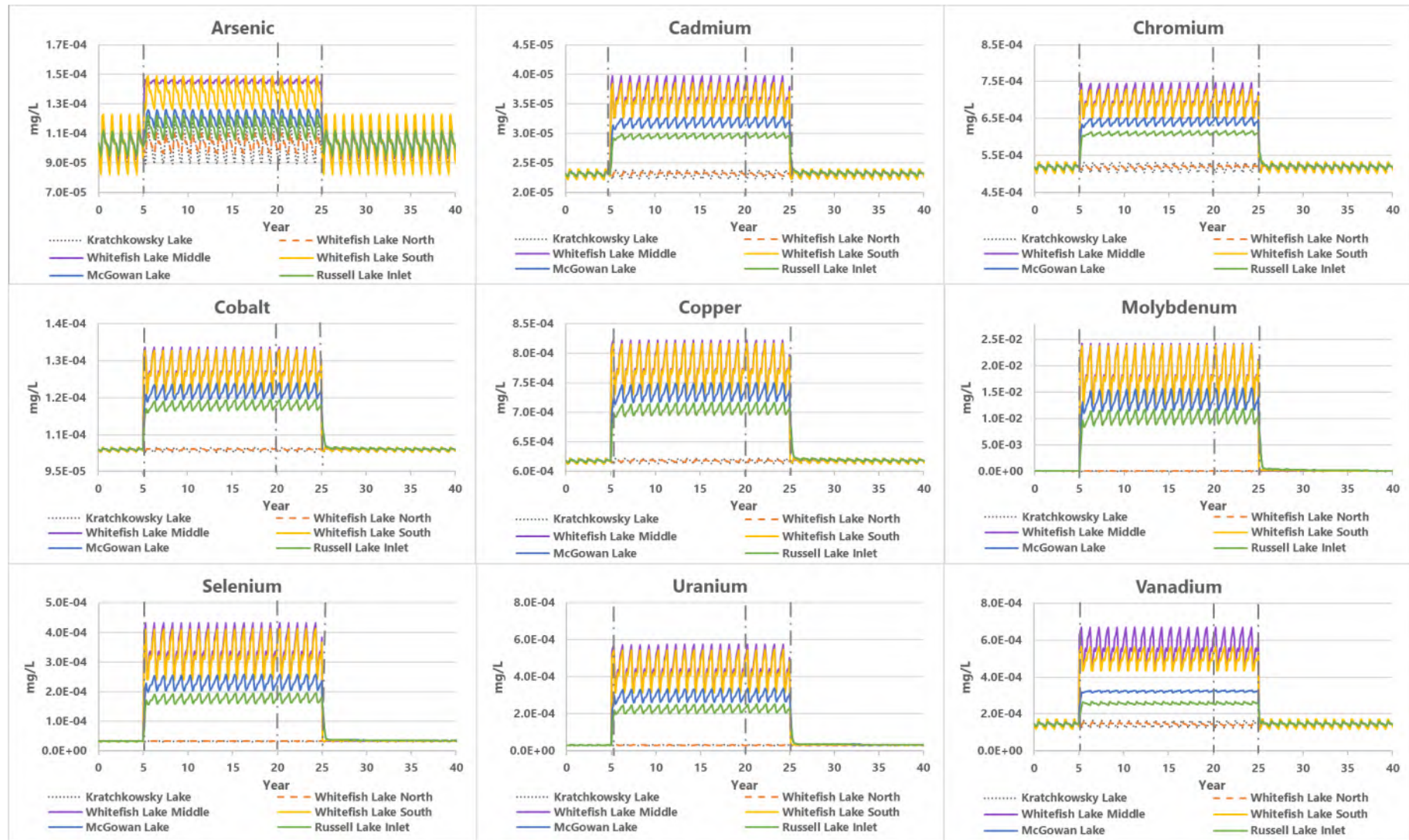
McGowan Lake	5.23E+01	5.23E+01	3.36E+01	7.15E+01	4.36E+02	4.41E+02
Russell Lake Inlet	4.01E+01	4.01E+01	3.11E+01	6.98E+01	4.11E+02	4.16E+02
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/kg dw)</b>					
Kratchkowsky Lake	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake North	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake Middle	8.82E+01	8.82E+01	3.83E+01	7.57E+01	5.57E+02	5.58E+02
Whitefish Lake South	8.44E+01	8.44E+01	3.80E+01	7.52E+01	5.19E+02	5.22E+02
McGowan Lake	5.87E+01	5.87E+01	3.41E+01	7.23E+01	4.42E+02	4.47E+02
Russell Lake Inlet	4.48E+01	4.48E+01	3.15E+01	7.04E+01	4.14E+02	4.20E+02

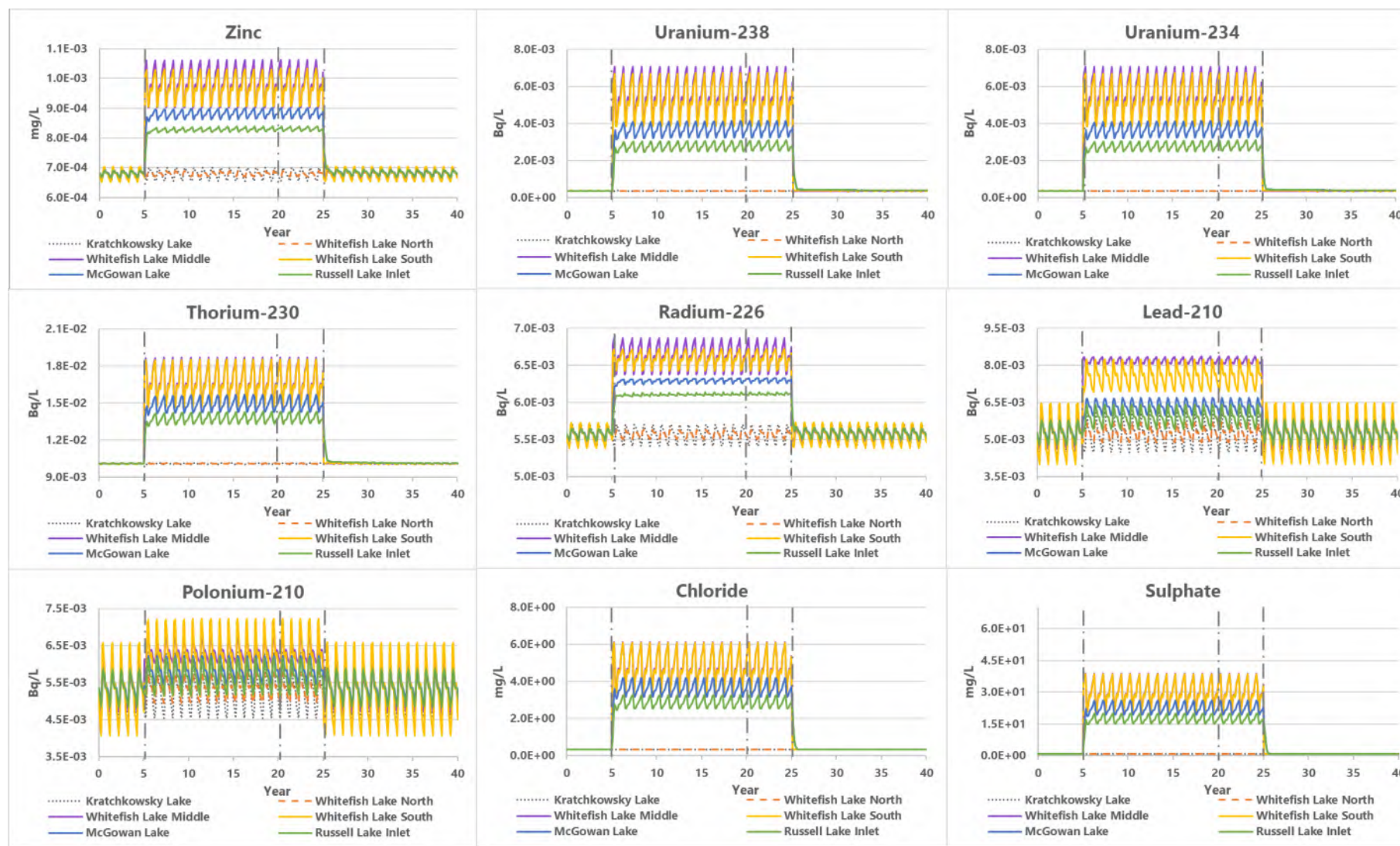
Table IR195-2: Summary of Effluent Quality for the Wheeler River Project during Operations and Decommissioning Phase

Constituent of Potential Concern (COPC)	Unit	Effluent Quality
<b>General Chemistry</b>		
Chloride	mg/L	600
Sulphate	mg/L	3915
Total Dissolved Solids	mg/L	6420
<b>Metals and Metalloids</b>		
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.003
Copper	mg/L	0.022
Molybdenum	mg/L	2.5
Selenium	mg/L	0.042
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
<b>Radionuclides</b>		
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7
Thorium-230	Bq/L	0.9
Radium-226	Bq/L	0.15
Lead-210	Bq/L	0.419
Polonium-210	Bq/L	0.15



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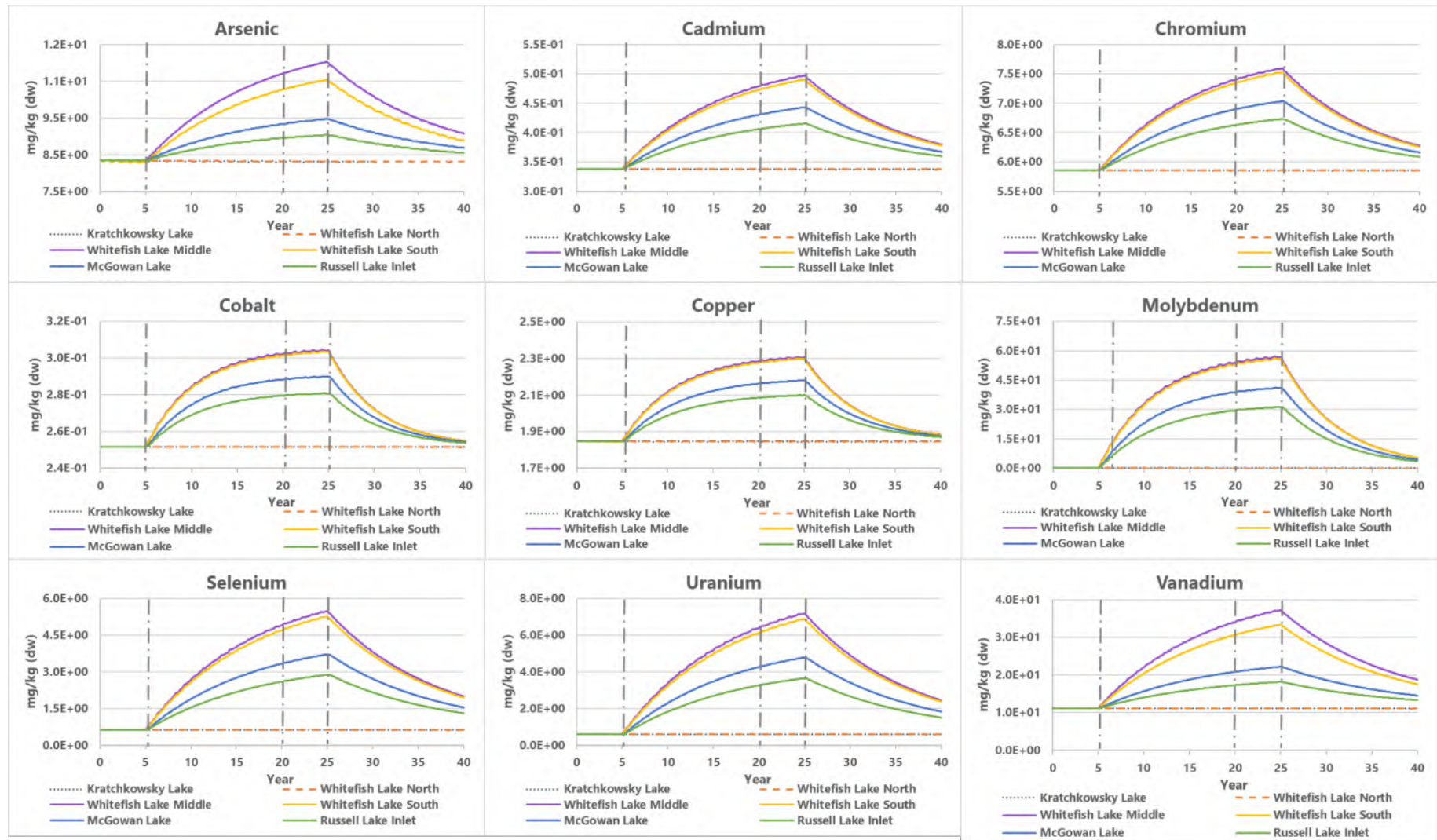


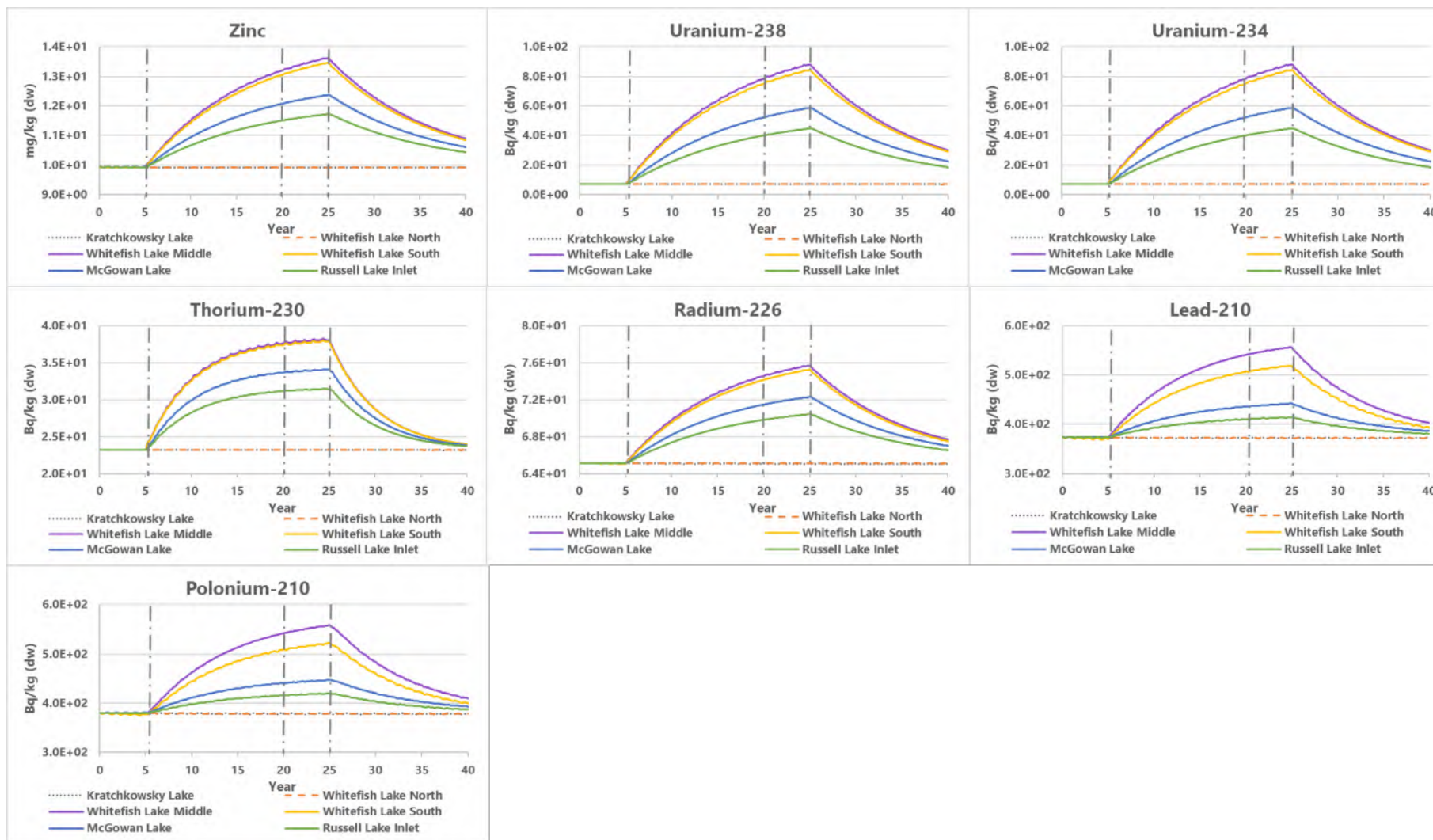
Long dash dot lines separate the time periods of project phases: 3 years baseline; 2 years construction; 15 years operations; 5 years decommissioning; first 15 years post-decommissioning

**Figure IR195-1: Modelled Concentrations of COPCs in Water during Project Phases**



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**Figure IR195-2: Modelled Concentrations of COPCs in Sediment during Project Phases**

## Attachment: IR-196

Number	IR-196
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.3
Context and Rationale	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information and justification for the selection of less stringent thresholds.</li> <li>2. Update the ERA as needed.</li> </ol>

Updated Appendix 10-A Table 3-6 below (red text indicates a change from the existing table in the draft EIS) to support response in IR table:

Constituent	Units	Maximum – Whitefish Lake (LA-5)	Sediment Quality Guidelines						Selected Sediment Screening Value	Is Concentration Greater than Selected Screening Value? (Y/N)
			Burnett-Seidel and Liber <sup>(b)</sup>		Thompson et al. <sup>(c)</sup>		CCME <sup>(d)</sup>			
			REF	NE2	LEL	SEL	ISQG	PEL		
Metals and Metalloids										
Arsenic	mg/kg dw	10.7	21	522	9.8	346	5.9	17	21	No
Cadmium	mg/kg dw	0.48	n/d	n/d	n/d	n/d	0.6	3.5	0.6	No
Chromium	mg/kg dw	7.41	31.5	26.2	47.6	115.4	37.3	90	31.5	No
Cobalt	mg/kg dw	0.3	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Copper	mg/kg dw	2.28	9.1	11.3	22	268.8	35.7	197	9.1	No
Lead	mg/kg dw	10.23	16.3	19.7	37	412	35	91.3	16.3	No
Molybdenum	mg/kg dw	53.99	23	245	14	1,239	n/d	n/d	23	Yes
Nickel	mg/kg dw	4	21	326	23	484	n/d	n/d	21	No
Selenium	mg/kg dw	4.9	3.6	30	1.9	16	n/d	n/d	3.6	Yes
Uranium	mg/kg dw	6.39	97	2,296	104	5,874	n/d	n/d	97	No
Vanadium	mg/kg dw	34.03	35.1	31.8	35.2	160	n/d	n/d	35.1	No
Zinc	mg/kg dw	13.2	n/d	n/d	n/d	n/d	123	315	123	No
Radionuclides										
Uranium-234	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Uranium-238	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Thorium-230	Bq/kg dw	37.71	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Radium-226	Bq/kg dw	74.55	n/d	n/d	600	14,400	n/d	n/d	600	No
Lead-210	Bq/kg dw	540.82	n/d	n/d	900	20,800	n/d	n/d	900	No
Polonium-210	Bq/kg dw	541.96	n/d	n/d	800	12,100	n/d	n/d	800	No
Bold and Grey shading indicates sediment concentration exceeds the REF or LEL value.										
a) Sediment concentrations predicted based on release of aqueous source-terms to LA-5 and interaction with sediment. Modelling performed in IMPACT according to the equations outlined in Appendix A.										

## Attachment: IR-198

Number	IR-198
Dept.	HC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)
Context and Rationale	Context: Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals. Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species. Rationale: While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.
Information Requirement	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.

### Response:

#### **1. Mammalian Organ Ingestion Rates**

The derivation of the Traditional Foods diet is explained in detail in Section 4.2.4.2 of Appendix 10-A (ERA), which states: “A dietary study was performed for residents of Patuanak and La Plonge to understand which traditional foods were consumed by each community and the approximate amounts consumed. The results of the survey were summarized in CanNorth (2017) by average daily intake in grams (fresh weight) of country foods by species and season, for Patuanak, La Plonge, and an average. A summary of the ERFN traditional food ingestion rates by food type is shown in Table 4-3 and the proportions of food types are shown in Figure 4-3.”



As shown in Table 4-3 in Appendix 10-A the mammalian organ ingestion rate was 6.2 g/d for La Plonge, and 16.2 g/d for Patuanak, and the average was 12.8 g/d for both areas combined. A more detailed breakdown of organ types is provided in IR-198 Table 1 below which indicates that organs are consumed from moose, woodland caribou, and barren-ground caribou. As shown in IR-198 Table 1 below, the greatest contribution to the total organ ingestion rate is from moose organs. Looking at the total organ ingestion rate, approximately 80% of the contribution is from moose liver, kidney, and other parts (see IR-198 Figure 1 below); therefore, it was decided for the ERA to assign the total organ ingestion rate to moose organs.

## **2. Rationale for Concentrations of Radionuclides in Moose Organs Only**

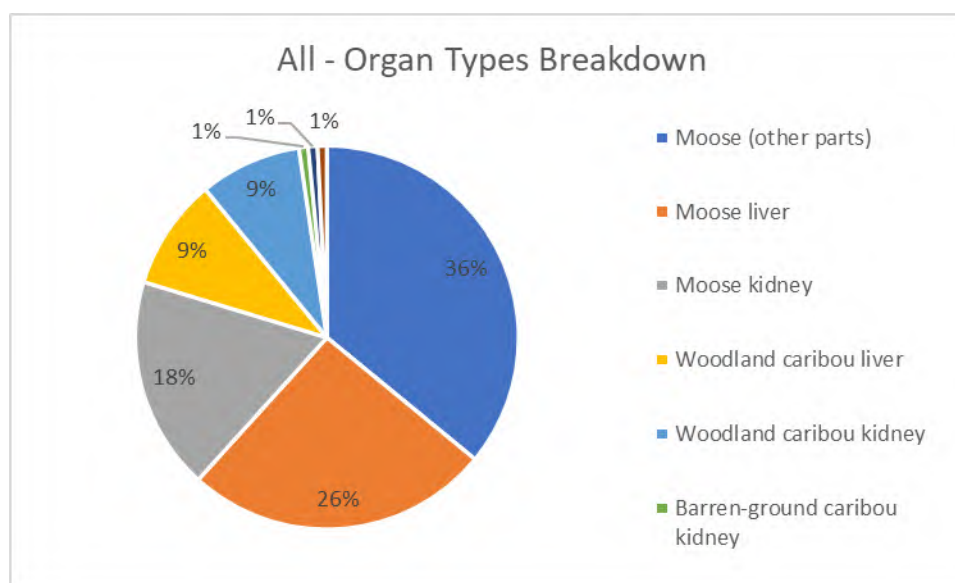
The reviewer also requested rationale for why concentrations of radionuclides are not provided for organs of animals other than moose. The reviewer acknowledges that they are “not aware of transfer factors to individual organs or to organs that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.” The transfer factor for moose organs was scaled based on the beef organs transfer factor from CSA N288.1-20 (see Table 3-15 in Appendix A to Appendix 10-A). Limited literature data is available for transfer factors for organs. It was decided to represent organs with moose organs based on the results from the ERFN diet explained above.

Denison acknowledges that the ingestion transfer factors for woodland caribou organs would be higher than the transfer factors for moose. These ingestion transfer factors are summarized in IR-198 Table 2 below for the relevant radionuclides, and the resulting tissue concentrations based on predicted concentrations at McGowan Lake are summarized in IR-198 Table 3. The predicted tissue concentrations for woodland caribou organs ranges from about 0.6 to 6.9 times higher than the predicted tissue concentrations for moose organs for radionuclides in the U-238 decay chain. However, based on the breakdown of organ ingestion rates shown in IR-198 Table 1 below, the caribou organ intake rate is ¼ of the moose organ intake rate, which roughly offsets the higher concentrations in caribou organs. Therefore, representing the organ intake as 100% moose organs is a reasonable approximation.

No changes to the EIS or ERA (Appendix 10-A) were made based on the response to this IR.

**IR-198 Table 1: Breakdown of Contribution of Organ Types to Total Organ Ingestion Rate**

Organ Types	La Plonge g/d	Patuanak g/d	All g/d	La Plonge % of Organs	Patuanak % of Organs	All % of Organs
Moose (other parts)	2.4	5.7	4.6	39%	35%	36%
Moose liver	1.8	4.1	3.3	29%	25%	26%
Moose kidney	1.8	2.5	2.3	29%	15%	18%
Woodland caribou liver	0.1	1.7	1.2	2%	10%	9%
Woodland caribou kidney	0.05	1.7	1.1	1%	10%	9%
Barren-ground caribou kidney		0.2	0.1	0%	1%	1%
Barren-ground caribou liver		0.2	0.1	0%	1%	1%
Caribou (other parts)	0.02	0.1	0.1	0%	1%	1%
<b>Total Organs</b>	<b>6.2</b>	<b>16.2</b>	<b>12.8</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>



**IR-198 Figure 1: Breakdown of Organ Types for ERFN Traditional Foods Diet**

**IR-198 Table 2: Ingestion Transfer Factors (d/kg fw) for Mammalian Organs**

<b>Radionuclide</b>	<b>Beef Organs</b>	<b>Moose Organs</b>	<b>Woodland Caribou Organs</b>
Body Weight (kg)	600	400	180
Uranium-238	6.90E-04	9.35E-04	1.70E-03
Uranium-234	6.90E-04	9.35E-04	1.70E-03
Thorium-230	6.30E-02	8.54E-02	1.55E-01
Radium-226	9.50E-04	1.29E-03	2.34E-03
Lead-210	2.20E-02	2.98E-02	5.43E-02
Polonium-210	5.00E-05	6.78E-05	1.23E-04

**IR-198 Table 3: Estimated Tissue Concentrations of Moose Organs and Woodland Caribou Organs at McGowan Lake**

<b>Tissue Type</b>	<b>Units</b>	<b>U-238</b>	<b>U-234</b>	<b>Th-230</b>	<b>Ra-226</b>	<b>Pb-210</b>	<b>Po-210</b>
Moose organs	mg/kg fw	7.84E-02	7.84E-02	3.04E+00	8.76E-02	7.15E+00	1.31E-02
Woodland caribou organs	mg/kg fw	3.31E-01	3.31E-01	3.30E+00	5.46E-02	4.94E+01	7.50E-02

## Attachment: IR-213

Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

Table to support response in IR table:

Table 3-2 in Appendix A of Appendix 14-A will be updated in the final EIS to include (new) Scenario 2.4 Well Casing Yield and/or Damage:

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.4	Scenario 2.4 Well Casing Yield and/or Damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Risk level is low, moderate consequence event (assume localized event to ground where clean up is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

:

## Attachment: IR-214

Number	IR-214
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Section 14.5.3 Appendix 14-A, section 3.2.3
Context and Rationale	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <ul style="list-style-type: none"> <li>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</li> <li>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</li> <li>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</li> <li>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</li> <li>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</li> <li>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</li> </ul> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>

Information Requirement	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.
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Tables to support response to IR-214:

The updated hazard screening tables on the following pages are provided in support of the response to IR-214.

It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.



Site Works - Summary – Nine potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-1: Hazard Identification Evaluation – Site Works

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
1.1	Fall / slip	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment	5	23	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.2	Fall / slip	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.3	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	4	2	Low	Overall Risk level is low, low-minor consequence event, no further assessment
1.4	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	1	3	Low	Overall Risk level is low, highly unlikely event, no further assessment
1.5	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	2	23	Low	Overall Risk level is low, highly-unlikely event, no further assessment
1.6	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.7	Vehicle and construction equipment accident	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage)	4	2	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.8	Vehicle and construction equipment accident	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.9	Vehicle accident	Co / Op / De	Hazardous materials spill	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage) Spill management and response	4	2	Low	Overall Risk level is low, minor consequence events, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



- EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply

Wellfield - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-2: Hazard Identification Evaluation – Drilling

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.1	Drilling mud spill	Co / Op	Material spill to ground, including contaminated drill muds	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Primary and secondary containment for drilling mud	4	2	Low	Overall risk level is low, <u>low-minor</u> consequence event (assumes containment and clean up), no further assessment
2.2	Piping failure in the well field	Co / Op	Loss of lixiviant, UBS, and/or regents to ground	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to ground where clean up is possible prior to groundwater contamination), no further assessment
2.3	Surface flood	Co / Op	Potential for groundwater contamination	Lined collection points Site grading to collection areas Collection pond sized to accommodate PMP	2	2	Low	Overall risk level is low, <u>low-minor</u> consequence event, no further assessment
2.4	Well casing yield and/or damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to groundwater where cleanup is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking


**EcoMetrix**

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
 Note: Table includes new scenario 2,4 FIRT IR 213.  
 August 16, 2023, 8:23 AM

Access Road / Land Transportation - Summary – Eight potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios carried forward for quantitative assessment.

Table 3-3: Hazard Identification Evaluation – Access Road / Land Transportation (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequences	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
3.1	Vehicle accident including rollover, collision, run off road	Op	Aquatic release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.2	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.3	Vehicle accident including rollover, collision, run off road	Co / Op / De	Aquatic release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.4	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP; Further Assessment Recommended to address interested party concerns (includes consideration of radioactivity)
3.5	Vehicle fire	Co / Op / De	Terrestrial release of hydrocarbons and fuel	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.6	Vehicle fire	Co / Op / De	Release of radioactivity to air	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	<u>Overall moderate (ALARP) low-risk, low-probability</u> highly unlikely event. Reversible and transient effect. No further assessment
3.7	Vehicle fire	Co / Op / De	Atmospheric release of particulate and combustion by-products	Occupational health and safety plan Personnel training and orientation Travel management plan Spill management and emergency response plan Fire safety plan and firefighting systems Ambient air monitoring	1	3	Low	<u>Overall low-low risk, highly unlikely-low-probability</u> event. Reversible and transient effect. No further assessment
3.8	Vehicle – Wildlife collision	Co / Op / De	Wildlife fatality	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan	4	2	Low	<u>Overall low risk</u> . Individual (not population) level <u>minor</u> effect, reversible and nonsignificant effect, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



Airstrip - Summary – Four potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-4: Hazard Identification Evaluation – Airstrip

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
4.1	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	1	3	Low	<del>Overall r</del> Risk level is low, highly unlikely event, no further assessment
4.2	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Secondary containment Spill and emergency response plan	4	2	Low	<del>Overall Risk</del> risk level is low, <del>low-minor</del> consequence event, no further assessment
4.3	Plane de-icing chemical release	Co / Op / De	Terrestrial release of reagent; possible aquatic release of reagent	Personnel training Containment Spill and emergency response plan	3	2	Low	<del>Overall r</del> Risk level is low, <del>low-minor</del> consequence event, no further assessment
4.4	<u>Air plane</u> crash	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-likelihood</del> Highly unlikely event, best practice in air traffic control resulting in ALARP, no further assessment
4.5	Ground vehicle – <u>air plane</u> collision	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Ground traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-Highly unlikely</del> likelihood event, best practice in air / ground traffic control resulting in ALARP, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze plant - Summary – Five potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.

Table 3-5: Hazard Identification Evaluation – Freeze plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
5.1	Ammonia storage and piping failure	Co / Op	Material spill	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	3	2	Low	<del>Overall risk</del> Risk level is low, <del>low</del> <u>minor</u> consequence event, no further assessment
5.2	Loss of freeze capacity	Op	Loss of freeze wall and secondary underground containment	Freeze wall monitoring Monitoring wells outside of the freeze wall – temp, pressure Back up gensets	1	5	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended. Denison does not believe a leak would occur however public perception of a loss of containment is of high concern and should assessed. In practice, the mechanical failure of refrigeration system can be addressed and mitigated well before the thawing of the freeze wall which would take months.
5.3	Cooling line break	Co / Op	Release of brine below ground and potential for groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Spill and emergency response plan	2	4	ALARP, moderate	<del>Low likelihood</del> <u>Unlikely</u> event, best practice resulting in ALARP, no further assessment
5.4	Cooling line break	Co / Op	Release of brine on surface – <del>potential</del> <u>potential</u> for ground and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Pipes in trenches and secondary containment Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low</del> <u>minor</u> consequence event with appropriate response and mitigation, no further assessment
5.5	Pumps failure	Co / Op	Release of brine on surface - potential for surface and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system No open drain from pumphouse Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low</del> <u>minor</u> consequence event with appropriate response and mitigation, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze wall - Summary – One potential scenario has been identified. Risks have been characterized as high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.								
Table 3-6: Hazard Identification Evaluation – Freeze wall								
ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
6.1	Failure of freeze wall due to seismic event / geotechnical instability	Op	Loss secondary underground containment and groundwater contamination	Freeze wall monitoring Redundancy in design Control of pump and injection wells	2	4	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended

Notes: “Co” is construction  
“Op” is [operations](#)  
“De” is Decommissioning  
“L” is [likelihood](#)  
“S” is [severity](#)  
“RR” is risk [ranking](#)

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EcoMetrix

No changes needed.

@mention or reply

Production Plant - Summary – Seven potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios are carried forward for quantitative assessment.

Table 3-7: Hazard Identification Evaluation – Production Plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
7.1	Process vessel and piping system failure	Op	Release of sulphuric acid	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.2	Process vessel and piping system failure	Op	Release of hydrogen peroxide and potential for fire	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.3	Process vessel and piping system failure	Op	Release of magnesium hydroxide	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.4	Process vessel and piping system failure, Thickener overflow	Op	Release of aqueous solution	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained Detectable signs of exposure e.g., irritation	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment. ALARP
7.5	Process vessel and piping system failure	Op	Release of acidic fume from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Availability of respirators Emergency response plan will implement medical response to acute exposure to acidic fumes. Ambient monitoring Building ventilation	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.6	Process vessel and piping system failure	Op	Release of radon from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Emergency response plan Ambient monitoring Building ventilation	3	3	Moderate	Overall moderate risk, moderate consequence event - Further Assessment Recommended
7.7	Facility fire / explosion	Op	Release of radioactivity and yellowcake powder to atmosphere	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan Ambient air monitoring	2	5	High	Further Assessment Recommended. It is also noted that this scenario could be an outcome of many initiating events – the specific details associated with the event will be determined based on the most current inventory of combustible and flammable materials associated with the production plant when the analysis is completed.
7.8	Process containment and gas cleaning and filtration system failure	Op	Release of yellowcake powder to atmosphere	Inspection, testing, and maintenance program Ambient air monitoring	3	4	ALARP, moderate	The consequence is bounded by scenario 7.7.

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.



Clean Waste Rock Pads - Summary – Four potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-8: Hazard Identification Evaluation – Clean Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
8.1	Stockpile slope failure	Co / Op / De	Release of material into surrounding environment	Personnel training and orientation Inspection and maintenance	2	2	Low	Overall low risk, unlikely event due to small extent of stockpiles, no further assessment
8.2	Stockpile erosion	Co / Op / De	Release of materials into the environment	Personnel training and orientation Inspection and maintenance Single-lined pad Inspection and maintenance	2	3	Low	Overall low risk, highly unlikely event, no further assessment
8.3	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of materials into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Ambient monitoring Surface water management Spill management	1	2	Low	Overall low risk, highly unlikely event, no further assessment
8.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of materials into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill response plan	2	3	Low	Overall low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
August 16, 2023, 9:11 AM  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
With Specific reference FIRT IR 214(IV) it is believed that that the revised scoring "unlikely" better reflects the event likelihood. Stockpile erosion may not be uncommon but stockpile erosion that would lead to an environmental release as envisioned by the scenario in consideration of the design basis is deemed unlikely.  
August 16, 2023, 9:12 AM  
@mention or reply

Special / Specialized Waste Containment - Summary – Two potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-9: Hazard Identification Evaluation –Special / Specialized Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
9.1	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Ambient monitoring Surface water management Spill management	1	3	Low	<del>Overall low</del> low risk, <del>highly</del> unlikely event, no further assessment
9.2	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill response plan	1	4	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)



EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Gypsum (clean) Precipitates Disposal Area - Summary – Five potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-10: Hazard Identification Evaluation – Gypsum (clean) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
10.1	Precipitates erosion	Co / Op /De	Release of contaminants into surrounding environment	Personnel training and orientation Single-lined pad Inspection and maintenance	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.2	Uncontrolled leachate / seepage release through runoff	Co / Op /De	Release of contaminants into the environment	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.3	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.4	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill management and response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.5	Wind erosion	Co / Op /De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)

EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Iron (contaminated) Precipitates Disposal Area – Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-11: Hazard Identification Evaluation – Iron (contaminated) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
11.1	Precipitates erosion	Co / Op / De	Release of contaminants into surrounding environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment
11.2	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of contaminants into the environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.3	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.5	Wind erosion	Co / Op / De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix
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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Wastewater Treatment System - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-12: Hazard Identification Evaluation – Wastewater Treatment System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
12.1	Equipment / piping failure	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Piping design pressure higher than pumps shutoff pressure Inspection and maintenance Process monitoring Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, containment of the piping within the ditches indicates no further assessment
12.2	Effluent clarifier overflow	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Secondary containment Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, no further assessment
12.3	Equipment and control system failure	Op / De	Release of reagents, Environmental contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Recirculation of off-spec water to the process Spill management and response	2	3	Low	Low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix

Changes made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenarios 12.1 and 12.2 were "moderate" but should have been ranked "low" based on L=2 and S=3.  
August 16, 2023, 8:47 AM

Ponds and Retention Berms - Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-13: Hazard Identification Evaluation – Ponds and Retention Berms

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
13.1	Pond overtopping	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	2	3	Low	Overall low risk, <del>low-probability</del> unlikely event, no further assessment
13.2	Ponds containment or embankment failure	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	5	ALARP, moderate	Best engineering practice in maintenance and inspection of the containment systems and berms. No further assessment
13.3	Ponds lining failure and leakage	Op / De	Contaminant and radioactivity release to groundwater	Personnel training and orientation Inspection and maintenance Groundwater monitoring Response plan	2	3	ALARP, moderate	Overall moderate risk, <del>low-probability</del> likely event with moderate consequence. Overall risk considered ALARP given engineering design and other safeguards. No further assessment recommended.
13.4	Surface flooding	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	3	Low	Overall low risk, <del>low-probability</del> highly unlikely event, no further assessment
13.5	Wildlife entering pond	Op/De	Exposure to contaminants, drowning	Wildlife management plan Inspection Fencing	1	2	Low	Overall low risk, <del>low-probability</del> highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



**EcoMetrix**  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply



**EcoMetrix**  
Per FIRT IR 214 the likelihood score has been revised from L=2 (unlikely) to L=3 (likely) and therefore overall risk has been updated to ALARP, moderate from Low.  
Based on information received from manufactures and the project team's own experience it is thought the L=3 (≤1 occurrence in 10 years and >1 occurrence in 100 years) may better reflect liner performance, assuming the liner is installed based on appropriate design criteria and used as intended.  
August 16, 2023, 10:34 AM  
@mention or reply

Electrical System and Power Plant - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-14: Hazard Identification Evaluation – Electrical System and Power Plant

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
14.1	Substation transformer leak	Co / Op / De	Release of mineral oil and potential for groundwater contamination	Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment	3	2	Low	Overall low risk, low-minor consequence, no further assessment
14.2	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational major injuries	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	2	23	ALARP, moderate/low	Best practice in worker health and safety program resulting in ALARP, no further assessment
14.3	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational fatalities	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

**EcoMetrix** ...  
Per FIRT IR 214, updated severity to 3 (from 2) to reflect occupational injury.  
Also, originally the overall risk ranking was ALARP, moderate - this has been revised to ALARP, low consistent with the hazard analysis risk matrix.  
August 16, 2023, 9:18 AM  
@mention or reply

**EcoMetrix** ...  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix. Also, change made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenario 14.2 was "moderate" but should have been ranked "low" based on L=2 and S=2.  
August 16, 2023, 8:52 AM  
@mention or reply



Fire Protection System - Summary – Two potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-15: Hazard Identification Evaluation – Fire Protection System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
15.1	Failure of fire pump	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Redundancy Fire safety plan and firefighting systems (including and elevated fire water tank, and a gas-powered pump for at a groundwater well) Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment
15.2	Loss or lack of fire water	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix
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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Hazardous Waste Management System - Summary – One potential scenario has been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-16: Hazard Identification Evaluation – Hazardous Waste Management System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
16.1	Hazardous waste spill	Co / Op / De	Potential for surface water and soil contamination	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Waste management plan Emergency response plan Onsite monitoring	2	2	Low	Overall low risk, low-minor consequence event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

## Attachment: IR-217


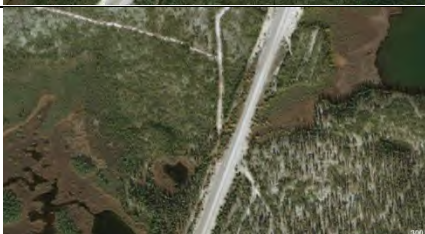


Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

### Response:





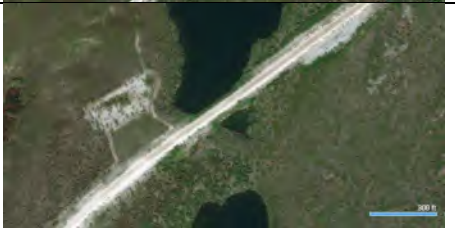

As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. A total of 66 water crossings were identified as shown in Table IR-217-1, below. Coordinates (lat., long.; are provided for each of the crossings along with a basic description of each and a corresponding satellite image. For reference, in the table the designation “Highway 165W” means the location of the crossing is on Hwy 165 west of Hwy 914, beginning at the Hwy 165/155 and travelling east and the designation “Highway 165E” means the crossing is east of Hwy 914, travelling east toward Hwy 2. It is noted that most crossings are not identifiable by a specific name and are thus identified as “Unnamed creek”.

As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.

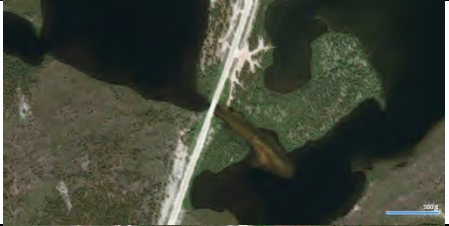





**Table IR-217-1 – Water Crossings on the Wheeler River Project Transport Route**

Crossing #	Hwy	Coordinates	Name	Feature	Feature Width (m)	Image
1	914	<a href="#">57.439217, -105.399002</a>	Unnamed creek	Water crossing	10	
2	914	<a href="#">57.378448, -105.464859</a>	Unnamed creek	Water crossing	<2	
3	914	<a href="#">57.354164, -105.485123</a>	Russell Lake	Lake crossing	900	
4	914	<a href="#">57.285332, -105.570038</a>	Unnamed creek	Water crossing	<2	

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5	914	<a href="#">57.273514, -105.591202</a>	Unnamed creek	Wetland complex	100	
6	914	<a href="#">57.220776, -105.685287</a>	Unnamed creek	Water crossing	13	
7	914	<a href="#">57.053490, -105.983330</a>	Unnamed creek	Wetland complex	35	
8	914	<a href="#">56.898136, -106.130302</a>	Unnamed creek	Water crossing	50	
9	914	<a href="#">56.882645, -106.152107</a>	Unnamed creek	Water crossing	60	
10	914	<a href="#">56.850391, -106.159187</a>	Unnamed creek	Water crossing	10	

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11	914	<a href="#">56.793152, -106.146248</a>	Unnamed creek	Water crossing	15	
12	914	<a href="#">56.787197, -106.149460</a>	Unnamed creek	Water crossing	<2	
13	914	<a href="#">56.722340, -106.165710</a>	Unnamed creek	Water crossing	<2	
14	914	<a href="#">56.669765, -106.201149</a>	Unnamed creek	Water crossing	10	
15	914	<a href="#">56.600300, -106.252251</a>	Unnamed creek	Water crossing	<2	
16	914	<a href="#">56.572754, -106.281494</a>	Unnamed creek	Water crossing	<2	



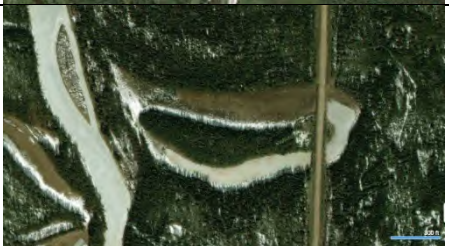
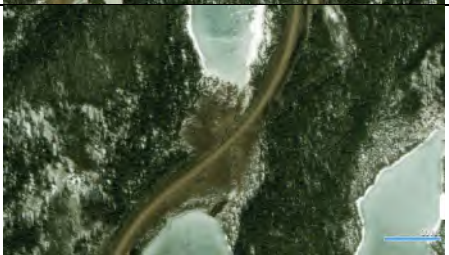
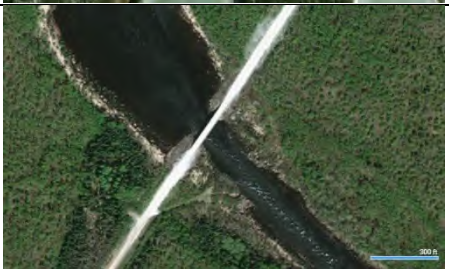
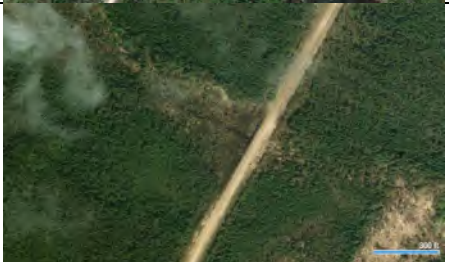


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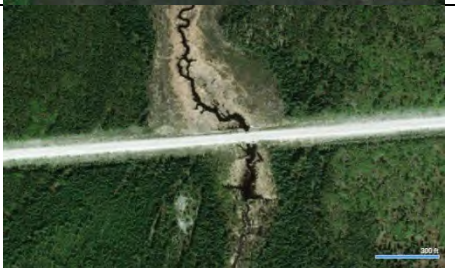


17	914	<a href="#">56.554306, -106.306236</a>	Unnamed creek	Water crossing	<2	
18	914	<a href="#">56.539055, -106.330338</a>	Unnamed creek	Water crossing	5	
19	914	<a href="#">56.444473, -106.401733</a>	Unnamed creek	Water crossing	10	
20	914	<a href="#">56.388561, -106.512726</a>	Unnamed creek	Water crossing	20	
21	914	<a href="#">56.353569, -106.565643</a>	Unnamed creek	Water crossing	<2	
22	914	<a href="#">56.329689, -106.562004</a>	Unnamed creek	Water crossing	10	








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23	914	<a href="#">56.147633, -106.613579</a>	Unnamed creek	Water crossing	35	
24	914	<a href="#">55.994797, -106.521835</a>	Unnamed creek	Water crossing	10	
25	914	<a href="#">55.967976, -106.532318</a>	Unnamed creek	Water crossing	30	
26	914	<a href="#">55.867905, -106.503120</a>	Unnamed creek	Water crossing	<2	
27	914	<a href="#">55.733261, -106.565331</a>	Churchill River	Water crossing	40	
28	914	<a href="#">55.660831, -106.585144</a>	Unnamed creek	Water crossing	<2	

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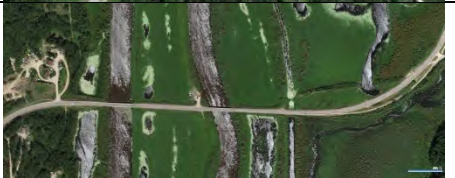


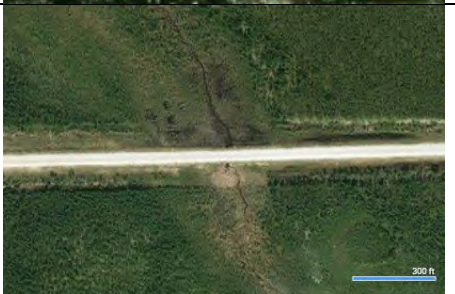

29	914	<a href="#">55.656418, -106.588326</a>	Unnamed creek	Water crossing	<2	
30	914	<a href="#">55.568588, -106.603722</a>	Unnamed creek	Water crossing	10	
31	914	<a href="#">55.494350, -106.646774</a>	Unnamed creek	Water crossing	<2	
32	914	<a href="#">55.504215, -106.714218</a>	Unnamed creek	Water crossing	7	
33	914	<a href="#">55.500674, -106.768551</a>	Unnamed creek	Water crossing	5	
34	914	<a href="#">55.474350, -106.836800</a>	Unnamed creek	Water crossing	20	

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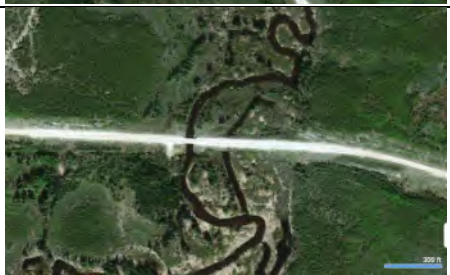



35	914	<a href="#">55.465046, -106.865280</a>	Unnamed creek	Water crossing	<2	
36	914	<a href="#">55.434074, -106.842552</a>	Unnamed creek	Water crossing	<2	
37	914	<a href="#">55.378868, -106.833595</a>	Unnamed creek	Water crossing	10	
38	914	<a href="#">55.358044, -106.839149</a>	Unnamed creek	Water crossing	<2	
39	914	<a href="#">55.282467, -106.815933</a>	Unnamed creek	Water crossing (2x)	40	








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40	165W	<a href="#">55.124847, -107.681786</a>	Unnamed creek	Water crossing	15	
41	165W	<a href="#">55.153086, -107.597933</a>	Beaver River	Crossing complex	750	
42	165W	<a href="#">55.219022, -107.403364</a>	Unnamed creek	Water crossing (minor)	3	
43	165W	<a href="#">55.222092, -107.214650</a>	Unnamed creek	Water crossing	18	
44	165W	<a href="#">55.240179, -106.869717</a>	Unnamed creek	Water crossing (minor)	3	
45	165E	<a href="#">55.229849, -106.789293</a>	Unnamed creek	Wetland complex	100	

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46	165E	<a href="#">55.210766, -106.789518</a>	Unnamed creek	Water crossing	6	
47	165E	<a href="#">55.190045, -106.755394</a>	Unnamed creek	Water crossing (one side ponded)	60	
48	165E	<a href="#">55.178462, -106.686886</a>	Unnamed creek	Crossing complex	13	
49	165E	<a href="#">55.164998, -106.635760</a>	Unnamed creek	Water crossing (one side ponded)	25	
50	165E	<a href="#">55.147328, -106.569588</a>	Unnamed creek	Water crossing (minor)	5	
51	165E	<a href="#">55.145846, -106.480813</a>	Unnamed creek	Water crossing	10	

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52	165E	<a href="#">55.148323, -106.465283</a>	Unnamed creek	Water crossing (minor)	3	
53	165E	<a href="#">55.155644, -106.419692</a>	Unnamed creek	Water crossing (minor)	3	
54	165E	<a href="#">55.160151, -106.391546</a>	Unnamed creek	Wetland complex	25	
55	165E	<a href="#">55.156452, -106.340823</a>	Unnamed creek	Water crossing	10	
56	165E	<a href="#">55.159666, -106.317084</a>	Unnamed creek	Water crossing	5	
57	165E	<a href="#">55.166328, -106.259241</a>	Unnamed creek	Water crossing (minor)	2	


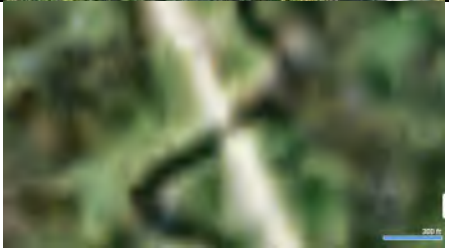



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58	165E	<a href="#">55.163412, -106.206745</a>	Smoothstone River	Water crossing (major)	50	
59	165E	<a href="#">55.122788, -106.016421</a>	Unnamed creek	Water crossing (minor)	5	
60	165E	<a href="#">55.103940, -105.963149</a>	Unnamed creek	Water crossing (minor)	3	
61	165E	<a href="#">55.104002, -105.949567</a>	Unnamed creek	Water crossing (ponded)	70	
62	165E	<a href="#">55.076830, -105.859303</a>	Unnamed creek	Water crossing (minor)	3	
63	165E	<a href="#">55.059849, -105.821333</a>	Unnamed creek	Water crossing (minor)	5	



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64	165E	<a href="#">55.056275, -105.810201</a>	Unnamed creek	Water crossing (minor)	3	
65	165E	<a href="#">54.884914, -105.748054</a>	Montreal River	Water crossing (major)	20	
66	165E	<a href="#">54.811663, -105.671518</a>	Unnamed creek	Water crossing (ponded)	38	

## Attachment: IR-218

Number	IR-218
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1.1 and 14.6.1.4
Context and Rationale	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>
Information Requirement	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.

Updated EIS tables to support response:

Table 14.6-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	3,309 <del>2,535</del>	129
Maximum	47	2,535 <del>3,309</del>	912

Table 8-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	<u>3,309</u> <del>2,535</del>	<u>129</u>
Maximum	47	<u>2,535</u> <del>3,309</del>	<u>912</u>

## Attachment: IR-236

Number	IR-236
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 15.5.2, Expected Environmental Conditions
Context and Rationale	<p>Context: It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p>Rationale: In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics.</p> <p>Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>
Information Requirement	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p>Technical Discussion Required: Yes</p>

### Response:

During the EIS review by the FIRT, there were information requirements (IRs; mainly IR-235 and IR-236, and to a lesser extent IR-103 and IR-104) related to current and future climate precipitation, as well as the probable maximum precipitation. The information in Attachment IR-236 will be added as *Appendix D Summary of Precipitation Values Presented in the EIS* to Appendix 6-C in the final EIS. The Project design and site drainage plan are more closely linked to detailed design to support the licensing process and the precipitation information provided in the draft EIS to support an EA decision is adequate. This new appendix to Appendix 6-C serves to provide clarifications only.

The probable maximum precipitation (PMP) event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program

(1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes. As an example, during a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m<sup>3</sup> (*excluding a freeboard of 1 meter*). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In EIS Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.”

Tables 1 to 4 below provide a summary of precipitation information for both current / existing climate and future climate under different emissions scenarios, in order to 1) summarize precipitation data from various sections of the EIS (Section 6 including Appendix 6-C, Section 8, and Section 15) and 2) provide context on the PMP of 493 mm in comparison to precipitation values (annual precipitation, maximum 1-day precipitation, and 1:100 year, 24 hour return).

Table 1: Precipitation - Existing Climate – Comparisons of Observed Annual Average Precipitation and Maximum 24-hour Precipitation to PMP

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
Annual average precipitation	456 mm	Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Annual average precipitation	483 mm	Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Maximum 24-hour precipitation	45.9 mm	Occurred on August 8, 2020.  Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 10.7 x lower than PMP</i></b>
Maximum 24-hour precipitation	72 mm	Occurred July 12, 1998. Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 6.8 x lower than PMP</i></b>

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
1 in 100 year, 24 hour return	79.9 mm	Calculated using IDF_CC Tool for the Wheeler River Project. Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 6.2 x lower than PMP</b>
1 in 100 year, 24 hour return	56.4 mm	Return Period Estimate based on data from the Key Lake Mine using the IDF_CC Tool (~32 km away from Wheeler River Project). Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 8.7 x lower than PMP</b>



Table 2: Precipitation – Future Climate - Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)

Year	Total Annual (mm)				Maximum 1-day (mm)			
	Measured	RCP 2.6	RCP 4.5	RCP 8.5	Measured	RCP 2.6	RCP 4.5	RCP 8.5
<b>2011-2020</b>	455	518	509	508	48	29	27	27
<b>2030</b>		528	503	537		27	24	26
<b>2040</b>		487	498	514		28	29	24
<b>2050</b>		504	524	520		26	29	33
<b>2060</b>		513	515	523		26	33	26
<b>2070</b>		527	534	568		29	31	28
<b>2080</b>		539	551	547		30	33	28
<b>2090</b>		543	545	548		31	32	35
<b>2100</b>		546	535	559		23	25	28
<b>Overall Increase:</b>		28	26	51		-6	-2	1

Table 3: Precipitation – Future Climate - Historical and Future Precipitation Data (Total Annual and Maximum 1-day) for Tomblin Lake, Climate Atlas (provided in EIS, Section 15, Table 15.5-1 and 15.5-2)

Period	Total Annual (mm)			Maximum 1-day (mm)		
	Historical	RCP 4.5	RCP 8.5	Measured	RCP 4.5	RCP 8.5
<b>Historical mean (1976-2005)</b>	456			24.1		
<b>Near Term (2021-2050)</b>		484	487		25.9	25.9
<b>Far Term (2051-2080)</b>		500	509		26.7	27.5

Table 4: Precipitation – Future Climate - Predicted Precipitation (1:100 year, 24-hour return) for Key Lake and Wheeler River Project, 2020 to 2050 using IDF\_CC Tool (provided in EIS Section 8)

Location	1:100 year, 24-hour return
<b>Key Lake Mine</b>	62.0
<b>Wheeler River Project</b>	88.6

References:

Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.

Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.

## Attachment: IR-237

Number	IR-237
Dept.	CNSC
Project effects link	EA follow-up and monitoring program
Reference to EIS, appendices, or supporting documentation	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)
Context and Rationale	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"> <li>objectives and structure of the follow-up program and the VCs targeted by the program</li> <li>tabular summary and explanatory text of the main components of the program including: <ul style="list-style-type: none"> <li>a description of each monitoring activity under that component</li> <li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li> <li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li> <li>the specific monitoring objective for that activity</li> <li>planned schedule</li> </ul> </li> <li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li> <li><u>possible involvement of independent researchers</u></li> <li><u>program funding sources</u></li> <li>information management and reporting (reporting frequency, methods and format)</li> <li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li> </ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>

Information Requirement	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>
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Response:

Denison concurs that follow-up program documentation will evolve over the planning process and is committed to providing complete and up to date documentation as the EIS is finalized and prior to the EA Decision. Per the March 20, 2023 letter from the CNSC to Denison (Subject: Results of the Federal-Indigenous Review Team technical review of the October 21st, 2022 Draft Environmental Impact Statement Submission for the proposed Wheeler River Project), the company will be providing, as part of the final EIS documentation, a Commitments Report in order to capture all the mitigation measures, follow-up program measures and commitments that have been referenced in the EA documentation in a single location for completeness and traceability. The Commitments Report will be scoped so that it also fulfils the obligations of the commitments registry required by the Saskatchewan Ministry of Environment.

Notwithstanding the above, Denison believes that section 16-C, Summary of Monitoring and Follow-up Programs, in the draft EIS generally meets the requirements outlined in the EIS guidelines but agrees that some additional information can be provided to clarify select aspects. Specific notes per the EIS Guidelines are provided below to provide context the remainder of the response. For reference text in *italics* is taken from the EIS Guidelines; whereas text in **bold** is commentary provide by Denison. Additionally, bold text that is underlined indicates where Denison commits to revising or adding information into the EIS.

*The EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.* **Note from Denison – Table 1-5.1 in Appendix 16-C identifies a framework or preliminary program upon which EA follow-up actions will be managed, as well as all phases of the Project in which the proposed individual follow up programs will be executed.**

*The EIS should provide discussion on the follow-up program's requirements, and include:*

- *objectives and structure of the follow-up program and the VCs targeted by the program* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs, provides an overall program structure and identifies the VCs targeted by the program.**
- *tabular summary and explanatory text of the main components of the program including:*
  - o *a description of each monitoring activity under that component* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies each proposed monitoring activity for the various technical disciplines within which the environment assessment has been organized.**
  - o *which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)* - **Note from**

**Denison - Table 1-5.1 in Appendix 16-C generally identifies whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures (see column “Monitoring Program Objective(s)”; however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further column will be added to indicate specifically whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures with rational.**

- o *the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects) – Note from Denison - Table 1-5.1 in Appendix 16-C identifies the relevant section of the EIS to which each proposed follow up activity refers. however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further, more specific reference to the section / subsection / statement (as appropriate) will be added to the “EIS Reference” column for greater traceability between the assessment section of the EIS for each of the technical disciplines and the proposed follow activities.*
- o *the specific monitoring objective for that activity- Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs.*
- o *planned schedule - Note from Denison -Table 1-5.1 in Appendix 16-C identifies the phases of the Project in which the proposed individual follow up programs will be executed. It is premature in Denison’s view to develop specific “schedule” associated with all follow-up activities that are proposed. As noted in draft EIS Section 1.7.5, Licensing and Permitting, as well as in other responses to FIRT IRs, the Project is proceeding through sequential EA and licensing process. Given the sequential process to which Denison has committed it is planned that further detail will be developed to align with detailed engineering design through licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.*

*roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results - Note from Denison – At this time and commensurate with the level of detail (i.e. concept) at which the follow up activities have been defined the proponent assumes responsibility for execution of all proposed activities. This may change as the program details are developed, and Denison presumes this is likely as it continues to work with the key Indigenous groups. It is noted however that provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners and therefore it is inappropriate (and may remain so) that specific details regarding follow up activities be shared without the expressed consent of the agreement signatories. Regulatory agencies at the provincial and federal levels are expected to largely play a review/approval role consistent with their responsibilities under various laws/acts/licenses/permits under which the Project, and follow up activities, will be executed. At this time there are no specific plans with local and regional organizations as it pertains to the design, implementation and evaluation of the program results; but this may change in the future. Per the above, Denison will add additional detail into Table 1-5.1 in Appendix 16-C with respect to roles and responsibilities consistent with the information provided in this IR response. As noted full disclosure of such information may not be possible as it would be*

**subject to non-disclosure covenants between Denison and its key Indigenous partners; nevertheless more specific information will be provided as is available.**

- *possible involvement of independent researchers* – **Note from Denison** – Involvement of independent researchers in follow up activities has not been identified at this time, nor has need for such been specifically flagged. This does not preclude possible involvement of independent researchers in the future; however, need for such has not been specifically flagged. As noted above, provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners, and such follow up activities and monitoring could include independent research. The sharing of information related to this type of independent research can and would only be shared with the expressed consent of the agreement signatories. **Per the above, Denison will add narrative to the text of Appendix 16-C clarifying the role of independent research that is consistent with the understanding of such at the time the final EIS is published.**
- *program funding sources* – **Note from Denison** – As noted above, the proponent assumes responsibility for execution of all proposed follow up activities that have been identified and therefore the funding of such. Also as noted above, provisions for follow up activities and monitoring that may be included in agreements developed between Denison and its key Indigenous partners will be subject to non-disclosure covenants in those agreements. This would include information concerning any funding that may be associated with these programs. It would be inappropriate (and may remain so) that specific details regarding any funding that may be provided for follow up activities be shared without the expressed consent of the agreement signatories.
- *information management and reporting (reporting frequency, methods and format)* – **Note from Denison** – A framework for information management and reporting is provided in Section 1.2 of Appendix 16-C. As described in Section 1.2 of Appendix 16-C specific information management and reporting structures associated with follow up activities are proposed to be developed as part of the development of the Project Environmental Management System (EMS). The Project EMS will be developed during licensing and permitting and that this information, including more detailed information regarding information management and reporting (e.g., reporting frequency, methods and format) will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.
- *possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program* – **Note from Denison** – As noted above, Denison is committed to continuing the ongoing process of identifying opportunities the participation of the public and Indigenous groups as follow up activity programs evolve. There is nothing specific to share at this time but it is expected that further clarity in this respect will be provided in the near to medium terms. It is also understood that any information that can be shared only represents a snapshot in time. Since follow up activities will span the full lifecycle of the Project identification of potential opportunities for involvement is an ongoing process that will also span the full lifecycle of the Project.

Denison anticipates that the lengthy and evolving EIS review process, and consideration of the public comments received by Denison on June 27<sup>th</sup>, 2023, will bring forward additional mitigation and follow up activities. Denison will update Section 16-C, Summary of Monitoring and Follow-up Programs, per the commentary provided in response to IR-237 and will also include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project's Commitment Report which will be provided as part of the final EIS documentation.



Responses to Advice to Proponent

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-01	Canadian Nuclear Safety Commission (CNSC)	Glossary sections	<p>There are terms used throughout the EIS that may either need defining, or inclusion in the glossary.</p> <ul style="list-style-type: none"><li>· “Bounding”, “bounding case” and “bound” are used frequently throughout the EIS to describe the scope of the assessment. For example, p. 2-6 the EIS States: “Denison has bound the environmental assessment above the deposit...”</li><li>· “Laydown”. P. 2-54 states: “During Construction, Denison plans to create a laydown area next to the future domestic landfill to temporarily store construction waste. Examples of materials include clean wood, plastics, metal, and concrete. The construction laydown area will not be lined, but it will have a berm surrounding the area to minimize run-on and runoff.”</li><li>· “Deflagration” (p. 2-22)</li><li>· “Speed of sound” The EIS states: “Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds...” (p. 2-22) - Explain briefly what is meant by “speed of sound”</li><li>· “Dries” (p. 2-65): “the main dries will be located in the processing plant”</li><li>· “Scarified” 2-84 Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species.</li><li>· “Furblock” (p. 4-29)</li><li>· “Cutlines” (p. 4-101)</li></ul>	<p>Add this terminology to either one of the early glossaries, or when describing the methodology, in order to help readers understand these terms (particularly non-technical readers, such as Indigenous peoples and members of the public).</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-02	CNSC	General	<p>Mining solution and lixiviant are used interchangeably throughout the EIS. When both are used periodically, may be difficult for a member of the public to recognize that these are one in the same (mining fluid seems more often used).</p>	<p>Be consistent in how this is referred to, in order to ensure it’s clear to readers that these are one and the same.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-03	CNSC	Throughout the Executive Summary (ES) and draft EIS	<p>Errors in formatting and grammar were identified throughout ES and EIS. Some examples are underlined below:</p>	<p>Please correct these and any other formatting, spelling or grammatical errors.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-04	CNSC	Section 2.2.1 Mining (p. 2-4 to 2-5)	<p>An arial view could be useful to help a reader understand the proposed freeze wall earlier in section 2 (e.g., The shape, whether it surrounds the deposit). This is unclear but there are good images further down in the EIS (i.e., Figure 2.3-1 on p. 2-78).</p>	<p>Consider adding image to Section 2.2.1, similar to or containing aspects of Figure 2.3-1.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-05	Transport Canada (TC)	Sections 2.2.3.2, 2.2.3.10, 2.2.5.1, 2.3.1.6, 8.3.4.2.2, 11.1.4.4.2,	The two water crossings over Kratchkowsky Creek and Hart Creek and the water intake and effluent discharge/intake pipeline and diffuser at Whitefish Lake may be subject to the <i>Canadian Navigable Waters Act</i> (CNWA). However, these works may be exempt from the CNWA, if they meet the requirements of the Minor Works Order.	<p>*This advice pertains to the regulatory phase.*</p> <p>It is recommended that the Proponent self-assess each work using TC’s Project Review Tool as follows: <a href="https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet">https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet</a></p> <p>If the works do not fit the Minor Works Order, the Proponent has the option to either submit an application for approval to the NPP, or use the public resolution process, as these are all unscheduled waterways. The full text of the Minor Works Order is available here: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html">https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html</a>.</p> <p>Background information on the NPP, the Minor Works Order, the application for approval process and the public resolution process are available here: <a href="https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp">https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp</a></p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.
AD-06	Environment and Climate Change Canada (ECCC)	Section 2.2.3.8, Project Description	<p>In this section it is stated that: “The third step of the Industrial Wastewater Treatment Plant (IWWTP) is anticipated to further neutralize and improve the remaining water quality proposed to be achieved with further pH adjustments through agitated tanks and a clarifier with negligible solids generation expected at this stage. Several additional technologies including ion exchange are being evaluated as part of an ongoing Best Available Technology Study to be complete as part of future permitting.” ECCC would be interested in reviewing this study when it becomes available.</p> <p>Considering that the third step of the effluent treatment process in the IWWTP is still undergoing development, ECCC cannot make final conclusions regarding the efficacy of the treatment process. When final treatment technologies have been evaluated and selected, ECCC would like to review this information to allow for release to the environment.</p>	ECCC requests the opportunity to review the Best Available Technology Study and selected treatment technologies for the IWWTP when the report becomes available.	The BATEA information for the IWWTP will be included in Denison’s application to the CNSC for a license to operate. As such, ECCC can direct their review request for review to the CNSC.
AD-07	TC	Section 2.2.5.3	With respect to the proposed airstrip, under the <i>Aeronautics Act</i> , the proposed airstrip would be considered an “aerodrome”, which is defined as: “aerodrome means any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.” Aerodromes, including the one proposed by Denison, are subject to the <i>Aeronautics Act</i> and the Canadian Aviation Regulations (CARs).	<p>*This advice pertains to the regulatory phase.*</p> <p>The proponent must notify the Minister of Transport of the proposed airstrip (aerodrome). This notification, being a summary report to the Minister of Transport, is required by section 307 of the CARs (CARs 307). CARs 307 also requires Denison to undertake consultation in the prescribed manner before it constructs the proposed aerodrome at the mine site. Details of the consultation are to be included in the above-mentioned summary report to the Minister of Transport.</p> <p>CARs 307 identifies the requirement to consult to include anyone seeking to undertake a prescribed aerodrome work at a certified or non-certified aerodrome, whether it is the creation of a new aerodrome or, at an existing aerodrome, lengthening an existing runway or making a</p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				<p>new one. The Regulation also provides minimum expectations for how the consultation should be conducted, including timelines, who to notify and under what circumstances. The intent of the Regulation is to compel consultation in advance of an aerodrome work that will result in sustained and regular impact on interested parties as identified in the Regulation. As the proposed aerodrome will not be within 4 kilometres of a city or built-up area, under CARs 307, the proponent is required to consult the following interested parties:</p> <ul style="list-style-type: none"><li>(i) the Minister of Transport,</li><li>(ii) the providers of air navigation services,</li><li>(iii) the operator of a certified or registered aerodrome located within a radius of 30 nautical miles from the location of the proposed aerodrome work,</li><li>(iv) the authority responsible for a protected area located within a radius of 4 000 m from the location of the proposed aerodrome work,</li><li>(v) any local land use authority where the proposed aerodrome work is to be carried out, and</li><li>(vi) the owner of any land bordering the land on which the proposed aerodrome work is to be carried out.</li></ul> <p>Proponents are encouraged to share their plans with the local land use authority before the consultation period. The local land use authority may have information about other nearby projects or developments that could impact on the proponent's plans.</p> <p>In summary, regarding the airstrip (aerodrome), the proponent must complete the consultation and file the summary report with the Minister of Transport, prior to commencing construction of the aerodrome.</p> <p>Further details can be found at: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01">https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01</a>.</p> <p>TC recommends that the proponent contact TC's Aerodromes Group at CASPNR- SACRPN@tc.gc.ca before starting the consultation, to ensure it is completed in accordance with CARs 307.</p>	
AD-08	CNSC	Figs. 3.4-1, 4.3. 1, and where applicable throughout the EIS	Some maps in the EIS do not contain highway numbers.	Please consider including the highway numbers on the maps early in the Draft EIS when laying out the project location so the reader can become familiar with road network within northern Saskatchewan when discussions take place.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-09	CNSC	Section 4, including Figures 4.3.1 and/or 4.3.2 and where applicable throughout the EIS.	The maps included in the EIS in sections do not have any Treaty boundaries. First Nation Treaties should be included on the map. Not all First Nations reserves, and boundaries are included on the map such as Cree Lake and Slush Lake, please include on map and consider adding others from the NAD.	It is recommended that Denison update the maps in these sections to include Treaty Boundaries and community locations are included on the Project location map in Figure 4.3.2 and other maps throughout the entire EIS where applicable.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-10	CNSC	Section 4	Overall, CNSC believes that Denison is abiding by the communications strategies and products identified in their PIDP, but would be interested in additional information that is available.	While CNSC staff are satisfied that the proponent meets the requirements with this EIS, further clarity and detail on the strategic planning behind these communications activities would be beneficial and would further support the overall goals of the Project’s engagement activities.	Acknowledged. Further details on the Public Information Program and Public Disclosure will form part of the documentation submitted in support of the CNSC licensing for the Project.
AD-11	CNSC	Section 4 Indigenous Engagement Report (IER)	There is a summary of what engagement activities will occur moving forward. However, it is not clear which engagement activities/meetings will occur during the different stages of the EA/ project life cycle. Please provide additional details upon submission of the Final EIS.	Denison should consider clarifying in the updated IER which engagement activities will occur during each stage of the project moving forward as per Reg Doc 3.2.2 before submitting the Final EIS.	<p>The engagement activities as outlined in the draft EIS are reflective of the iterative nature of engagement with respect to the Project.</p> <p>At the time of the filing of the final EIS, Denison will describe the status of engagement and future expected engagement activities to occur, which will continue to be aligned with the requirements of Reg Doc 3.2.2.</p>
AD-12	CNSC	Section 4 IER	Information included in the EIS Section 4 and IER regarding engagement activities, communication and issues and concerns raised will need to be updated when the next version of the EIS is submitted. The EIS and IER will need to be updated to include information from Fall of 2022 until approximately two months prior to the submission date of the next EIS.	When re-submitting the EIS, ensure that the engagement log, issues and concerns tables and information about engagement activities done to date have been updated. No action needed only advice to update this section before submission with most up to date engagement activities including any that take place with other Indigenous Nations and communities not included in the Draft EIS.	Acknowledged.
AD-13	CNSC	Section 4 IER	Denison states that validation of VC selection was completed with ERFN, the Northern Village of Beauval, the Northern Village of Pinehouse Lake, and the Northern Hamlet of Patuanak (hereafter Beauval, Pinehouse, and Hamlet of Patuanak, respectively). The EIS states that this was completed through a shared online survey. The EIS also indicates that YNLR was also included in this process.	How has Denison validated VC selection with the other Indigenous Nations and communities that have showed interest and if so, by what methods (survey’s, engagement, meetings, review of Draft sections etc.?) Did Indigenous Nations and communities select any VC’s that were not included in the EIS and if so why not? Please elaborate and provide more details in the EIS on any other methods used including engagement sessions that were completed with Indigenous Nations and communities, through in-person community workshops, VC selection approval through early review of Draft EIS sections.	<p>Section 4 of the draft EIS describes the approach taken related to the Indigenous and non-Indigenous Communities of Interest in relation to the Wheeler River Project. Denison has engaged with these entities regarding the validation of the VC selection.</p> <p>Denison has not undertaken VC validation activities with other Indigenous Nations or communities that have shown interest in the Project, owing to the systematic approach to engagement Denison has been following. This approach is consistent with the methodology presented to the CNSC by Denison in early 2020, for which confirmation was received in mid-2020 and reflected in the draft EIS.</p> <p>All activities undertaken in relation to engagement on VCs are currently described in the EIS; there are no additional details to add.</p> <p>Denison can confirm that it is unaware of additional or new VCs brought forward by other Indigenous Nations or communities that are not suitably captured within the current draft EA approach.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-14	CNSC	Section 4.3.1, Pg 246	On this page, Denison states that MN-S is “currently structured with a President, an Executive, a Provincial Metis Council, Regional Presidents, and Local Presidents. The wording of ‘Regional President’ is incorrect and should be changed to say, ‘Regional Director’.	Please update all wording of “Regional President” to “Regional Director” when referring to MN-S.	Thank you for the advice comment. This will be corrected in the final EIS.
AD-15	ECCC	Sections 5.3.4 (Table 5.3-3); 8.1.3.3 Climate Change; 8.1.3.4 Climate Change Influenced Extreme Events; Table 15.4-1: Summary of Potential Effects of Short-term Extreme Weather  Events on the Project and Associated Mitigation; Section 15.5 Climate Change.	<p>The Proponent indicates that the Project’s full lifetime is roughly 40 years (including the post- decommissioning phase) and that climate conditions are important design considerations for a number of sensitive aspects of the Project. Potential future climate changes and their potential effects on the Project and Valued Components (VCs) are described in various sections of the draft EIS. Notably, in Section 15.5.2, ensemble mean projections are provided for several climate variables for two future time periods and emissions scenarios (RCP 4.5 and 8.5). In Section 8.1.3.4, the Proponent describes possible future changes in short-duration precipitation extremes (based on Intensity Duration Frequency or IDF curves from the IDF_CC tool) and indicates that an increase in their frequency and magnitude may occur over the Project lifetime “... and may require consideration for greater storage and conveyance capacity for Project water management infrastructure” (p.8-41).</p> <p>The Proponent indicates that aspects of the Project are being designed to meet standards based on design values that appear to be derived from observed (i.e. historical) climate conditions (e.g. water management infrastructure; see Table 15.4-1). In Section 15.5.3, they indicate that an adaptive management approach will be used to address some aspects of future climate change as necessary. For example, page 15-19 of the draft EIS states that: “Denison will develop an Emergency Preparedness and Response Program for the Project to address forest fires and extreme weather that may occur. If unforeseen effects on the Project occur from longer and more severe forest fire seasons associated with climate change, or increased frequency or severity of extreme weather (e.g., ice storms, snowstorms, flooding), Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” (Emphasis added).</p>	<p>ECCC recommends that when considering potential future climate change and relevant effects on the Project, the Proponent consider the range of variability from the ensemble of models (not just the ensemble mean). ECCC also recommends that the Proponent consult the 2019 Canadian Standards Association Guidance on Intensity Duration Frequency for Canadian Water Resources practitioners , which provides examples of alternative methodologies to estimate future return values for design as needed.</p> <p>In terms of adaptive management, ECCC recommends that the Proponent clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p>	<p>Please see response to IR-15, IR-103, IR-104, IR-235, and IR-236.</p> <p>The probable maximum precipitation (PMP) value of 493 mm selected for design of water management infrastructure, such as ponds, is similar to total annual precipitation (456 mm from Key Lake station, and 483 mm from 1981-2020 climate normals).</p> <p>The selected PMP is well above (&gt;5 times higher): 1) current/measured 24-hour maximum precipitation, 2) modelled 1 in 100 year 24-hour return for current conditions, 3) modelled 1:100 year 24 hour return for a future (2020-2050) period, 4) the predicted maximum 1-day precipitation under different emissions scenarios for the future (including RCP8.5 in the 2021-2050 period).</p> <p>For comparison to the <b>design PMP of 493 mm</b>:</p> <ul style="list-style-type: none"><li>- the measured maximum 24-hour precipitation from Key Lake station was <b>42.9 mm</b> and <b>72 mm</b> from 1981-2020 climate normals.</li><li>- the modelled existing/current 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>79.9 mm</b> and at the Key Lake area was <b>56.4 mm</b>.</li><li>- the modelled future (2020-2050) climate 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>88.6 mm</b> and at the Key Lake area was <b>62.0 mm</b>.</li><li>- the predicted future climate (2021-2050) under the highest CO2e emissions scenario (RCP 8.5) shows maximum 1-day precipitation of <b>25.9 mm</b>.</li></ul> <p>The PMP is much higher (&gt; 5 times higher) than the observed and predicted 24-hour maximum precipitation and the 1:100 year 24 hour return. Completing the design using a large PMP provides confidence that the water management infrastructure will be sufficient and function under future climates as it relates to potential changes in precipitation.</p>
AD-16	CNSC	Section 5.10 (p.70) and throughout the EIS	<p>In section 5.10 of the ES, where the seven scenarios are listed, formatting is inconsistent. Likelihood is in quotes in some places, but not in all.</p> <p><b>Not significant</b> is bolded inconsistently throughout the EIS. As well, in many cases noted as “not significant”, where others note “are not expected to have a significant effect”.</p>	<p>Suggest making formatting consistent if going to use quotes and bolding to highlight sections of the text. Also, validate that use of “not significant” and “are not expected to have a significant effect” are consistently used (where appropriate).</p>	<p>Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.</p>



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AD-17	ECCC	Appendix 6-A Air Quality Technical Supporting Document A.10	Some of the off-road vehicles have an emission rating of Tier 2 but in Appendix 6-A Section A.10 the Proponent claims that “for non-road diesel combustion, Tier 4 emission factors were assumed”. Choosing an engine with a lower Tier will increase emissions in NOx significantly and the Proponent should be using the best available technologies to minimize environmental impacts.	ECCC recommends that the Proponent choose engines that meet the most stringent emission standards to the extent possible, which are Tier 4 for the compression-ignition engines, during all phases of the Project.	Please see response to IR-139.
AD-18	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	Understanding Project emissions is important to inform analysis of a Project’s potential impact on Canada’s emissions targets and climate change commitments. ECCC notes that Section 4.0 and Appendix C: Greenhouse Gas Emissions Calculations of Appendix 6-C identifies the source of emissions and quantifies them in the construction, operation, and decommissioning phases of the Project, in accordance with the Draft Technical Guide Related to the SACC (Draft Technical Guide). While ECCC recognizes that the emissions will be relatively small in the post-decommissioning phase, the identification and quantification of the emissions in this phase is not found in the draft Environmental Impact Statement (EIS). The post- decommissioning phase is expected to last 15 years, likely going past 2050. The draft EIS does not discuss emission intensities of the Project, only the grid electricity. The draft EIS also does not discuss the Project’s potential impacts on Canada’s climate targets.	ECCC recommends that the identification of the sources of Greenhouse Gas (GHG) emissions and quantification of these emissions be described for the post-decommissioning phase, as done for the other phases. ECCC recommends the Proponent include discussion on the emission intensities of the mining of the product, following the guidance of the SACC and the Draft Technical Guide. ECCC recommends that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the SACC and the Draft Technical Guide.	The Post-Decommissioning phase only includes monitoring (physical, chemical, and biological) and regulatory site inspections. These activities are not expected to generate any significant GHG releases. Notwithstanding, the calculated GHG emissions estimates for Construction, Operation and Decommissioning are expected to be sufficiently conservative to capture any incidental GHG releases during monitoring and inspection activities.  The EIS anticipated an annual average production rate of approximately 4,082 metric tonnes of U <sub>3</sub> O <sub>8</sub> and an annual net GHG releases of 30,702 metric tonnes CO <sub>2</sub> e over the operations phase of the project. The annualized GHG intensity during operations is estimated at 7.5 tonnes of CO <sub>2</sub> e / tonnes of U <sub>3</sub> O <sub>8</sub> .  Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.  Also see response for AD-19 (second paragraph).
AD-19	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	The draft EIS lacks information related to estimates of impact on carbon sinks and emissions from land-use changes. As land use shifts from a vegetated site prior to development, to an industrialized site, removal of vegetation and peat will have impacts on carbon sinks and construction emissions. Section 6, Appendix 6-C, 4.1.2 Land Use Change states that site-specific information of above- ground mass of vegetation was not available and default data from Table 20 of the Draft Technical Guide were applied. The default data is contained in this table is not applicable in this case, as they represent aboveground woody vegetation in cropland systems. ECCC recognizes that the usage of the median value of 0.51 for the carbon content is reasonable. From the information given in the draft EIS, it does not seem that the soil carbon was taken into account. In the absence of detailed information, the Proponent assumed that the area cleared would also be excavated (and drained in the case of wetland areas) which would create significant additional emissions from soil disturbances and drainage. Section 4.1.2 also states the Project involves clearing an area of	Land Use Change Regarding the lack of site-specific information of above-ground mass of vegetation, an initial site survey on-site using basic information such as site class and species would assist in determining the above-ground biomass. More specific data, such as regional data from provinces, forest companies, or literature may be available, and generic national data is available (e.g., Fo148-1-2E.pdf (publications.gc.ca), 4775.pdf (nrcan.gc.ca)). ECCC recommends that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands. Carbon Sinks ECCC recommends that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the Draft Technical Guide.	Limited site-specific data were available to characterize land use change and impacts on carbon sinks. As such, the use of default values from the SACC/IPCC in conjunction with some limited habitat/vegetation data (extracted from Chapter 9.2 Terrestrial Environment – Vegetation and Ecosystems, Listed Plant Species and Wetlands) was employed and is considered reasonable at this stage of the assessment. Please note that additional information on the land use change GHG calculations can be found in Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report.  In accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data becomes available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks

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			approximately 169.6 hectares. There are no estimates on the impact on carbon sinks related to the Project.		and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.
AD-20	NRCan	Section 7.3.1, Physical Geography	Drumlins and eskers in the region trend Northeast to Southwest as opposed to northwest to southeast as written on page 7, line 18. Correct orientations are used on page 7, line 23.	NRCan recommends revising the text. Please refer to 250 000 scale Surficial Geology Lines from Quaternary mapping, CSRS NAD83 Zone 13, Saskatchewan Geological Survey 2017.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS. In Section 7.3.1. the text will be updated to say the following: “The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...” See also response to IR-54.
AD-21	NRCan	Section 7.3.2.3, Metacrystalline Basement Rock	Pegmatite missing from list of basement rock types.	NRCan suggests addition of pegmatite to the list of basement rock types as shown on Figure 7.3-6.	Denison will update the final EIS per NRCan’s suggestion.
AD-22	NRCan	Section 7.3.3.1, Aquifer Properties, Section 7.3.2.3, Metacrystalline Basement Rock, Appendix 7A, 2.0, 2.3.1, 2.3.2	The terms “metacrystalline” and “metagranitic gneiss” are not frequently used terms in scientific literature. Gneiss is, by definition, a metamorphic rock.	NRCan suggests revision to “Crystalline Basement rocks” or “Basement metamorphic rocks”, and “granitic gneiss” as used in Figure 7.3-6. Please refer to Oxford Dictionary of Earth Sciences.	Denison will update the final EIS per NRCan’s suggestion.
AD-23	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Orogeny is the process, orogen (or orogenic belt) is the feature produced by orogeny.	NRCan suggests replacing “Tran Hudson Orogeny” with Trans Hudson Orogen”.	Denison will update the final EIS per NRCan’s suggestion.
AD-24	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Quartzite is by definition a metamorphic rock, and the term is used later without the meta- prefix.	NRCan suggests replacement of the term “meta-quartzite” with “quartzite”.	Denison will update the final EIS per NRCan’s suggestion.
AD-25	NRCan	Appendix 7A, 2.3.4, Athabasca Group Sandstones and Conglomerates	Sands are unlithified, whereas you are referring to grain sizes in this case.	In Table 2-1, NRCan suggests replacing the term “sands” with “grain sizes” under MFc and MFb descriptions.	Denison will update the final EIS per NRCan’s suggestion.
AD-26	NRCan	Appendix 7A, 2.3.5, Overburden	Typo on page 2, line 7: “A grain size sample was collected in GWR-033 from approximately 9 m below ground surface, and the same consisted of 8.8% clay (less than 4 µm).	NRCan suggests revision of “same” to “sample” and clay to “clay-sized” grains.	Denison will update the final EIS per NRCan’s suggestion.



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AD-27	CNSC	Section 8.2.1.3 – Spatial and Temporal Boundaries	It is noted that McGowan Lake is an identified reference lake for the Key Lake Mill site. With the establishment of the Wheeler River mine, effluent would be flowing into McGowan Lake, which could potentially interfere with Key Lake’s environmental monitoring program by compromising McGowan Lake’s baseline conditions. Depending on the loading of COPC’s into McGowan Lake and resultant water concentrations, it may no longer be accepted as an acceptable reference lake for use by Key Lake. This would require Cameco to modify their monitoring program at the Key Lake Mill.	The CNSC advises Denison to communicate with Cameco to ensure they are aware of this situation. Coordination between the two companies may be necessary to ensure Key Lakes environmental monitoring program is not compromised. It is recommended to discuss this potential issue with Cameco ahead of time to determine the best path forward.	<p>Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.</p> <p>Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.</p>
AD-28	ECCC	Section 8.2.4.2.3 Appendix 10-A, Section 3.1.1.2	Tables 8.2-9 and 8.2-10 in Section 8.2.4.2.3 Part II_S8 Aquatic Environment and Table 3-1 in Appendix 10-A Section 3.1.1.2 demonstrate predicted maximum effluent concentrations of Constituents of Potential Concern (COPCs) and maximum predicted receiving environment concentrations. The final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short-term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guideline, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe. While uranium is not a Schedule 4 substance with prescribed concentration limits under the Metal and Diamond Mining Effluent Regulations (MDMER), the MDMER requires the characterization of uranium concentrations in effluent under Schedule 5, and requires that all mine effluent released from final discharge points be non-acutely lethal. Under Schedule 5 Section 9(d) of the MDMER, the Proponent will likely be required to conduct selenium fish tissue sampling if average annual concentrations of selenium in effluent equals or exceeds 5 ug/L.	Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.	Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria.
AD-29	CNSC	Section 8.3.3 Figures 8.3.5 etc. 8.5-4	It does not appear that aquatic baseline sampling maps for Russell Lake have LAB 1 and 2 locations showing the baseline sampling locations within Russell Lake. (Figures 8.3.5). Please update the Figures throughout aquatic environment section to include of the baseline sampling studies/ locations within Russell Lake.	Please update maps and sections in EIS to reflect aquatic baseline studies that were completed.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

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AD-30	CNSC	EIS sections 8.4.3.2.4 Benthic Invertebrate Community and 8.4.7.6 Climate Change Considerations	<p>ECCC EEM guidance recommends the use of multiple reference areas as it offers the greatest statistical power to detect a meaningful difference between a reference area and an exposure area and can also give an indication of variability among reference areas. It is also important to incorporate multiple reference locations into the study design to aid in designing against spatial confounding factors.</p> <p>Section 3 of the Aquatic Environment Baseline Study Report details the similarities between benthic invertebrate communities by using the mean Bray-Curtis index between sampling locations and the median reference condition for the lake group size. It's not clear in the EIS if there are any issues expected to be able to use this data to compare project effect locations to references sites into the future, as some sampling locations are currently not very similar to the reference sites. In addition, climate change could affect the sediment and benthic communities in the future. The EIS states “the frequency and magnitude of extreme precipitation events have the potential to change water levels and flows in the RSA, which may affect sediment transport, deposition, and therefore benthic invertebrate habitat. Changes to average and upper and lower bounds of ambient temperatures may also affect aquatic habitat, which in turn may affect benthic invertebrate communities. Climate change over the life of the Project (i.e., 35 to 40 years) will be monitored as part of the Project’s environmental monitoring programs, and influences on water quality, sediment quality, and benthic invertebrates will require adaptive management to mitigate any potential effects of the Project that may be exacerbated by climate-related changes on the aquatic environment”. It is recommended to ensure that appropriate number/location of reference sites are sampled to enable any changes to sediment or benthic invertebrate communities that may be due to climate changes, and not project effects, are able to be assessed.</p>	<p>Considering climate change may change the lake conditions from baseline conditions, and that there is already natural variability between lakes that will be used as reference lakes and exposure lakes, it could become difficult to show changes to sediment/benthic invertebrates are not due to project activities, therefore there is a recommendation to ensure the current baseline data is adequate, and to consider if additional data, and addition of additional reference stations, will be needed moving forward.</p>	<p>Changes in landscape influence and lake conditions are not limited to those brought about by climate change. The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.</p>
AD-31	CNSC	Section 8.4.6.1, Residual Effects Characterization	<p>The EIS states “Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment.” Based off concerns from Indigenous communities, and the fact that phosphate is a COPC in the effluent, and elevated concentrations of mercury were measured near the</p>	<p>Please consider adding methylmercury to the environment sampling plans (such as fish dorsal muscle) in order to confirm there are no unexpected effects of the project on levels, and to satisfy stakeholder concerns.</p>	<p>Refer to response to IR-100.</p>

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			Kratchkowsky Lake bottom, adding methylmercury to the environment sampling plans may be beneficial.		
AD-32	CNSC	Section 9.1.8.3, Appendix 10-A (ERA) section 3.2.1.5	<p>It appears there is no consistency between the assessment of soil quality in the ERA and the baseline soil sampling program presented in the EIS. The baseline program includes 10 soil permanent sampling locations (Appendix 9-B, section 2.5). Sampling at these locations is proposed to be continued during the Operation Phase, and monitoring data will be compiled and reported annually/periodically (EIS section 9.1.8.3). Conversely, the ERA estimates and predicts concentrations of COPC in soil based on atmospheric deposition. Furthermore, the location of ecological receptors in the ERA (Figure 5-2) is different from the permanent soil sampling plot locations (Appendix 9-B, Figure 2.5-1). It is unclear why measured baseline soil quality data were not discussed in the ERA and whether future monitoring data will be considered in the ERA to verify accuracy of predicted COPC concentrations</p>	<p>Please clarify how baseline measured data on COPC concentrations in soil is considered in the current and future iterations of the ERA.</p>	<p>Baseline measured soil data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. The baseline soil concentrations used in the model are provided in Section 3.5.1 and Table 3-8 of Appendix A in Appendix 10-A (ERA).</p> <p>The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.</p>
AD-33	CNSC	Section 9.3.3.1.2	<p>Indigenous knowledge is summarized with regard to moose, including:</p> <ul style="list-style-type: none"><li>· Calving sites close to the Wheeler River, with lots of muskeg in the area. A moose calving area is located in the Terrestrial RSA, southwest of the Project Area.</li><li>· A wildlife corridor is used by moose, running between Cree Lake (outside and to the west of the Terrestrial RSA) and Russel Lake (in the southern portion of the Terrestrial RSA).</li></ul> <p>It is unclear how this information is incorporated into the residual effects assessment.</p>	<p>Please clarify how Indigenous knowledge on moose calving sites and corridors in the RSA is incorporated into the residual effects assessment for the key indicator “moose”.</p>	<p>The sites identified by IK were explicitly considered in the impact assessment as indicated by their identification as overlapping with the Terrestrial RSA as noted in the question. However, the areas were not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects.</p> <p>The Indigenous Knowledge provided by ERFN and SVS (2022) identifies a moose calving site (Feature 1001-08) ~ 2 km southwest, and a wildlife corridor ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022). Both areas are within the Terrestrial RSA but outside the Wildlife LSA. The reference to “Calving sites close to the Wheeler River...” refers to a broad area that is 45 km east of the Project Area, well beyond interactions with the Project Area.</p> <p>The presence of the areas identified through IK was acknowledged in Section 9.3.3.1.2 (Information from Indigenous Knowledge, Local Knowledge, and Engagement) in Part II, Sec. 9 of the Draft EIS. The assessment (Sec. 9.3.4.2) considered alteration and/or habitat loss at the LSA and RSA scale. Section 9.3.4.2.1 (pg. 9-210) summarizes the effects on moose habitat as follows: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA....”</p> <p>Further, Sec. 9.3.6.2.1 (Alteration and/or Loss of Habitat, pg. 9-230) identifies that an area within a 500 m radius of the Project Area will be influenced by the Project and likely make the habitat within that area less suitable for use by moose. Therefore, the effects of the Project on moose calving have been appropriately assessed and are expected to be contained within the Wildlife</p>

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					LSA. That affected area does not overlap with the moose calving site or the wildlife corridor identified by IK.
AD-34	CNSC	Appendix 9-B	Baseline studies for birds are restricted to short time frames in one year only, for example: <ul style="list-style-type: none"><li>· Breeding Songbird Point Count Call Survey (June 7 and 17, 2017)</li><li>· Aerial Waterfowl and Raptor Stick Nest Survey (June 15 and 16, 2017)</li></ul> The Canadian Wildlife Service (2022) recommends: <ul style="list-style-type: none"><li>· Consider the potential effects of projects on birds throughout the year and document the distribution and abundance of birds in all seasons. Some species may be under-represented in existing data bases due to temporally restricted periods of detectability.</li><li>· Explicitly target species at risk and other focal species.</li><li>· Conduct at least two years of field surveys as a national standard for major projects, so that temporal variability can be considered in future comparisons to baseline data.</li></ul> <b>Reference:</b> Canadian Wildlife Service. 2022. Guidance Regarding Data Needed to Support Assessment of Project Effects on Birds. Environment and Climate Change Canada, Gatineau, Quebec. 80 p.	Please consider conducting surveys following CWS’s recommendations or provide an explanation as to how current baseline data for birds is sufficient to characterize the existing environment.	The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site. However, to supplement the species data that were collected as part of the baseline field program, Denison is willing to acquire additional information on species presence in the RSA from existing sources, specifically from the Saskatchewan Breeding Bird Atlas (Birds Canada). However, collection and consideration of this information is not expected to affect the findings and/or conclusions stated in the draft EIS as the assessment was habitat-based to address all species.
AD-35	CNSC	Section 10, IMPACT MODEL	Denison discusses details of the IMPACT model but has not provided scenario(s) used to facilitate review.	Please consider providing CNSC with the IMPACT model scenario file(s) in the spirit of regulatory cooperation.	The intent of Appendix A to Appendix 10-A is to provide the inputs used for the IMPACT model as well as all of the characteristics for human and ecological receptors. Where site-specific data were not used in the model it can be assumed that default values from CSA N288.1-20 were used in the IMPACT model. As such, Denison does not intend to provide the scenario files.
AD-36	English River First Nation (ERFN)	Section 10.1.3.2, Traditional Foods Diet (p. 10-15)	The EIS States: "The ERFN is comprised of seven reserve lands across Saskatchewan" (p. 10-15). While this is accurately reflecting a source document, the source document is incorrect.	Please update to "The ERFN is comprised of seven historical settlements that have now grown into 19 different reserves across Saskatchewan"	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-37	CNSC	Section 10.1.9, Human Health Summary and Appendix 10-A – 4.4.1 Risk Estimation	The Human Health section of the EIS, as well as the ERA, indicates that there is an exceedance for selenium for the fisher/trapper receptor, with the Project estimated to contribute to the majority of this exceedance (0.93 of the HQ). While the assessment is conservative by assuming an increase intake rate of fish solely sourced from Russel Lake, the precautionary principle should be considered to ensure in reality the HQ for selenium remains below 1, even under conservative assumptions.	Please conduct of effluent, water, and aquatic organism monitoring (as already suggested in EIS) to confirm HQ's are highly conservative in the EIS modelling and receptors remain protected. Should it be determined Se concentrations are increasing in the environment at such a rate as there may be in impact to the environment or human health, installation of a selenium removal circuit into the effluent treatment process should be considered. The proponent should ensure that the proposed wastewater treatment system design incorporates the capability for expansion or upgrades in alignment with the precautionary approach, pollution prevention, and continuous improvement.	Denison acknowledges that a robust effluent and environmental monitoring program will be developed to confirm all EIS modelling predictions. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-38	CNSC	Appendix 10-A (ERA)	It is unclear if measured or modelled COPC concentrations in blueberry were used in the calculations of human receptor dose. Similarly, it is unclear if measured or modelled COPC concentrations in lichen and blueberry were used in the calculations of ecological receptor dose. CSA N288.6-22, Clause 7.3.6 states that "Measured concentrations of COPCs should be used, where possible, in the exposure assessment." Please see the Clause for further information.	Please clarify if measured or modelled COPC concentrations in blueberry / lichen were used in the calculations of human and ecological receptor dose.	Measured baseline lichen data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. Measured baseline blueberry data were used for model calibration to determine if there was good agreement between measured data and modelled data. The IMPACT model was used to predict both baseline and Project contributions for blueberries. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-39	CNSC	Appendix 10-A (ERA), Table 2-2	Table 2-2: Estimated Home Ranges of Selected Terrestrial Ecological Receptors Based on the reference McLoughlin et al. (2016), the Home Range for Woodland Caribou is indicated as "Expected = 80 km2" which represents the mean range sizes pooled over the two study years for calving/post-calving. The indicated Minimum (67 km2) and Maximum (267 km2), however, do not relate to the calving/post-calving stage, which is not clearly stated in Table 2-2. In contrast, these values are actually mean range size values for autumn/rut and early winter, respectively, as described in the source document on Page 83 (McLoughlin et al., 2016). It should be noted that in terms of true minimum and maximum, the source document states that individual home ranges, based on up to two years of GPS locations, varied in size from 16.2 km2 to 1363.9 km2 (Page 82 of McLoughlin et al., 2016). Reference: McLoughlin et al. 2016. Population dynamics and critical habitat of woodland caribou in the Saskatchewan Boreal Shield. Interim Project Report, 2013–2016. Department of Biology, University of Saskatchewan, Saskatoon. 162 pp. Available online at <a href="http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf">http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf</a>	Please provide clear details on the source of the home range values listed in Table 2-2.	Denison acknowledges the comment and will add clarification in Table 2-2 of Appendix A in Appendix 10-A that the minimum represents the autumn/rut and the maximum represents the early winter.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-40	CNSC	Appendix 10-A (ERA) section 3.2.1.5	Although the soil type selected in the ERA for modeling of atmospheric deposition to soil is sandy soil, organic soils have been delineated and characterized (section 9.1.3.3 of the EIS) as valued component (i.e., “Organic Matter/Peat”). It is unclear if the soil quality modeling performed in the ERA is protective for soil types other than sandy soil.	Please clarify if COPC modeling based on sandy soil is protective of organic/peaty soil and provide justification.	The majority of the soil in the Project Area and LSA is considered sandy soil. Section 9.1.3.2 of the EIS states "Mineral soils are associated with upland sites and (in all likelihood) anthropogenically disturbed land that, together, correspond with >99% of the Project Area and 91.5% of the LSA (Figure 9.1-8). The predominate mineral soils within the RSA have been classified as Sandy Dystric Brunisols (Smith et al. 2011)." Organic matter/peat was included as a VC in the EIS because of the concern regarding drying and losing biological function through groundwater interactions, and not in terms of assessment of soil quality. Additionally, Section 9.1.3.3 of the EIS acknowledges that organic soils is limited in the Project Area. As such, this comment is considered not applicable.
AD-41	CNSC	Appendix 10-A (ERA), Table 5-5	Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model The exposure pathway for phytoplankton is stated as “direct contact in sediment”, however, phytoplankton live suspended in the water column. It is acknowledged that in the IMPACT modelling report, phytoplankton is described with an occupancy factor of 1 in water (Table 2-5).	Please add the pathway “direct contact in water” to Table 5-5 and revise all calculations accordingly.	Table 5-5 will be revised to state “direct contact in water” for phytoplankton. No calculation changes are needed.
AD-42	CNSC	Appendix 10-A (ERA), Table B.12	Table B.12: Sample Calculation – Adult Recreational Fisher/Hunter (McGowan Lake) Dose and Risk Calculations for Selenium  The source for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry is stated as “Table C.5”, however, this table could not be located.	Please provide the referred-to Table C.5 or an alternate source of information for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-43	CNSC	Appendix 10-A (ERA), Environmental Risk Assessment for Wheeler River Technical Support Document	The ERA is prepared by Ecometrix and submitted to Denison Mines. It is unclear if the ERA submitted has been reviewed and accepted by the proponent (Denison Mines).  CSA N286-12 clause 9.5.5 specifies that “the selected supplier’s technical documents that are required to be submitted shall be reviewed and accepted”.  Meeting these CSA N286-12 requirements will ensure that the proponent has control of the purchased services as a future licensee applicant.	Provide clarifications if ERA documents have been reviewed and accepted by the proponent.	See response to IR-202 which indicates that Denison reviewed and accepted the ERA. This text will be added to Appendix 10-A.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-44	CNSC	Section 11	It is not clear whether all of the interested Indigenous Nations and communities were engaged on the results and findings of the Heritage Resources Impact Assessments (HHRIA) or just ERFN?	CNSC staff would appreciate an update on any engagement activities that have taken place with regards to any of the HHRIAs for the Project, or any site or thing that is of historical, archaeological, paleontological or architectural significance as requested by other Indigenous Nations and communities to date.	<p>Denison confirms that the results of the Project-related HRIAs were discussed with ERFN, as they expressed interest in further understanding the nature of the work undertaken.</p> <p>The Saskatchewan Ministry of Parks, Culture and Sport, Heritage Conservation Branch (HCB) administers The Heritage Property Act. Regulatory approval as per section 63 of The Heritage Property Act (GS 80) was granted for the Project for the two separate HRIAs (HCB File No. 16-2102, December 14, 2017 and HCB File No. 19-933 February 12th, 2020).</p> <p>The results of the HRIAs were included and formed part of the draft EIS. Comments made by Indigenous communities on this section of the EIS will therefore be responded to accordingly by Denison, where appropriate.</p> <p>Additionally, as noted in Section 11.3.2, “The Heritage Resource Management Plan (HRMP) was informed by engagement with ERFN, who recommended that the HRMP should include a mechanism to involve Indigenous communities where appropriate (21-EN-ERFN-591.1; 21-EN-ERFN-591.2) (see Appendix 11-B).”</p> <p>The mechanism to involve Indigenous communities has been included in the HRMP and allows for general notification to Indigenous communities should an artefact be found, which provides flexibility to engage all appropriate Indigenous nations accordingly.</p>
AD-45	CNSC	Section 11.1.4.5.2. Perceived Suitability/Safe Use of Resources (p. 11-59)	The EIS States: “Section 2.6.1 in Section 2 describes the extensive review of mining methods that led to the decision to adopt the ISR mining method.” (p. 11-59). This reference is not correct, as this section does not contain a review of the mining methods.	Please update this to reflect the appropriate section.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-46	TC	Section 14.6.7.2	<p>Transport Canada would like to clarify that although the proponent may use a third party to assist in developing emergency response assistance plans (ERAPs), it is the proponent’s responsibility to submit the ERAP application(s) to Transport Canada, per Section 7(1) of the <i>Transportation of Dangerous Goods Act, 1992</i> as follows:</p> <p>Emergency response assistance plan</p> <p>7 (1) No person shall import, offer for transport, handle or transport dangerous goods in a quantity or concentration that is specified by regulation — or that is within a range of quantities or concentrations that is specified by regulation — unless the person has an emergency response assistance plan that is approved under this section before</p> <p>(a) importing the dangerous goods;</p> <p>(b) offering the dangerous goods for transport; or</p> <p>(c) handling or transporting the dangerous goods, in the case where no other person is required to have an emergency response assistance plan under paragraph (a) or (b) in respect of that handling or transporting.</p>	<p>*This advice pertains to the regulatory phase.*</p> <p>Transport Canada notes that the sentence highlighted in yellow below is incorrect and should be revised or removed. While a contractor could assist the proponent to develop the ERAP(s), it is the responsibility of the proponent to apply to Transport Canada for approval of the plan(s).</p> <p>14.6.7.2 Design and Mitigation Considerations Principal traffic risk mitigation measures include:</p> <ul style="list-style-type: none"><li>• traffic control measures such as speed limits;</li><li>• travel management plans;</li><li>• spill and emergency response planning; and</li><li>• driver training.</li></ul> <p>Additionally, Denison considered several provisions to make sure that the effects of a terrestrial release of hazardous materials are as low as practicable. In addition to transportation mitigations listed for Scenarios 1 and 2, the following provisions were considered.</p> <ul style="list-style-type: none"><li>• The Transportation of Dangerous Goods Act, 1992 (Government of Canada 2019) outlines the requirements for entities that transport dangerous goods to establish emergency response assistance plans. These plans list specialized personnel and equipment that are required for responding to an incident. <b><i>It is expected that a contractor responsible for the transportation of uranium concentrate, fuel, and hazardous chemicals would develop these plans.</i></b></li></ul>	<p>Acknowledged. Section 14 will be updated in the final EIS to clearly state that while a contractor could assist Denison to develop the ERAP(s), it is Denison’s responsibility to apply to Transport Canada for approval of the plan(s).</p>
AD-47	Health Canada (HC)	Appendix 14-A (p. 8-9)	<p><b>Context:</b> No emergency response plan has been provided within the draft EIS, which states that emergency response plans will be developed in the future (Section 14 Appendix 14-A, p.8-9).</p> <p><b>Rationale:</b> For any emergency event, Health Canada considers the protection of human health as a primary consideration in the development of emergency preparedness and response plans.</p> <p>This includes monitoring for human health impacts and the provision of health-related guidance. Further, this will be a requirement of the licensing process.</p> <p>The proponent should ensure that the emergency response plans consider the protection of all relevant potential human receptors that could be impacted by an onsite or project-related off- site accident involving the release of chemical and/or radiological substances.</p>	<p>It is recommended that Denison develop an emergency response plan in consultation with potentially affected communities and stakeholders that includes, but is not limited to, the following:</p> <ol style="list-style-type: none"><li>1. All relevant contact information of the communities, especially related to km 160 of Hwy 914, which is the location of a cultural camp that has been established by the English River First Nation and km 67 of Hwy 914 that is a gathering location for the Kineepik Metis Local associated with the Northern Village of Pinehouse.</li><li>2. Description of the mechanisms for communication with communities in case of an emergency.</li><li>3. Description of the partnership with and the training of local communities and local responders (see Section 14 Appendix 14-B, p.1).</li><li>4. Description of mutual aid agreements with neighboring industries/municipalities, where appropriate.</li></ol>	<p>Denison acknowledges the comment and thanks Health Canada for the recommendations as to the development of its Emergency Response Plan.</p> <p>As noted in the draft EIS, Denison has committed to the development of an Emergency Preparedness and Response Program as a component of its Environmental Management System (EMS). The objectives of the program are generically consistent with the recommendations that have been provided and Denison, as it has demonstrated to date, is committed to meaningful engagement with communities of interest and will solicit input and advice during all aspects of program development.</p> <p>For reference it is noted that as it concerns its EMS framework documentation hierarchy it is expected that three levels of documentation will be developed – Programs, Plans and Procedures. The emergency preparedness and response documentation will follow this hierarchy and input from interested parties will be solicited during all phase of program/plan/procedure development. Denison intends to develop this documentation as it advances through the licensing phase of Project realization.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-48	ECCC	Appendix 16-C, Summary of Monitoring and Follow-up Programs	Appendix 16-C does not include consideration of any monitoring and follow-up programs regarding GHGs.	ECCC recommends that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the draft EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Denison anticipates being subject to ECCC’s reporting requirements for emitters over 10,000 tonnes CO2e and the information is collected under section 26 of the Canadian Environmental Protection Act. This was noted in the draft EIS, Section 2.5 Greenhouse Gas Emissions.
AD-49	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	ECCC notes that GHG mitigation measures have not been considered for the Project. Furthermore, the Project’s lifetime is expected to extend into 2050 and beyond. Consistent with the information requirements of the SACC, and aligning with Canada’s commitment to achieve net-zero GHG emissions by 2050, the Proponent should provide a credible plan that describes how the Project will achieve net-zero emissions by 2050.	ECCC recommends that the draft EIS include an assessment of potential GHG mitigation measures throughout all phases of the Project. This could include a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the Draft Technical Guide. ECCC also recommends that the Proponent provide a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the Draft Technical Guide.	<p>GHGs were not included as a VC or KI in the draft EIS and as such, there are no specific GHG-related mitigation measures in Appendix 16. However, many of the mitigation measures for the VC Air Quality related to combustion products would also be associated with a reduction in the Project’s Scope 1 emissions. As noted in the draft EIS, Section 2.5, at this stage in the Project Denison will look for opportunities to optimize energy management and improve the energy intensity of the Project where practical. Also see response for AD-19 (second paragraph).</p> <p>Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances. Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.</p>

**Information Requirement (IR) Response Table – Denison’s Response to December 2023 FIRT Comments, February 2024**

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-06	-	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>• feasibility of meeting remediation targets.</li><li>• groundwater flow conditions and validation of flow models.</li><li>• mobilization of contaminants (e.g., Al, Se or V).</li><li>• potential for free gas evolution/two-phase flow.</li><li>• identifying composition of lixiviant and production solutions.</li><li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal</p>	<p>This response has not been accepted.</p> <p>The mining area decommissioning objectives shown in Table 2.3-3 of the original EIS (Section 2.3.3.1.1) show different numerical values when compared to those shown in Table IR-06-1 of Denison's response to IR-06. Notably, allowable proportions of Al, As, Cd, Cr, Cu, Fe, Mo, SO4, Se, U, V, and Zn are increased over the IR-159 nitial decommissioning objectives. Denison's Final Proposed EIS update for IR-06 does not include any text regarding alteration of decommissioning objectives for the mining area.</p> <p>Please also see follow-up IR-06-R1.</p>	<p>Denison acknowledges that the presentation of information in Table IR-06-1 of Attachment IR-06 has created some confusion; for clarity, Table IR-06-1 of Attachment IR-06 was never meant to replace Table 2.3-3 of the draft EIS.</p> <p>The information provided in Table IR-06-1 of Attachment IR-06 (Annex 1, Attachment IR-06 on page 90/419) was from Denison's Feasibility Field Test (FFT). The FFT was an ISR pilot program permitted by SK ENV and completed under a CNSC nuclear substances license. The purpose of the FFT was to validate previous field and laboratory testing and determine the feasibility of the ISR mining methodology. The leaching and neutralization phases of the FFT were completed in 2022. The leaching phase was designed to assess the effectiveness of the ISR mining method. This phase included controlled injection of an acidic solution into the mineralized zone with recovery of the solution through existing test wells. The neutralization phase involved the injection of a mild alkaline (basic) solution into the leaching zone to neutralize the area and verify the groundwater in the area is returned to acceptable, permitted conditions. Table IR-06-1 was included at the request of the CNSC during the 1<sup>st</sup> round of IRs and provides context to the reviewer on restoration of the leaching zone to permitted pH conditions.</p> <p>Based on the above, there are no proposed changes to the mining area decommissioning objectives shown in Table 2.3-3 of the draft EIS.</p>	No

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																						
					Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.	liquid/solid ratios, anticipated reagent consumption, etc.																																																									
IR-06	IR-06-R1	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>feasibility of meeting remediation targets.</li><li>groundwater flow conditions and validation of flow models.</li><li>mobilization of contaminants (e.g., Al, Se or V).</li><li>potential for free gas evolution/two-phase flow.</li><li>identifying composition of lixiviant and production solutions.</li><li>success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal</p>	<p>CNSC staff request that Denison provide clarification relating to the alteration of mining area decommissioning objectives. Additionally, Denison is requested to provide a discussion on how alteration of the mining area decommissioning objectives fits within the geochemical reactive transport modelling presented in Appendix 7-C (i.e., effect of increase proportions of allowable COPCs on surface water quality), given that these objectives (as shown by "Restored Solution #1" in Table 3-5 of Appendix 7-C) are used as the bounding scenario for groundwater quality during reactive transport scenarios.</p> <p><b>Original EIS – Table 2.3-3:</b> <i>Table 2.3-3: Mining Area Decommissioning Objectives</i></p> <table><tr><th>Parameter</th><th>Units</th><th>Restored Solution</th></tr><tr><td>pH</td><td></td><td>4.3</td></tr><tr><td>Aluminum</td><td>mg/L</td><td>7</td></tr><tr><td>Arsenic</td><td>mg/L</td><td>0.06</td></tr><tr><td>Cadmium</td><td>mg/L</td><td>0.015</td></tr><tr><td>Cobalt</td><td>mg/L</td><td>2</td></tr><tr><td>Chromium</td><td>mg/L</td><td>0.05</td></tr><tr><td>Copper</td><td>mg/L</td><td>0.17</td></tr><tr><td>Iron</td><td>mg/L</td><td>100</td></tr><tr><td>Molybdenum</td><td>mg/L</td><td>0.1</td></tr><tr><td>Nickel</td><td>mg/L</td><td>9.7</td></tr><tr><td>Lead</td><td>mg/L</td><td>3.1</td></tr><tr><td>Sulphate</td><td>mg/L</td><td>703</td></tr><tr><td>Selenium</td><td>mg/L</td><td>0.08</td></tr><tr><td>Zinc</td><td>mg/L</td><td>1.4</td></tr><tr><td>Uranium</td><td>mg/L</td><td>100</td></tr><tr><td>Vanadium</td><td>mg/L</td><td>0.51</td></tr><tr><td><sup>226</sup>Radium</td><td>Bq/L</td><td>2.00E+02</td></tr></table> <p><b>IR-06 Response – Table IR-06-1:</b></p>	Parameter	Units	Restored Solution	pH		4.3	Aluminum	mg/L	7	Arsenic	mg/L	0.06	Cadmium	mg/L	0.015	Cobalt	mg/L	2	Chromium	mg/L	0.05	Copper	mg/L	0.17	Iron	mg/L	100	Molybdenum	mg/L	0.1	Nickel	mg/L	9.7	Lead	mg/L	3.1	Sulphate	mg/L	703	Selenium	mg/L	0.08	Zinc	mg/L	1.4	Uranium	mg/L	100	Vanadium	mg/L	0.51	<sup>226</sup> Radium	Bq/L	2.00E+02	As noted in the response to IR-06, Denison is not proposing changes to the mining area decommissioning objectives presented in the draft EIS and therefore discussion of said changes within the context of the review comment is not applicable. The objectives presented in Table 2.3-3 of the revised draft EIS are unchanged relative to the draft EIS.	No
Parameter	Units	Restored Solution																																																													
pH		4.3																																																													
Aluminum	mg/L	7																																																													
Arsenic	mg/L	0.06																																																													
Cadmium	mg/L	0.015																																																													
Cobalt	mg/L	2																																																													
Chromium	mg/L	0.05																																																													
Copper	mg/L	0.17																																																													
Iron	mg/L	100																																																													
Molybdenum	mg/L	0.1																																																													
Nickel	mg/L	9.7																																																													
Lead	mg/L	3.1																																																													
Sulphate	mg/L	703																																																													
Selenium	mg/L	0.08																																																													
Zinc	mg/L	1.4																																																													
Uranium	mg/L	100																																																													
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<sup>226</sup> Radium	Bq/L	2.00E+02																																																													



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					Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.	liquid/solid ratios, anticipated reagent consumption, etc.	<div>Table IR-06-1: Feasibility Field Test Leaching Zone Remediation Targets compared to Interim (December 2022) Groundwater Well Monitoring Results</div> <table><tr><th>Parameter</th><th>Units</th><th>Leaching Zone Remediation Target</th><th>Neutralization Phase Results <sup>1</sup></th></tr><tr><td>pH</td><td>pH units</td><td>5.5</td><td>8.24</td></tr><tr><td>Aluminum (Al)</td><td>mg/L</td><td>9.5</td><td>3.3</td></tr><tr><td>Arsenic (As)</td><td>mg/L</td><td>0.7</td><td>0.05</td></tr><tr><td>Barium (Ba)</td><td>mg/L</td><td>0.2</td><td>0.07</td></tr><tr><td>Calcium (Ca)</td><td>mg/L</td><td>535</td><td>203</td></tr><tr><td>Cadmium (Cd)</td><td>mg/L</td><td>0.3</td><td>0.00001</td></tr><tr><td>Cobalt (Co)</td><td>mg/L</td><td>0.24</td><td>0.0001</td></tr><tr><td>Chromium (Cr)</td><td>mg/L</td><td>0.38</td><td>&lt;0.0005</td></tr><tr><td>Copper (Cu)</td><td>mg/L</td><td>0.19</td><td>0.001</td></tr><tr><td>Iron (Fe)</td><td>mg/L</td><td>390</td><td>144</td></tr><tr><td>Potassium (K)</td><td>mg/L</td><td>45</td><td>185</td></tr><tr><td>Magnesium (Mg)</td><td>mg/L</td><td>8.92</td><td>22.6</td></tr><tr><td>Molybdenum (Mo)</td><td>mg/L</td><td>0.16</td><td>0.04</td></tr><tr><td>Sodium (Na)</td><td>mg/L</td><td>626</td><td>385</td></tr><tr><td>Nickel (Ni)</td><td>mg/L</td><td>1.17</td><td>0.02</td></tr><tr><td>Lead (Pb)</td><td>mg/L</td><td>2</td><td>0.04</td></tr><tr><td>Sulfate</td><td>mg/L</td><td>4,147</td><td>1114</td></tr><tr><td>Selenium</td><td>mg/L</td><td>0.47</td><td>0.0002</td></tr><tr><td>Uranium</td><td>mg/L</td><td>501</td><td>83</td></tr></table> <div>E-doc: 6858048p. 93/419</div> <div>Annex 1 – FIRT IR Table – Technical Review of the Wheeler River Project draft EIS Denison Response - August 16, 2023</div> <table><tr><th>Parameter</th><th>Units</th><th>Leaching Zone Remediation Target</th><th>Neutralization Phase Results <sup>1</sup></th></tr><tr><td>Vanadium</td><td>mg/L</td><td>19.3</td><td>0.2</td></tr><tr><td>Zinc</td><td>mg/L</td><td>17.1</td><td>0.5</td></tr></table> <div><sup>1</sup> Results are the average of three groundwater monitoring wells (G019-036, -040 -041) sampled in December 2022</div>	Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>	pH	pH units	5.5	8.24	Aluminum (Al)	mg/L	9.5	3.3	Arsenic (As)	mg/L	0.7	0.05	Barium (Ba)	mg/L	0.2	0.07	Calcium (Ca)	mg/L	535	203	Cadmium (Cd)	mg/L	0.3	0.00001	Cobalt (Co)	mg/L	0.24	0.0001	Chromium (Cr)	mg/L	0.38	<0.0005	Copper (Cu)	mg/L	0.19	0.001	Iron (Fe)	mg/L	390	144	Potassium (K)	mg/L	45	185	Magnesium (Mg)	mg/L	8.92	22.6	Molybdenum (Mo)	mg/L	0.16	0.04	Sodium (Na)	mg/L	626	385	Nickel (Ni)	mg/L	1.17	0.02	Lead (Pb)	mg/L	2	0.04	Sulfate	mg/L	4,147	1114	Selenium	mg/L	0.47	0.0002	Uranium	mg/L	501	83	Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>	Vanadium	mg/L	19.3	0.2	Zinc	mg/L	17.1	0.5		
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IR-12	-	ECCC	Change to an environmental component due to hazardous contaminants Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p>Context: There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field,</p>	<ol style="list-style-type: none"><li>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</li><li>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</li></ol>	<p>This response has not been accepted, for the following reasons (numbers correspond with original IR):</p> <p>1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed.</p> <p>3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999</p>	<p>1-2. The water management design information presented in the draft EIS is considered appropriate at the EA stage and for this stage of the Project and fit-for-purpose to support the assessment of potential effects. The detailed design information on site water management infrastructure and runoff management requested in this IR and related IRs (i.e., IR-12-R1A and IR-12-R1B) will be provided to the CNSC and province as part of licensing and permitting.</p> <p>Nevertheless, and building on information provided previously, additional information and context regarding site water management and design concepts is provided as follows:</p> <ul style="list-style-type: none"><li>• Conceptual site drainage maps spanning the full Project Area scale has been provided in Attachment IR-12 to this IR response table as context for the reviewer.</li><li>• Design for the access roads and airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road or airstrip.</li><li>• The overall vision for non-contact water along the access roads and airstrip is to use shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems.</li><li>• The condition of the airstrip and roads would be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.</li><li>• Infrastructure features that are within 50 to 100 m (depending on grade) of waterbodies and that are associated with cleared land where there is no vegetated buffer may require additional erosion management / controls to ensure protection of the waterbodies from unmitigated suspended solids inputs.</li></ul>	No																																																																																												

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					<p>processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p> <p>Rationale: In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>		<p>study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value.</p> <p>CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.</p> <p>Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment.</p> <p>Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR.</p> <p>Reference: [A.1] Atmospheric &amp; Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie &amp; Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>	<p>A map showing the distance of Project components to waterbodies is available in Attachment IR-12 as context for the reviewer. The map shows for example, that four waterbodies (waterbody numbers 1, 16, 23, and 86) are within 100 m of the Project footprint where potential erosion protection measures may be employed. The details of erosion control measures at these locations will be outlined in the Environmental Management System to support licensing.</p> <ul style="list-style-type: none"><li>Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water along roads and at the airstrip would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred.</li><li>As described in the draft EIS, the proposed crossings at Kratchkowsky Creek and Hart Creek are not culverts, but clear span bridges. Clear span bridges are designed to completely span a watercourse without interfering with the channel bed and banks.</li><li>As a reminder to ECCC that the road to the Project’s proposed airstrip follows an existing, decommissioned road, the Fox Lake Road.</li><li>The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence and the well-drained characteristics of the region support the plans to divert non-contact water to ground, and as noted made surfaces would be graded to promote drainage and discourage pooling.</li><li>Please refer to our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419) for additional context on best practice and mitigation measures related to water management and also the scoping and evaluation of accident and malfunction scenarios in the draft EIS.</li><li>Importantly, the conceptual management scheme outlined above for non-contact water runoff is consistent with other roads and airstrips in the region – that is, runoff is not currently captured from other roads and airstrips in the region as envisioned by the review comment. This includes infrastructure associated with Saskatchewan Ministry of Highways and Infrastructure, existing uranium mines and mills, and communities including First Nation communities. It is not practical to do so and collection of non-contact water is not needed based on risk and moreover as noted above is to be avoided so as not to necessarily affect water quantity in local drainages and sub-drainages.</li></ul> <p>3. The reviewer is referred to the response to IR-103 for a discussion regarding the PMP and its suitability and relevance given available data and different methods of calculation included that provided by CSA guidance. Notwithstanding the information provided in response to IR-103 Denison is committed to revisiting this issued as per CNSC’s recommendations, as applicable, for the licensing phase of the Project.</p> <p>To reiterate, Denison believes it has fulfilled its information requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process. Notwithstanding</p>	

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								that, Denison recognizes that further information will be required as the Project moves past the EA and into the licensing and permitting phases. It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by the Denison as part of the licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.	
IR-12	IR-12-R1A	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<p>Context: Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern (COPCs) directly from mining operations infrastructure. However, it still has the potential to contain deleterious substances from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills, fire management practices, and snow removal practices. The Metal and Diamond Mining Effluent Regulations (MDMER) pursuant to the Fisheries Act requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. This includes deleterious substances in non-contact water from all site infrastructure including the airstrip, roads, and camp area.</p> <p>Rationale: All mine effluent and seepage that contains deleterious substances must be discharged through a final discharge point. This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices. The Proponent has not included how non-contact water runoff from site infrastructure will be captured within site water management planning. To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the capture of non-contact water.</p>	<p>1.Update site water management plans to include management of potentially deleterious substances contained in non-contact water from all site infrastructure.</p> <p>2. Provide updated estimates of water volumes to be drained and managed from overall site infrastructure (including runoff from roads, airstrip, camp area, etc.) during the different Project phases. Include updated information on water treatment flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.</p>		<p>1 and 2.</p> <p>Denison understands the prohibition related to deleterious substances under Section 36 of the Fisheries Act and Denison affirms its commitment to ensuring no such events occur. However, in the context of this IR, we interpret ECCC is connecting the concept of deleterious substances under MDMER (those constituents identified in Part 1(3) i.e., arsenic; copper; cyanide; lead; nickel; zinc; suspended solids; radium 226; and un-ionized ammonia.) with the general concept of deleterious substance per the Fisheries Act. Mine effluent associated with MDMER defined deleterious substances will be discharged through a final discharge point to Whitefish Lake, and this has been reflected in the water management information presented in the draft EIS, including Section 2.2.3.</p> <p>The IR is suggesting Denison collects runoff water from the airstrip and roads with the rationale that this is needed in order to collect potential contact water associated with hydrocarbons spills (the text in rationale notes: <i>This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices</i>). As indicated in the draft EIS and in our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419), should a spill occur, the spill response plan will be followed. The details of Denison’s response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Importantly, hydrocarbons are not mine waste-related deleterious substances perm MDMER definition. Collecting and treating non-contact runoff throughout the life of the Project would mean Denison collects an extremely large volume of clean water to protect against infrequent hydrocarbon spills which will be cleaned up in the appropriately scaled process (spill response), in terms of cost and risk to the environment. No other roads or airstrips in the region (including those associated with uranium mine and mill operations) requires the collection and treatment of runoff water from infrastructure such as roads and airstrips. It is not practical to do so and based on risk, the collection of non-contact water is not required.</p> <p>The road or trail to the airstrip is currently an unmaintained road: the decommissioned Fox Lake Road. For road upgrades and airstrip construction, Denison will be using material from the borrow area. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to upgrade roads and construct the airstrip will not be a source of metals or ARD.</p> <p>Denison will implement erosion control measures at infrastructure locations within 50 to 100 m of a waterbody (refer to response to IR-12 above and to Attachment IR-12, Figure</p>	No



IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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								<p>IR-12-5: Distance from Project Footprint to Waterbodies) where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies).</p> <p>In consideration of the above, Denison maintains that the runoff at the airstrip and roads are non-contact water. The water management mandate for the Wheeler River Project is to keep clean water clean and minimize the total volume of water requiring management, treatment, and discharge.</p> <p>In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p>	
IR-12	IR-12-R1B	ECCC	Water Quality - Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<p>Context: The Proponent has clarified that there is no infrastructure in place for management of non-contact water from site infrastructure that may contain COPCs, including but not limited to roads, the airstrip, and the campground.</p> <p>Rationale: To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the type of infrastructure and its location for the capture of non-contact water.</p>	Provide a map marking the locations of proposed surface drainage structures for runoff collection including collection ditches, culverts, diversion ditches, perimeter berms, collection ponds and other similar structures.		<p>It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by Denison as part of the permitting and licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.</p> <p>In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p> <p>Notwithstanding the above, Denson has provided the reviewer with additional, conceptual site drainage maps in Attachment IR-12, Figures IR-12-1, IR-12-2, IR-12-3, and IR-12-4; these are supplemental to the site drainage map provided in the draft EIS Figure 2.2-17.</p>	No
IR-13	-	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	Context: The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).	Please provide: 1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching; a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML. b. Confirm that the part of waste rock recovered	This response has not been accepted.  In the response, Denison expected that portion of basement rock will be potentially acid generating and stated that all basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. However, criteria for	The commitment for waste rock segregation provided in the draft EIS in combination with Denison’s previous response to IR-13 (refer to Annex 1, IR-13 on page 7/419) is considered appropriate for this stage of the Project and fit-for-purpose to support the assessment of potential effects. We remind the reviewer that since (1) there is no release of effluent during construction, and (2) contact water from both the clean and special waste rock pads will be collected and eventually treated in the IWWTP during operation, the details of the waste rock segregation are not required to support the assessment of potential project effects on the environment. It is further noted that Denison has committed to developing a lined storage pad for potentially acid generating (PAG) material that is of sufficient capacity to store all the waste rock that is expected to be removed from the drill holes through life of mine. From an operational risk perspective there is more than ample contingency to manage the risk that may be associated with PAG material. Due to the	No

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					<p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p>Rationale: ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>	<p>from the basement rock, will also be tested for potential ARD/ML.</p> <p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>	<p>segregating the potential acid generating waste rock from the clean waste rock are not provided.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings by either recovering uranium or placing the materials underground into the mining area at the end of a well’s production. However, it is not clear how the potentially acid generating waste rock will be disposed of in the long term.</p>	<p>relatively small volume of PAG material that is anticipated to be brought to surface through the ISR method, details for the permanent disposal will be developed as part of decommissioning plan updates. The small PAG volume and short mine life allows a number of decommissioning options; PAG rock could be decommissioned in place, moved to the industrial landfill or IWWTP precipitate pond, and/ or added to grout for well backfilling and closure.</p> <p>Despite the above, Denison continues to work towards defining waste segregation criteria. In December 2023, Denison completed an Acid Base Accounting (ABA) testing program on 34 composite samples derived from 372 individual pulp samples at the Saskatchewan Research Council (SRC). The testing was done to further the understanding of the geochemical nature of material that would be generated by ISR wellfield drilling, specifically as it concerns expectations with respect to the quantities of PAG and non-PAG material and the derivation of appropriate segregation criteria. Individual pulp samples were selected from representative drill core samples taken throughout the entire length of drillholes throughout the deposit footprint area. Samples were composited along the length of each drill hole to represent the major horizons of the sandstone and the different basement lithologies (refer to Attachment IR-13 for a figure showing the major horizons). The horizons were selected to identify horizon-specific geochemistry, and as such the composites were developed so as to not straddle between different horizons, which could influence the representativeness of the horizon-specific ABA results. The different lithologies sampled represent all of the overlying and underlying horizons at the site, and include the overlying Upper Aquifer, Intermediate Aquitard, and Lower Aquifer. The underlying horizons include the Graphitic Pelite (GFPL), Quartzite (QZIT), and Garnetiferous Pelite (GTPL).</p> <p>Samples were analyzed for:</p> <ul style="list-style-type: none"><li>• Paste pH (pH units)</li><li>• Acid Neutralizing (g CaCO3/kg)</li><li>• Acid Producing (g CaCO3/kg)</li><li>• Net Acid Generation (g CaCO3/kg)</li><li>• Sulfate, Acid soluble (%)</li><li>• Sulfide (ug/g)</li><li>• Sulfur (%)</li></ul> <p>Though definite criteria have not yet been defined, initial consideration of results suggest the following:</p> <ul style="list-style-type: none"><li>• SANDSTONE<ul style="list-style-type: none"><li>○ all upper aquifer and intermediate aquitard samples were not acid generating (non-PAG); and</li><li>○ 2 out of 8 lower aquifer samples were acid generating, and the rest were not acid generating (non-PAG).</li></ul></li><li>• BASEMENT<ul style="list-style-type: none"><li>○ Quartzite samples (n=2) are not acid generating (non-PAG); and,</li><li>○ Garnetiferous and graphitic pelite samples (n=8) range from being acid consuming to acid generating, but overall are acid generating.</li></ul></li></ul>	

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								<p>Based on these test results, the lower sandstone aquifer (MFa) and basement would likely be PAG and stored on the special waste pad, but the balance of waste rock is expected to be non-PAG and placed on the clean waste rock pad.</p> <p>Specific waste rock segregation criteria (e.g., for distinction of PAG vs non-PAG material) will be defined using the data referenced above, as well as previous test data, in procedure level documentation that support the Waste Management Program documents that are part of initial licensing with CNSC. The program and plan documents define the overall strategies for minimizing waste generation, improving waste segregation, and implementing sustainable waste management techniques and the means to systematically and effectively manage the generation, handling, storage, disposal, and recycling of waste streams generated during by the Project, respectively, whereas the procedure level documentation is focused on operationalization of high-level strategies. The detailed waste rock segregation criteria will be provided to the CNSC and part of the licensing process and with the province as part of permitting at the appropriate time.</p> <p>While appropriate management of waste rock is important at all mining operations, we note that for context in relation to management and risk to the environment that through the selection of the ISR mining method, the Wheeler River Project is unique in that it is expected to generate a fraction of waste rock (clean, mineralized, and PAG) compared to other mining methods. For the reviewer’s context and consideration, refer to Attachment IR-13 for a summary of the Wheeler River Project’s expected waste rock volumes compared to a proposed underground uranium mining project in the Athabasca Basin (NexGen’s Rook I Project), an underground mining project which recently completed the Saskatchewan EA process (Foran’s McIlvenna Bay Project), and an open pit mining project which recently completed the federal EA process (Generation PGM’s Marathon Palladium Project); Table IR-13-1, Figure IR-13-2, and Figure IR-13-3 in Attachment IR-13.</p>	
IR-14	-	CNSC	Wastes and Decommissioning	<p>Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)</p> <p>Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)</p>	<p>Context: The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)</p> <p>Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as Complete.</p> <p>Rationale: Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.</p>	<p>How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?</p>	<p>This response has not been accepted.</p> <p>The response provided in IR-28 indicates that responses will be updated in the final EIS and future iterations of the IER. Although Denison commits to provide a PDP at a later date, the commitment does not include incorporating or addressing Indigenous concerns. The current response also does not address the concerns raised by Indigenous Nations and communities regarding restoration of the environment or indicate that it was brought to their awareness).</p> <p>Additionally, IR-28 highlights examples of how engagement will be captured in future iterations of the IER and “final EIS”. Please provide proposed text for the revised EIS, for subject matter expert (SME) review and acceptance.</p>	<p>Denison will incorporate or address Indigenous concerns into decommissioning plans as the plans are developed. This was noted to in the round 1 response to IR-14; see Annex 1, IR-14 on page 8/419 and excerpt here (emphasis added): “The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan will evolve over time and the plan will become more refined as the Project advances. Denison is committed to continue to engage with Indigenous Nations and communities to solicit input.” It is consistent with engagement aspects of REGDOC-2.11.2, Decommissioning and also Denison’s commitment to conducting meaningful engagement with Indigenous communities and organizations potentially affected by the Project, and to maintain relationships with these communities and organizations throughout all phases of the Project.</p>	No

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								<p>Denison’s is of the opinion that ‘input’ can refer to a wide range of comments, issues, concerns, advice, observations, etc. We believe the information provided in the EIS is sufficient for this stage of the Project and the conceptual decommissioning plan. Future decommissioning plan updates will be overseen by both the province and the CNSC and provide ample opportunity for the review of how Indigenous input has been incorporated into decommissioning plans.</p> <p>While the CDP outlined plans to keep small area of concrete foundations in place the specifics of the decommissioning plan may change. From the revised draft EIS Section 2.3.3.1.3 “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” This detail will in no way influence Denison’s decommissioning commitment to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure.</p> <p>Denison has not asked for specific feedback by Indigenous groups on concrete foundations remaining in place as outlined in CDP. The draft EIS was reviewed by several Indigenous groups through the public review process and by ERFN in advance of submission to the CNSC. To date, no concerns have been raised regarding concrete foundations. Despite the above context for the reviewer on when Project decommissioning details will be available and when the related engagement on these details would be conducted, Denison commits to specifically engaging with ERFN and KML on details of the decommissioning plans related to concrete foundations. Denison will incorporate and address engagement related to decommissioning, including plans for structures to be left in place such as concrete foundations, into the appropriate version of the decommissioning plan updates.</p> <p>Please refer to Appendix 4B - Key Issue and Concern No 18 outlining the resolution of ERFN concern noted by the reviewer in IR-14.</p>	
IR-18	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description  Appendix 8-E	Context: In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.	1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.  2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.  3. Update Table 2.2-1 and	This response has not been accepted.  ECCC requested that the Proponent update Table 2.2-1 and Appendix 8-E to include all general water quality parameters required for environmental effects monitoring, including pH, temperature, hardness, alkalinity and conductivity. This information was not provided in the updated table in the Proponent’s response. ECCC also requested that the Proponent Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the Metal and Diamond Mining Effluent Regulations (MDMER) including aluminum, iron, nitrate, thallium and manganese. The Proponent has not provided the requested information for	<p>The effluent modelling work presented in the draft EIS focused on COPCs which were predicted based on expected Project activities and water treatment processes and selected following CSA N288.6 Environmental Risk Assessments At Class I Nuclear Facilities And Uranium Mines And Mills. The CNSC participates in CSA documents and endorses use of this document.</p> <p>Schedule 5 of the MDMER outlines the various requirements of Environmental Effects Monitoring (EEM) Studies once a mine is subject to the regulation. The MDMER requires EEM as a condition for the authorization to deposit effluent into waters frequented by fish. Environmental effects monitoring involves assessing whether effluents are having an effect on receiver water quality, fish, fish habitat, and use of fish by humans. Schedule 5 of the MDMER is not a predictive section of the regulation to be used to direct EA scope. It is applicable to operational metal mines.</p> <p>Many MDMER parameters including those in Schedule 5, Section 4 identified by ECCC were not selected for analysis during lab studies completed by Denison to support the EIS,</p>	Yes  Revised Draft EIS, Table 2.2-1 in Section 2  Appendix 8-E, Table 15.

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					<p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>Rationale: ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	<p>Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</p> <p>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</p> <p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>	<p>aluminum, iron, nitrate, thallium and manganese. In the Proponent’s response it is stated that, “Schedule 5 parameters are included where available.” However, it is unclear if this means that the requested effluent characterization concentrations for these parameters is currently unknown, or if these parameters are expected to have negligible concentrations in the effluent. Furthermore, ECCC requested that the Proponent include all acute and chronic water quality thresholds under the most stringent of the MDMER, CCME, and/or Provincial Guidelines for each parameter in Table 2.2-1 and Appendix 8-E. This information has not been provided as only chronic toxicity guidelines have been provided.</p> <p>The Proponent is legally required to meet MDMER release targets and intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project. ECCC must advise the CNSC of predicted effects of COPCs to surface water quality and recognize the Proponent’s legal requirement to comply with the MDMER. Therefore, proposed and draft effluent targets must be reviewed against the requirements of the regulations and with an eye to any potential effects to the receiving environment for both regulated and other effluent parameters. It is necessary for ECCC to review effluent targets for general water quality parameters and MDMER Schedule 5 Section 4 parameters required for effluent characterization and environmental effects monitoring to determine if effluent at the end-of-pipe from all final discharge points is not predicted to be acutely lethal. Additionally, the predicted uranium effluent concentration currently exceeds the acute water quality guidelines for the protection of aquatic life. Table 2.2-1 does not currently provide the information necessary to verify acute and chronic thresholds.</p> <p>Therefore, please see the following reiterated requests:</p> <p>1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental</p>	<p>since they were not COPCs associated with IWWTP design. Information from laboratory tests is not available at this stage for all of the MDMER parameters. Further, MDMER Schedule 5 Section 4 include a list of parameters to be monitored (not modelled) and many of the 'missing' parameters have no associated limits under MDMER. Denison is committed to meet all requirements of MDMER, which includes future EEM programs.</p> <p>With respect to the bullet items in the IR the following is noted.</p> <p>1) Table 2.2-1 and Appendix 8-E have been updated to include all general water quality parameters required for environmental effects monitoring, including pH, temperature, hardness, alkalinity and conductivity.</p> <p>2) Table 2.2-1 and Appendix 8-E have been updated to include the following missing Schedule 5 Section 4 parameters required for effluent characterization: aluminum, iron, nitrate, thallium, and manganese.</p> <p>1) Updates to Table 2.2-1 and Appendix 8-E Include all acute and chronic water quality thresholds for each parameter as well as information on the concentrations of modifying environmental factors (i.e. pH, hardness, etc.) used to calculate these guidelines as footnotes.</p> <p>Denison is committed to meet the requirements of the MDMER as previously stated. Denison is also committed to working through the process of identifying discharge criteria as stipulated under Provincial legislation for mine effluent discharge as part of the application for an approval to operate a pollutant control facility as well as per the requirements and conditions of the CNSC, the licensing body for the Project. Denison will follow the advice of the CNSC with regard to requirements for further consultation with ECCC.</p>	



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							effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.  2. Update Table 2.2-1 and Appendix 8-E to include the following missing Schedule 5 Section 4 parameters required for effluent characterization: aluminum, iron, nitrate, thallium, and manganese. Provide further explanation if this information is not available.  3. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E. Include information on the concentrations of modifying environmental factors (i.e. pH, hardness, etc.) used to calculate these guidelines as footnotes.  4. Provide a clear commitment to ECCC for continued consultation on developing effluent discharge targets including a review of final predicted effluent discharge targets once available.		
IR-23	-	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	Context: There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.  A few examples: <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There’s lots of heavy muskeg there. A lot of us have been there, and we’d like to know there’ll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn’t happen. Even the permafrost is now further down. In the Wheeler River area, where there’s some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> Rationale: Appendix 2-C, Alternative Means assessment, states (p.3): “Engagement with Interested Parties naturally included	Please explain how comments and concerns collected during Denison’s engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it’s appendices.	This response has not been accepted.  The response and additional Annex (Table 2.10-1) provided in the draft EIS submission do not address concerns listed in the examples requested by CNSC staff.  The additional row in Table 2.10-3 meant to address input received from interested parties does not clearly demonstrate how comments received regarding alternative means were incorporated into the evaluation factor. Additionally, references provided in this row are not in the submission package or the original EIS.	The reviewer is referred to the revised Draft EIS, Appendix 2-A. The column titled “Denison’s Response to Question/Concern (where applicable)” outlines additional context on how the comment was considered in the EIS. This includes the specific comments listed by the reviewer, i.e., 16-EN-DesNd-101.1, 16-EN-ERFN-100.15 and 16-EN-ERFN-100.17.  For additional context, the previous IR response (Annex 1, IR-23 on page 13/419) provided a narrative on how the comments included in Appendix 2-C were part of the fulsome consideration of alternative means. The alternative means assessment is largely a screening level exercise to identify more versus less preferred options. The fact that it is carried out at the screening level is appropriate for this stage of the Project, given the level of design that was available at the time many of the engagement discussion occurred and that is typical for such resource development projects. The alternative means assessment is conducted across a range of criteria including biophysical environment, human environment, technical factors, cost factors, and any engagement comments specific to the options or more generally on importance of environmental protection, economic/business opportunities or concern about climate change. The alternative means assessment process is outlined in Appendix 2-C and summarized in Section 2.10 of the Project Description.  In response to the second part of this comment, we would like to clarify that the tables presented in Attachment IR-24 (Annex 1, IR-24 on page 13/419; and a reminder that Attachment IR-24 is now included in the revised draft EIS as part of updates to Section 2.10 Project Alternatives) were directly from the draft EIS Appendix 2-C. Specifically, Table 2.10-3 in Attachment IR-24 is a direct copy of Table 6 from Appendix 2-C and this is stated directly in the table title. There was no new information contained in the Attachment IR-	Yes  Appendix 2-A (Updated includes a column titled “Denison’s Response to Question/Concern (where applicable)”)

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					<p>alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and Appendix 2-A Engagement Database Summary – Project Description for details of engagement information referenced in this alternative means assessment.”</p> <p>It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.</p>			<p>24 (Annex 1, IR-24 on page 13/419) tables compared to what was provided in the draft EIS, specifically Appendix 2-C.</p> <p>Denison has committed to undertaking engagement with Indigenous Communities of Interest and Communities of Interest, which if they desire it, may include discussion of project alternatives in the context of licensing, as may be appropriate.</p>	
IR-25	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p>Context: The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: “As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS.” (p. 11-36)</p> <p>Rationale: More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the Project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	<p>Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.</p> <p>In addition, please include an updated Issues and Concerns table that includes relevant information from the MN-S as a result of engagement activities and relevant MN-S studies in the next version of the EIS, as appropriate.</p> <p>Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.</p>	<p>This response has not been accepted.</p> <p>As the information from MN-S has not yet been incorporated into a version of the EIS for review, CNSC cannot accept this response as complete. MN-S has provided new information to Denison and this should be reflected in Denison’s assessment.</p> <p>CNSC requires that Denison provide additional information within the revised version of the EIS. The response should include the newly revised text within the EIS and the page numbers of where staff can find the information.</p>	<p>The information from the MN-S has been updated in the revised draft EIS in track changes form, for ease of review. The following sections have updates:</p> <ul style="list-style-type: none"><li>• 3.3.2</li><li>• 3.4.2.3</li><li>• 3.4.4</li><li>• 3.4.8</li><li>• 11.1.1.1</li><li>• 11.1.1.2</li><li>• 11.1.2.3</li><li>• 11.1.3.1.2</li><li>• 11.1.3.2.2</li><li>• 11.1.4.3.1</li><li>• 11.1.4.5.1</li><li>• 11.2.1.1</li><li>• 11.2.2</li><li>• 11.2.3.2</li><li>• 11.2.3.3.1</li><li>• 11.2.3.9</li><li>• 11.2.4.4.1</li><li>• 12.1.1.1</li><li>• 12.1.1.3.1</li><li>• 12.1.2.4</li><li>• 12.1.3.2.3</li><li>• 12.1.4.2.1</li><li>• 12.2.1.1</li><li>• 12.2.1.3.1</li><li>• 12.2.2</li><li>• 12.2.3.2</li><li>• 12.2.3.3</li><li>• 12.2.4.2.2</li><li>• 12.2.4.2.3</li><li>• 12.3.1.1</li><li>• 12.3.2</li><li>• 13.1.1</li><li>• 13.1.2</li></ul>	<p>Yes</p> <p>Revised Draft EIS sections:</p> <ul style="list-style-type: none"><li>• 3.3.2</li><li>• 3.4.2.3</li><li>• 3.4.4</li><li>• 3.4.8</li><li>• 11.1.1.1</li><li>• 11.1.1.2</li><li>• 11.1.2.3</li><li>• 11.1.3.1.2</li><li>• 11.1.3.2.2</li><li>• 11.1.4.3.1</li><li>• 11.1.4.5.1</li><li>• 11.2.1.1</li><li>• 11.2.2</li><li>• 11.2.3.2</li><li>• 11.2.3.3.1</li><li>• 11.2.3.9</li><li>• 11.2.4.4.1</li><li>• 12.1.1.1</li><li>• 12.1.1.3.1</li><li>• 12.1.2.4</li><li>• 12.1.3.2.3</li><li>• 12.1.4.2.1</li><li>• 12.2.1.1</li><li>• 12.2.1.3.1</li><li>• 12.2.2</li><li>• 12.2.3.2</li><li>• 12.2.3.3</li><li>• 12.2.4.2.2</li><li>• 12.2.4.2.3</li><li>• 12.3.1.1</li><li>• 12.3.2</li><li>• 13.1.1</li></ul>



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								<ul style="list-style-type: none"><li>13.1.3.1</li><li>13.1.4</li><li>13.2</li><li>13.2.1.3</li><li>13.2.1.6</li><li>13.2.3</li><li>13.3.2.1</li><li>13.3.2.1</li></ul>	<ul style="list-style-type: none"><li>13.1.2</li><li>13.1.3.1</li><li>13.1.4</li><li>13.2</li><li>13.2.1.3</li><li>13.2.1.6</li><li>13.2.3</li><li>13.3.2.1</li><li>13.3.2.1</li></ul>
IR-28	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p>Context: The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p>Rationale: Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community,</p>	<p>This response has not been accepted.</p> <p>Denison provided information about the verification process for KML with an example chart that CNSC staff deem acceptable. CNSC requires that Denison complete this process with all identified Indigenous Nations and communities.</p> <p>It will be expected that a fully updated IER and issues and concerns tables for each Nation as per the original IR, in a future version of the revised EIS for SME review and acceptance.</p> <p>For part 3 of the IR, Denison must have validation from all Nations and Communities. Validation from ERFN, YNLRO and other Nations with interest in the Project should also be obtained. Alternatively, a path forward to complete the validation can also be provided.</p>	<p>Section 4 of the EIS and the IER have been fully updated with engagement information as recent as January 2024.</p> <p>The Interests, Issues and Concerns tables have been fully updated with responses from Denison to the items identified, including whether or not the Denison responses have been deemed acceptable and validated, or whether or not the engagement efforts in this regard are ongoing. Where engagement efforts are ongoing, if possible, a definitive indication of next steps is provided in respect of the resolution process. Denison notes that it is not always possible to specifically outline next steps with respect to validation, but the commitment to working toward a resolution should also be acceptable, as Denison alone cannot determine an engagement process for Indigenous nations; the Indigenous nations and communities may wish an alternative course of action.</p> <p>It is also important to note that Denison’s engagement efforts may not yield positive validation on all Interests, Issues and Concerns raised by all Indigenous Nations and Communities (i.e., consensus on every topic may not be achieved), but wherever possible, Denison’s efforts to be transparent about what those issues are, and the process associated with the attempts to find positive resolution will be identified.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 4</p>

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						through mitigation and monitoring measures, this should be documented, and a rationale provided.  4. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).			
IR-35	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	Context: The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.  Rationale: This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.	Please consider acrolein in the assessment or provide a rationale for its exclusion.	This response has not been accepted.  Although the requested assessment is provided in response to IR-35, this information also needs to be reflected in a revised version of the EIS. Please provide proposed text for the revised EIS, for SME review and acceptance.  Please also see follow-up IR-35-R1.	The quantitative screening analysis of acrolein has been included in the revised Draft EIS as Appendix D to Appendix 6-A to support the conclusion that acrolein is not a COPC. A summary of this analysis is also provided in Section 6.1.1.2 in the revised Draft EIS. Tables 3-10 and 3-11 in Appendix 10-A were also updated to be consistent with the changes made in Section 6.  The assessment includes estimated concentrations of 1-hour and 24-hour acrolein compared to Ontario Ambient Air Quality Criteria. It has also been updated to include estimated annual acrolein concentrations. The annual concentrations are predicted to be below the Tolerable Concentration (0.4 µg/m3) from Environment and Climate Change Canada and Health Canada’s Priority Substances List Assessment Report as well as the chronic reference concentration (0.02 µg/m3) from the US EPA. As such, acrolein can be screened out as a COPC from further assessment.	Yes  Revised Draft EIS Section 6.1.1.2, and Appendix 6-A  Revised Draft EIS Appendix 10-A, Table 3-10 and Table 3-11
IR-35	IR-35-R1	Health Canada (HC)	Change to an environmental component due to hazardous contaminants  IR-35 Response from Denison	Section 6, Chemicals of Potential Concern	Context: Potential health risks from long-term exposure to acrolein were not considered in the Proponent’s response to IR-35.  Rationale: No annual predicted concentrations for acrolein were provided in the draft EIS or in the response to IR-35. Concentrations were modelled for short-term exposure (1h and 24h) only in the draft EIS and compared to the 1-hour and 24-hour Ontario Ambient Air Quality Criteria for acrolein. It is Health Canada (HC) guidance to assess both potential short and long-term health effects. The predicted annual concentrations for acrolein should be compared against chronic reference concentrations (e.g., the USEPA Reference Concentration (RfC) <sup>1</sup> (0.02 µg/m3) and the Tolerable Concentration (TC) from Environment and Climate Change Canada and Health Canada’s Priority Substances List Assessment Report <sup>2</sup> (0.4 µg/m3)).	Use predicted annual concentrations and available chronic reference concentrations to account for potential health risks from long-term exposure to acrolein to support the decision to screen out acrolein as a COPC from further assessment.		See response to IR-35.	See response to IR-35

<sup>1</sup> [https://iris.epa.gov/static/pdfs/0364\\_summary.pdf](https://iris.epa.gov/static/pdfs/0364_summary.pdf)  
<sup>2</sup> [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf)

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-37	-	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<p>Context: "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist Proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."</p> <p>Rationale: Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry” OR “Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.</p> <p>Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).</p>	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.	<p>This response has not been accepted.</p> <p>Although a summary is provided in response to IR-37, this also needs to be reflected in revised version of EIS. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	A summary of consultation described in the previous IR response (Annex 1, IR-37 on page 17/419) has been added to the revised Draft EIS in Section 6.1.4.2. The references in Appendix 6-A have also been revised for consistency with the EIS.	Yes  Revised Draft EIS Section 6.1.4.2 and Appendix 6-A
IR-41	-	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<p>Context: The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."</p> <p>Rationale: If La Loche monitoring station is located near anthropogenic sources and the Project is not, use of this data is not a conservative or realistic representation of background.</p> <p>For a realistic approach, background data considered should be upper 95th percentile (or max if n&lt;10) from an area representative of project location</p> <p>For a conservative approach, background data from an area located even further from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact</p>	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.	<p>This response has not been accepted.</p> <p>Please propose a more suitable background site to use as background subtraction. La Loche is not a suitable background site as it is potentially impacted from other industrial sources; it is expected that another background site removed from other industrial sources be identified and used.</p>	<p>Denison and its SME restate its assertion that the La Loche station provides data that suit the intended purpose of the EIS. For context, the rationale for using the Saskatchewan Ministry of Environment regional air quality data set (which is derived from the La Loche station data) has been included in the revised draft EIS. La Loche is a small village and Clearwater River Dene Nation community in northwest Saskatchewan with a population of around 3,600 people. While the regional air quality data set was described as being ‘near anthropogenic sources’ we would like to clarify that there are no major industries with emissions in the community. The anthropogenic sources would be expected to be associated with vehicles and dust from gravel roads.</p> <p>The regional air quality data set was applied in the air quality modelling assessment to meet the requirements of the Saskatchewan Air Quality Modelling Guideline. This approach is used so that worst-case concentrations in air are predicted and evaluated against applicable air quality standards. We also note that northern Saskatchewan does not have an abundance of stations where parameters relevant to this assessment are measured and no stations are in truly remote areas (e.g., located away from small communities). For instance, the next closest station after La Loche is at Buffalo Narrows. which is about 200km away from the Project and would be expected to have similar air quality to La Loche as the communities are somewhat comparable in terms of size and industries, or lack thereof.</p> <p>Denison commits that it will consider and evaluate the potential use of alternative data sets that may be representative of baseline conditions in northern Saskatchewan, should</p>	Yes  Revised Draft EIS 6.1.3.2.7

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.			such be available, for future measurement programs and air quality modelling. Denison notes again, however, that use of the La Loche station data was appropriate and fit for purpose.	
IR-44	-	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p>Context: Section 6.2.8 discusses Monitoring and Follow- up. The Proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p>Rationale: Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see Health Canada, 2017).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per Health Canada (2017).</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>	<p>This response has not been accepted as preliminary details for mitigation and monitoring plans for noise impacts and complaints resolution process were not provided.</p> <p>The response partially addresses IR-44 through the commitment to developing the complaints resolution process. However, CNSC expects that the noise complaint resolution and response procedure will be included for review in the EIS.</p> <p>Section 9 (p. 44) of the EIS Guidelines state that the EIS “Shall present an outline of the preliminary environmental monitoring program, including:</p> <ul style="list-style-type: none"><li>the description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required),</li><li>plans to engage Indigenous groups in monitoring, where appropriate.”</li></ul> <p>Please provide proposed text for the revised EIS, for SME review and CNSC acceptance.</p>	<p>Denison notes that it believes the specific the request for the Noise Complaint Resolution and Response Procedure is beyond the scope of the requirements of an EA of a designated project under the Canadian Environmental Assessment Act, 2012. This request is also outside the scope of the Project Terms of Reference (Draft EIS, Appendix 1-A). Denison will submit management system documentation (procedures, plans) as part of the future licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process. As noted previously, Denison has committed to developing a community complaints and response procedure and the response procedure will be consistent with the appropriate Health Canada guidance. It would be premature to define the details of such a procedure without having engaged with the Indigenous Communities of Interest first. To this, it is also relevant to provide some spatial context that will inform engagement and the nature of the procedure. The Project is located on crown land in a remote area of Saskatchewan’s boreal forest. No communities are located within the immediate proximity of the Wheeler River property. Travelling by existing roads, the closest community to the Project is approximately 260 km away. Calculated using a straight line, the closest communities are approximately 150 km from the site and Saskatoon is 600 km south. The majority of crown land leases in the LSA are assumed to contain rustic, remote cabins which are typically used seasonally.</p> <p>Notwithstanding the above, we have provided additional details for Health Canada's consideration and the details, along with Denison’s commitment to developing a community complaints and response procedure consistent with the appropriate Health Canada guidance, will be added to Section 6.2.8 of the revised Draft EIS and Appendix 6-E. Prior to the commencement of the first routine noise monitoring campaign during Construction, Indigenous Groups and other Interested Parties will be notified of the monitoring schedule and planned locations. Initially, the proposed locations will be the same locations as were used in the baseline program for direct comparison of the data to the baseline conditions. These locations may be revised or expanded upon to include other locations based on feedback received. At the same time, Indigenous Groups and other Interested Parties will also be notified of how noise complaints may be registered. If a noise complaint is received, the associated monitoring would then take place at the location of the complainant. Upon receiving a noise complaint, the responsible Denison environmental staff will implement a complaints response and resolution process, documented using a complaints management form. The information to be recorded during the registration of the complaint will include the name and contact details of the complainant, the nature of the complaint, a description of the possible source(s) at the site associated with the complaint. Sound levels will then be monitored at the location of the complainant according to the description below, and a recommended action will be identified within two days with a timeline for implementation. Follow-up with the complainant will then take place to ensure that the issue has been resolved and follow-up monitoring will be completed where appropriate. Once the complainant is satisfied that that the issue has been resolved, the complaint will be formally closed out and a summary report will be completed by Denison and kept on file.</p>	<p>Yes</p> <p>Revised Draft EIS, 6.2.8</p> <p>Appendix 6-E</p>

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IR-48	-	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p>Context: Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p>Rationale: The noise assessment typically includes a map illustrating modelled noise levels from the Project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.	<p>This response has not been accepted.</p> <p>The map provided in the response did not include the contour lines requested in IR-48 to illustrate the maximum baseline and predicted noise levels. Furthermore, the map does not provide labels for receptor locations that appropriately describe the type of noise-sensitive receptor.</p> <p>HC requests that a map showing the following be provided:</p> <ol style="list-style-type: none"><li>1. Contour lines representing the maximum baselines and predicted noise levels at the location of the receptors;</li><li>2. Labels for receptor locations that are more descriptive of receptor type (e.g., hunting camp, ceremonial area).</li></ol> <p>It was also noted that the receptor location of Risk 2 (i.e., Trapper/Intensive Land User) in the provided map was not consistent with other receptor location maps in the Draft EIS (e.g. Section 10, Figure 10.1-7 Human Receptor Locations for the Project Human Health Risk Assessment). These differences included both the receptor location (i.e., opposite sides of McGowen Lake) and type (i.e. Trapper/Intensive Land User vs. Seasonal Resident). The receptor locations and types should be confirmed and consistently used throughout the EIS, and any discrepancies should be explained.</p> <p>Finally, a portion of Figure 8 – Adjusted Ldn (p.19 – appendix 6-E) is cut off from the page, preventing proper review. HC requests that the full/complete version adjusted to fit the page be provided.</p>	<p>We remind the reviewer that the Project is located on crown land in a remote area of Saskatchewan’s boreal forest. No communities are located within the immediate proximity of the Wheeler River property. Travelling by existing roads, the closest community to the Project is approximately 260 km away. Calculated using a straight line, the closest communities are approximately 150 km from the site and Saskatoon is 600 km south. The majority of crown land leases in the LSA are assumed to contain rustic, remote cabins which are typically used seasonally in the summer.</p> <p>The figure provided with the previous IR response (Annex 1, IR-48 on page 21/419) is included in the revised draft EIS as Figure 6.2-4. The purpose of this figure was to introduce the study areas and receptors. This figure is not meant to present results of the noise assessment and as such, the request to include contour lines representing the maximum baselines and predicted noise levels at the location of the receptors is not appropriate. Denison has included the receptor locations on the contour maps with the predicted noise levels (Appendix 6-E, Figures 8 to 15). Denison and its SME believe it is appropriate to have the detailed figures contained in Appendix 6-E, and there is no need to repeat them within Section 6.</p> <p>In response to this IR, we have completed the following revisions in Section 6 of the revised draft EIS:</p> <ul style="list-style-type: none"><li>• Updated Section 6.2.4.2 to include reference to specific Appendix 6-E figures for cross-referencing ease.</li><li>• Added a summary table that describes the sensitive noise receptors (Table 6.2-3) which may provide additional context to Figure 6.2-4.</li><li>• Updated the human risk receptor names for Risk 2 and Risk 4 as we recognize the earlier version of the names may have caused some confusion when compared to the HHRA receptors in Section 10.<ul style="list-style-type: none"><li>○ “Risk 2 - trapper” is now “Risk 2 - seasonal resident at McGowan Lake.”</li><li>○ “Risk 4 - seasonal resident” is now “Risk 2 - seasonal resident at Russell Lake.”</li></ul></li><li>• Adjusted Figure 8 in Appendix 6-E to fit the page.</li></ul> <p>We thank the reviewer for highlighting a mapping error in the Section 10 receptor locations. In the revised draft EIS Section 10, Figure 10.1-7 has been updated to correct the location of the McGowan recreational fisher/hunter. The location was incorrectly shown on the east side of the lake in the draft EIS when it should have been placed on the west side of the lake. Please note this was a mapping error only and the location and assessment of the receptor within the HHRA was correct and matches the updated figure in the revised draft EIS.</p> <p>It is noted that this IR response does not change the outcome of the noise assessment. Information added to the EIS documentation as noted above is for editorial purposes.</p>	<p>Yes</p> <p>Revised Draft EIS, 6.2.4.2.1, Appendix 6-E</p> <p>Revised Draft EIS, Section 10, Figure 10.1-7 was updated and the corresponding Appendix 10-A figure (Figure 4-2)</p>
IR-52	-	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater	Context: According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid,	1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the	This response has not been accepted as the Proponent did not provide the information that	Containment of mining solution during operation will be confirmed by a robust groundwater monitoring network comprised of numerous wells located at various vertical depth horizons above the mineralized zone. Data generated from the groundwater	No



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				Appendix 7	<p>hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.</p> <p>Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the center surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long’’. </p> <p>As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.</p> <p>Rationale: The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.</p>	<p>injection and extraction wells was not presented.</p> <p>2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.</p>	<p>would allow validation of the conclusion that hydraulic containment was successful.</p> <p>Hydraulic containment is to be utilized as a process to prevent the migration of contaminants away from injection well locations by groundwater. The Proponent indicated that tracer testing demonstrated hydraulic containment of the injected solution (as per the response to IR-6).</p> <p>Hydraulic containment is an important process as part of a multi-pronged approach to preventing the migration of contaminants to Whitefish Lake by groundwater migration. Consideration of all field test data will allow ECCC to review the Proponent’s conclusions about hydraulic containment.</p> <p>Provide all field test data to allow ECCC to review the conclusion that hydraulic containment was successful.</p>	<p>monitoring plan would serve various purposes, such as to assess performance and the controls associated with the ISR process. Denison provided the CNSC with the results of the tracer test (“Hydrologic Report, Summary of Findings, 2019 to 2021” prepared by Petrotek) as part of the response to the first round of IRs. The first-round response to IR-06 (Annex 1, IR-06, starting at page 90/419) summarized the results of the tracer test pertaining to hydraulic control of the injected solutions. Hydraulic control of the injected solution was demonstrated through analysis of groundwater samples from monitoring wells surrounding the test well pattern. No elevated values of the tracer were observed in the monitoring wells.</p> <p>To eliminate potential excursion of mining solutions to the regional groundwater Denison will engineer and create an artificial freeze wall to encompass the uranium deposit and isolate the mining area; the freeze wall will extend vertically approximately 400 m from the basement rock up to surface (details in EIS Section 2.2.1.3, 2.2.1.4.2.3, and 2.3.2). The freeze wall is a no flow boundary and will prevent the mining solutions from travelling out of the mining area and into the regional groundwater system. Denison reiterates that contaminants will not be able to migrate to Whitefish Lake during Operations and into the Decommissioning period until mining area remediation objectives are met and the freeze wall is allowed to thaw. The inclusion of a freeze wall isolates the mining area from the regional groundwater system and this design feature provides a high level of protection to groundwater resources.</p> <p>Denison believes it has fulfilled its requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on this topic for concluding the EA process. Notwithstanding that, Denison recognizes that further information may be required as the Project moves past the EA and into the licensing and permitting phases.</p> <p>The ISR mining model for the Wheeler River Phoenix deposit and the hydraulic containment on the mining solutions within the assessed area has been validated and signed off by a Qualified Professional, a legal requirement of a 43-101 Feasibility Study. The detailed data is not available publicly however, should the CSNC wish to further discuss the details with the Qualified Professional to support licensing requirements, Denison will arrange such a meeting.</p>	
IR-53	-	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<p>Context: The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.</p> <p>However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p>Rationale: It is not clear how representative the calibrated K</p>	<p>Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).</p>	<p>This response has not been accepted.</p> <p>Please include figure(s) (y axis representing depth below ground, x axis representing K, different length of vertical line segment representing different packer testing intervals, etc.) showing the field measured K values, as well as the calibrated K value for the upper sandstone aquifer, intermediate aquitard, and lower sandstone aquifer. This would help demonstrate the distribution of field measured K values and representativeness of calibrated K values.</p>	<p>All hydraulic conductivity (K) values for the intermediate sandstone aquitard considered in developing the regional model are presented in Appendix C of Appendix 7-A of the draft EIS. This Appendix includes the depth range for all packer intervals. Note that when reviewing these data, any K values that are prefixed with "&lt;" (e.g., &lt; 1.0e-7), indicate that the fractured rock has very low hydraulic conductivity. Denison does not feel a figure illustrating the data included in the table would add additional value to the information presented (as it would be redundant to the information provided) and the K values selected for the used in the model in Appendix 7-C of the Draft EIS.</p> <p>Note that hydraulic conductivity values applied in the numerical modelling reflect not only the packer tests, but also our conceptual model, which is based on core logging, lithology and mineral contents, and geochemistry sampling. Further the interpretation of the lower</p>	No

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					<p>values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>			hydraulic conductivity for the Intermediate Sandstone is consistent with the AECL published interpretation at Cigar Lake (i.e., a very similar setting).	
IR-55	-	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;  Appendix 7-C, section 2.8	Context: According to the Proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The Proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the Proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the Proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The Proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The Proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters < 50 years old) in the Lower	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the Proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.	This response has not been accepted.  In response to IR-55, the Proponent states “The viewpoint from the third party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed.”  If the alternative model requested in IR-55 has been developed by the Proponent, NRCan requests that full details of this model be provided in an attachment.	Additional documentation has been provided in Attachment IR-55 for the groundwater flow system that results from a calibrated condition where the Intermediate Sandstone Aquitard has a hydraulic conductivity of 1.0E-7.  An acceptable calibration was able to be achieved with the higher hydraulic conductivity in the Intermediate Sandstone Aquitard. As is appropriate to maintain a calibrated condition, the hydraulic conductivity within other hydrogeologic units were also varied. The match to the observation data is not as good as the base case calibrated model, but it is within acceptable limits. The alternative calibrated groundwater flow model, with a higher hydraulic conductivity in the Intermediate Sandstone Aquitard, results in higher volumes of groundwater flow converging upon Whitefish Lake, resulting in a decreased contribution of flow from the deep aquifers to the total volumetric groundwater flow to the lake.  Geochemical reactive transport of COPCs is further discussed as part of IR-89-R1, including for the groundwater flow conditions described in IR-55. Reflecting the smaller relative contribution of deep groundwater to flow to Whitefish Lake, there is an overall reduction in peak COPC concentrations in groundwater beneath the lake.	No



IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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					<p>Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the Proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p>Rationale: The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated in the Proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).</p>				
IR-56	-	CNSC	Geology and Groundwater	Section 7.3.3.2	<p>Context: It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p>Rationale: It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?	<p>This response has not been accepted.</p> <p>Although Denison’s response is acceptable, in order for the response to be accepted the following text should be incorporated in the EIS:</p> <p>“During Operation, select exploration boreholes will be re-utilized for narrow diameter injection wells that will be developed with monitoring devices for the determination of excursions and water levels. Exploration boreholes not selected for the use of narrow injection wells will be grouted to surface to seal off any remaining conduit.”</p>	The requested text has been added to Section 7.3.3.2 of the revised draft EIS.	Yes  Revised Draft EIS, Section 7.3.3.2.
IR-57	-	NRCan	Fish and fish habitat	Section 7.3.3.2  Appendix 7-A, sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p>Context: The Proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the Proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the Proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).	<p>This response has not been accepted.</p> <p>Using data provided in Attachment #57 (observed and simulated static water levels, screen mid-point elevations), NRCan was unable to reproduce the head gradient values reported by the Proponent in their table.The Proponent should check the gradient calculations.</p>	Denison thanks NRCan for their careful review of the information provided. Gradient calculations have been checked and corrections made. The calculation error does not affect the discussion however, as the same formula was used for observed and simulated gradient calculations. The technical contents of the original response (Annex 1, IR-57, starting at page 200/419) have been added to Appendix 7-C as Section 2.5.2.4., including a Table (Table 2-7) with the calculated gradients shown.	Yes,  Appendix 7-C, Section 2.5.2.4

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					<p>flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p>Rationale: In NRCan's opinion, the Proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the Proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the Proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>				
IR-61	-	CNSC	Geology and Groundwater	Section 7.4.2	<p>Context: There is no discussion of potential induced seismicity from mining processes.</p> <p>Rationale: Induced seismicity may lead to a loss of process as identified for natural seismicity.</p>	Please provide information on the potential mining-induced seismicity.	<p>This response has not been accepted.</p> <p>CNSC staff expect a discussion of the occurrence of mining-induced seismicity in general in Saskatchewan, and the inclusion of a summary of potential sources of induced seismicity related to ISR mining (such as the response that Denison provided for IR-61) and the corresponding mitigation measures in the EIS. The paucity of records of seismicity in northern Saskatchewan (as stated in EIS Section 15.2) does not necessarily indicate a lower potential for future induced seismicity. It should be noted that earthquakes of up to magnitude (ML) 4.4 are spatially correlated with locations of extractive industries with ongoing activity.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The following has been added to Section 7.4.2.4 of the revised Draft EIS:</p> <p>“Within the broader context of terrain stability, it is noted that natural seismic activity in Northern Saskatchewan is quite rare with no significant events in recorded history (refer to Section 15.2 Seismic Events).</p> <p>Mining induced seismicity has been of interest for some time, with mining-induced seismicity reported in Canadian hard-rock mines since the 1920s (Hudyma et al, 2017) and the first formal Canadian research on the problem starting in the 1930s (Hedley, 1992). Hasegawa et al. (1989) and Ortlepp (1992) describe several mechanisms by which induced seismicity may be capable of occurring in relation to underground (excavation based) mining; though, those mechanisms generally relate to discrete, large-scale rockmass failures whereas more than 90% of seismic events can be categorized as micro seismic events with moment magnitude &lt; 0 (Hudyma, 2008).</p> <p>In Saskatchewan, investigations of inducted seismic have been completed in association with potash mining and uranium operations. Sedghizadeh et al. (2023) applied statistical methods to investigate the nature of micro seismicity in a potash mine. Clustering analysis of micro seismicity indicated that the majority of events could be treated as independent background events mostly driven by underground mining operations; however, there is some clustering of seismicity and the formation of limited aftershock sequences of the “burst-type” (i.e., those that have only one parent event and many children). For example,</p>	<p>Yes</p> <p>Revised Draft EIS, Section 7.4.2.4</p>

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								<p>with respect to uranium mining (Barghwal and van der Baan) investigated the source mechanisms and possible causes of micro seismicity recorded in an underground Uranium mine for a period of one month in January 2011. The events occurred near the main working level at 480 m depth and show some temporal correlation with the daily rate of rock removal. The study concluded the observed micro seismicity occurred due to reactivation of pre-existing faults that were favourably oriented in the static stress state created by the extensive horizontal tunnel network and due to dynamic stress due to rock crushing activities.</p> <p>Despite the above noted link between seismicity and conventional hard-rock mining techniques / operations, as well as compared to high pressure liquid injection processes, the potential for mining-induced seismicity from the nature of the ISR mining that is proposed by the Project is interpreted as being quite low, given that the mechanisms that are purported to create or induce seismicity will not occur. Nevertheless, potential for mining-induced events for the Project that could be postulated to occur as the result of a few sources are discussed below for completeness: 1) collapse of cavity voids from leaching, 2) hydraulic fracturing, and 3) use of permeability enhancement techniques.</p> <p>1. Collapse of cavity voids. To clarify, the portion of the deposit being mined is never truly a void (as in a large empty underground cavern); rather, what remains will be a honeycomb textured environment with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses. In terms of void space creation and collapse of the overlying strata, modelling has demonstrated that only 0.05% by volume of desilicified material immediately overlies the ore zone and would be subject to collapse (Appendix 7C, Attachment K). This low volume and percentage are determined to not be of significant seismic concern.</p> <p>2. Hydraulic fracturing. EIS Section 2.2.1.4.2 Wellfield Operation provides a comparison of ISR mining pressures to conventional fracking pressures used in the oil and gas industry. Conventional fracking pressures used in the oil and gas industry can vary; however, common pressures to induce fracturing can range up to 15,000 psi and require injection of fracking fluids of up to 16,000 liter per minute over periods of three to four days. Fracking fluids are comprised of a slurry of water, proppant (generally silica sand), and chemical additives to support and maintain the open fracture system after fracking is conducted. Conversely, ISR mining for the Project is planned at nominal pressures of 100 psi, intermittent pressures of up 250 psi, and average flow rates of 30 liters per minute within a recovery well. The ISR mining method proposed for the Project is markedly different than fracking. For example, looking at intermittent pressures alone, ISR pressures are anticipated to be 60 times lower than fracking pressures.</p>	

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								<p>3. Permeability enhancement techniques. EIS Section 2.2.1.4.3 Permeability Enhancement outlines the three types of techniques being considered for the Project: mechanical, Propellant, and hydraulic options. Propellants are classified as a low hazard explosive (S.1 special-purpose explosives, low hazard explosives, per Explosive Regulations, section 36). Propellants technically do not explode (like classic mine explosives which detonate) but rather burn through a process called deflagration. Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds. Neither ISR mining or permeability enhancement is expected to produce mining-induced seismicity.</p> <p>Under normal operating conditions there is no expected mining-induced seismicity. See also Bounding Scenario 4 Failure of the Freeze Wall in Section 14.”</p> <p><b>References:</b></p> <p>Barghwal H. and M. van der Baan. 2020. Microseismicity observed in an underground mine: Source mechanisms and possible causes. Geomechanics for Energy and the Environment. Volume 22, May 2020.</p> <p>Hasegawa, H.S., R.J. Wetmiller, and D.J. Gendzwill. Induced seismicity in mines in Canada- An overview. Pure Appl Geophys. (1989) 129:423–53. doi: 10.1007/978-3-0348-9270-4_10.</p> <p>Hedley, D.G.F. 1992. Rockburst handbook for Ontario hardrock mines. CANMET Special Report SP92-1E, 305 p.</p> <p>Hudyma, M.R. Analysis and Interpretation of Clusters of Seismic Events in Mines. PhD thesis. University of Western Australia Perth (2008).</p> <p>Hudyma, M.R., L. Brown and O. Carusone. 2017. Seismic Hazard in Canadian Mines. Conference Proceedings. CIM AGM - May 2017, Montreal, Canada.</p> <p>Ortlepp, W.D. 1992. Invited Lecture: The design of support for the containment of rockburst damage in tunnels – An engineering approach. Proceedings of Rock Support and Underground Construction, (Editors: P.K. Kaiser and D.R. McCreath), Rotterdam, A.A. Balkema, pp. 593-609.</p> <p>Sedghizadeh, M. van den Berghe and R. Shcherbakov. 2023. Statistical and clustering analysis of microseismicity from a Saskatchewan potash mine. Frontiers in Applied Mathematics and Statistics. March 2023.</p>	
IR-64	-	ECCC  CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation	Context: The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case	Explain: <ul style="list-style-type: none"><li>Will this be revisited with updated data based on extraction feasibility results?</li><li>How will the surface expression of a subsidence will</li></ul>	This response has not been accepted.  CNSC staff expect Denison to include within the EIS a summary of the results of RESPEC’s most recent numerical modelling study that suggests negligible ground subsidence associated with the proposed	<p>Additional geomechanical modelling undertaken by Denison subsequent to the filing of the draft EIS, with refined, more granular inputs is included as Appendix K (RESPEC, 2024) to Appendix 7-A of the EIS. This report replaces earlier reporting.</p> <p>A brief summary of the RESPEC (2024) approach and results has been included in Section 7.4.2.2 of the revised Draft EIS. In summary, based on the modelling results presented</p>	Yes  Revised Draft EIS Executive Summary, Section 7, Section 9 and Section 16

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				Appendix 7-A, Appendix K (p. 12)	<p>bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.</p> <p>Rationale: ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.</p> <p>It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.</p>	<p>be limited to 7.5 cm and localized?</p> <p>Suggestions for mitigation and follow-up measures: ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.</p>	<p>volumetric extraction as this is an important consideration for designing an appropriate implementation plan for subsidence control and remediation measures.</p>	<p>therein, Denison does not anticipate the need for remediation measures, with the surface subsidence being negligible (on the order of millimetres) within the context of changes in terrain as it relates to decommissioning objectives.</p> <p>For clarity, the text added to Section 7.4.2.2 of the revised Draft EIS is as follows:</p> <p>“To aid in advancing the Project, a study was undertaken to evaluate the geomechanical stability of rock mass within the Phoenix deposit, overlying sandstones, and underlying basement rock following ore extraction with ISR and including the presence of the proposed freeze wall. The geomechanical study is presented as Appendix K of Appendix 7-A. Specifically, a full-scale 3D model of northeast extent of the ore zone, and specifically the northern half-length of Zone A shown in Figure 7.3-3, was developed to evaluate stress redistribution in the case of failure of remnant rock from rock mass removal. Average material properties were assumed for hydrostratigraphic units in the Pheonix deposit and surrounding rock, including hydrostratigraphic units shown in Figure 7.3-3. In the numerical model, instantaneous and random rock removal representing 30% by volume and 3% by volume for the high-grade ore zone and low-grade ore zone, respectively, was assumed.</p> <p>Quantified in the model was the competency of the remnant rock based on the predicted stress field and the potential for tensile fracturing of the rock. The modelling results indicated that the highest predicted failure volumes in remnant rock are associated with the ore zone (41%), but that predicted failure volumes decrease substantively to 8-26% in the immediately surrounding clay zones, and are very limited (0.02%) in the overlying sandstones, including within the desilicified zone, and underlying basement rock. In addition, no (0%) failure was predicted within the freeze wall itself. Importantly, associated vertical displacement of host rock into the mined cavity is predicted to be limited to values of no more than 49 cm in the ore zone and decrease to 0-7 cm only 4-5 m from the low-grade ore zone. Overall, predicted failure conditions are limited to 5-8 m of the extent of the low-grade ore zone and there is limited potential instability in the freeze wall.</p> <p>Subsidence at ground surface from displacement of host rock was predicted to be negligible. The average vertical displacement at ground surface is 2.5 mm.”</p> <p>Additionally, and for consistency with the information presented in the updated Appendix K of Appendix 7-A, surface subsidence estimates have been updated in the Executive Summary, Sections 7, 9 and 16 of the revised draft EIS from “7.5 cm” to “2.4 to 2.8 mm”.</p>	<p>(subsidence estimate clarification)</p> <p>Revised Draft EIS Section 7.4.2.2.</p> <p>Appendix K, Appendix 7-A.</p>
IR-65	-	CNSC	Geology and Groundwater	Section 7.4.2.2	<p>Context: It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?</p> <p>Rationale: Surface facilities and wells may be impacted if there is unaccounted for subsidence.</p>	<p>Please provide additional details for any dewatering/pumping induced subsidence.</p>	<p>This response has not been accepted.</p> <p>CNSC staff expect Denison to include within the EIS a summary of their response to IR-65 to establish their basis for a low probability of pumping and/or dewatering subsidence. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>Per the comment the following text has been added to Section 7.4.2.2 of the revised Draft EIS.</p> <p>The potential for subsidence related to changes in fluid balance within the freeze wall during Operation was also considered. The freeze wall will provide hydraulic containment between the internal wellfield and the external regional groundwater system with each well pattern maintaining a 1.7% 'bleed' to maintain hydraulic gradients towards recovery wells. This results in an isolated hydrogeological environment within the freeze wall, separate from the regional groundwater system but considered an unconfined aquifer within the freeze wall, being open to atmosphere. The "extra" water pumped (i.e., the water pumped in excess of injection) will be derived from stored groundwater within the</p>	<p>Yes</p> <p>Revised Draft EIS, Section 7.4.2.2</p>



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								<p>sandstone units above the ore zone, and from the underlying paleoweathered zone, within each phase of Operation that is surrounded by freeze walls. The volume of stored water was estimated using the calibrated groundwater flow model (Appendix 7-C), which contains 3D volumes for the saturated soil and rock within each of the walled phases, including appropriate porosity values. These volumes of stored water were compared to the volume pumped within each phase of operation, over the expected period of extraction based on the mining plan. The stored volume of water was calculated to be 3.4 (Phase 1) to 9.7 (Phase 4) times the estimated excess pumped volume. In other words, there is ample stored water within each walled phase to supply the excess pumped volume. The excess pumping creates a hydraulic gradient toward the ore zone within each walled phase and help vertical spreading of the UBS during operations. If monitoring during operations indicates water levels are falling quicker than anticipated, additional water could be added within the walled phase, within the Upper Sandstone Aquifer.</p> <p>Given the above, a fluid balance (or flow rate balance) was conducted as part of wellfield planning to inform Feasibility Study production rates within the mining zone contained within the confines of the freeze wall. Freeze studies concluded a no flow boundary once closure of the freeze wall is established along the perimeter of the mining area. Additional modelling within the mining area, including groundwater (FEFLOW) and production (Goldsim) modelling, were applied and although a net increase in volume is anticipated over the life of mine, a net draw is maintained on a well pattern basis to maintain 'bleed' and inward hydraulic gradient during active mining operations. To maintain fluid balance and not draw down the water table in the overlying sandstone units, additional sources of water from groundwater wells outside the freeze wall will be injected inside of the freeze wall as part of normal drilling operations during wellfield development and will be accounted for in the balance. This ensures potential for subsidence related to water table drawdown in the upper sandstone units is mitigated. Operating parameters rely on a relative net water balance for successful operations and would not support a significant drawdown of the water table owing to ground subsidence concerns.</p>	
IR-66	-	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<p>Context: Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.</p> <p>Rationale: Subsidence may impact wells and surface infrastructure.</p>	Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.	<p>This response has not been accepted.</p> <p>Denison claims that the expected risk from subsidence is negligible. Granted that updated models by RESPEC indicate negligible ground subsidence, in practice, modelled and actual subsidence measurements usually vary. Therefore, CNSC staff still deem it necessary to include additional details on subsidence monitoring and contingency plans (including triggers for implementing these). Moreover, since Denison plans to survey well collar elevations notwithstanding the negligible ground subsidence modelled by RESPEC, they might as well discuss the techniques that they plan to employ. Currently, it is not clear what method they plan to utilize to potentially detect elevation changes in well collars that cannot also be used to detect subsidence of</p>	<p>The response below has been added to Section 7.8.1 of the revised Draft EIS, and a reference to these details added to Section 7.4.2.2.</p> <p>“Initial wellfield construction primarily consisting of earthworks to level the pertinent wellfield phases will be guided by Lidar surveys to provide a consistent datum prior to the installation of any well type (monitoring, injection, recovery, freeze) within the wellfield.</p> <p>The subsequent installation of any well type is located on a ‘easting’ and ‘northing’ basis guided by a differential global positioning system (DGPS) with accuracy of within 5 cm. Although DGPS systems can measure a point in the vertical or ‘Y’ direction with a comparable level of accuracy to the ‘X’ and ‘Y’, the vertical datum of any installed well will be further validated by use of stadia rods, which have accuracy to within 5 mm.</p> <p>The top of collar elevation of all newly installed wells will be measured to a known datum located off the wellfield. As part of annual inspections well collar elevations will be measured on a regular basis and recorded relative to the prior years’ measurements to determine the degree (if any) subsidence occurring within the well itself that may be attributable to sloughing or shifting of a well at depth. Measurements of the well collar</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 7.8.1, 7.4.2.2, and 16.2.1, and Executive Summary Section 5.3.1.</p>

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							the overall terrain. Denison has discussed the limitations (i.e., resolution) of Lidar, which is a good start. However, it must be noted that vertical accuracy and precision are more important considerations than spatial resolution for evaluating the applicability of subsidence monitoring techniques for this project, especially considering the size of the study area. CNSC staff also recommend that Denison further explore the applicability of methods such as DGPS, InSAR, and UAV-based Lidar change detection for their monitoring plan.	<p>elevations are a surveying industry standard tool for determination of any vertical movement within a well itself.</p> <p>Satellite system’s such as InSAR may be utilized to complement the stadia rod measurements on an as needed basis; however, due to the negligible subsidence (&lt;10 mm) anticipated the system is envisioned to have its limitations with emphasis and reliance placed on site specific measurements.</p> <p>The proposed monitoring program, as conceptually described above, will be documented more formally as part of the overall operations management program prior to establishment of the well field. The monitoring program will include a contingency plan whose objective would be to facilitate the timely identification of, and response(s) to, potentially emerging conditions whereby routine monitoring data indicate performance is not meeting expectations (e.g., levels of subsidence are outside the range of expectations). The contingency plan conceptually would identify performance objectives, key performance indicators and measurement endpoints, triggers that would describe conditions, when met, where a response is required and a tiered-response plan in which an emerging issue would be confirmed (or not), with successive levels of response, including investigation of cause and risk, investigation of strategies to mitigate risk and implementation of preferred risk mitigation."</p>	
IR-67	-	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<p>Context: Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.</p> <p>Rationale: The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).</p>	<p>1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.</p> <p>2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.</p>	<p>This response has not been accepted, as this information should be provided in the EIS.</p> <p>CNSC staff request that Denison either include a high-level summary of the results of the metallurgical tests (including the data) or include appendices to the EIS that contain the data provided in attachments IR-20, IR-67, IR-69 and cite these within the EIS.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The response to IR-67 from the initial round of FIRT review comments that included consideration of issues raised in IR-20, IR-67 and IR-69 has been included as Appendix F to Appendix 7-C of the revised Draft EIS. References to the new appendix (Appendix F of Appendix 7-C) have been made in Appendix 7-C and Section 7 of the EIS as appropriate. Appendix F of Appendix 7-C has been included within the revised Draft EIS documentation provided as part of the overall response to the second round of FIRT review comments.</p>	<p>Yes</p> <p>Appendix F (a new appendix) has been added to Appendix 7-C.</p>



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						3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.			
IR-70	-	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p>Context: The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p>Rationale: A hydraulic conductivity (K) value of 5x10-6 m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	<p>Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.</p>	<p>This response has not been accepted.</p> <p>In the discussion of K values for the Ore Zone in Section 2.3.1.7 of Appendix 7-C, Denison notes that available measurements are derived from permeameters and likely underestimate actual conditions because they do not account for macro-scale fracture flow in the ore zone. Section 4.4.2 of Appendix 7-C indicates that a hydraulic conductivity value of 5E-06 m/s (5 times greater than value assumed for the ore zone in the 3D regional-scale model) was assigned to represent mining post-decommissioning for the base case scenario. The description for Scenario #7 of the sensitivity analysis reads "higher hydraulic conductivity within the ore zone". In their response to IR-70, Denison states that for Scenario #7, "the hydraulic conductivity in the ore zone was raised to be a uniform value of 2E-07 m/s to represent the effective dissolution of any clay cap minerals". No information relating to permeability or hydraulic conductivity is provided in the IR-20/IR-67/IR-69 attachment outside of qualitative observations of increased permeability following leaching with lixiviant. The information provided to CNSC staff thus far indicates that hydraulic conductivity (K) values for the base case scenario was 5E-06 m/s, and 2E-07 m/s for the higher ore zone hydraulic conductivity scenario (Scenario #7). Clearly this interpretation is not logical given that 2E-07 &lt; 5E-06. Furthermore, Denison's assertion that the post-mining conductivity of the ore zone is unimportant relative to the hydraulic conductivity of lower sediments and desilicified zone is not supported by the data presented in Table 4-6 of Appendix 7-C. The table below provides a summary of predicted groundwater concentrations for key COPCs (As, Se, U) for Scenarios 5, 6, and 7, as well as the relative percent difference to values predicted by the base case scenario. For these COPCs, it appears that increased ore zone hydraulic conductivity brings about the same order of magnitude changes as does varying K values for the lower sandstone (LSS). As such, it is important that the</p>	<p>There are a number of second round IRs associated with the theme of 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p>Our earlier responses to this and related IRs referred to the ore zone as being a relatively small portion of the Draft EIS-characterized source volume as being part of our rational for not considering it a critical element. As stated in the Draft EIS, the source volume was conservatively estimated assuming a flare zone above and below the ore zone, within the confines of the freeze-walled zones. To further expand on that, as described in Draft EIS, the source volume includes the ore zone (core and barrier layers), the underlying paleo-weathered zone, and the overlying Lower Sandstone Aquifer (i.e., the restored solution extends 50 m above and below the ore zone). As such, the ore zone represents 2.75% of the source zone fluid volume, and less than 6% of the source mass of uranium, for example. As such, mass contained within the ore zone represents a relatively small portion of the overall source.</p> <p>Further, the most transmissive portion of the source zone is within the lower sandstone aquifer, and the most persistent portion of the source zone is within the paleo-weathered bedrock horizons where matrix diffusion is expected to result in source persistence.</p> <p>The hydraulic conductivity varied within prediction uncertainty scenario #7, reflects a higher hydraulic conductivity for the barrier layers of the ore zone, rather than the ore zone core. This was considered the most relevant parameter to vary to reflect a higher potential for ore zone mass to enter the overlying altered and desilicified units.</p> <p>To further demonstrate the robust nature of this hydrogeologic setting, an additional sensitivity scenario was run in direct response to the IR. This transport simulation was performed with the conductivity of the ore zone set to 5e-5 m/s (10 times higher than the overlying lower sandstone aquifer and desilicified zone). Under this scenario, similar peak COPC concentrations reaching Whitefish Lake to the base case scenario are predicted. COPC concentrations in groundwater remain below groundwater quality screening criteria at Whitefish Lake and do not change the conclusions of the original analyses. Details of this additional scenario are included in Attachment IR-89-R1.</p> <p>The table produced by the reviewer highlights changes of up to 200% between scenarios; however, that is to be expected since the results as presented simply reflect the variation between the scenarios based on scenario assumptions. All peak COPC concentrations in</p>	No

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							<p>parameterization for Scenario #7 of the sensitivity analysis is valid - Denison is requested to provide clarification on this matter.</p> <p>From Table 4-6 of Appendix 7-C (p. 4.43). Relative percent difference compared to base case scenario shown in brackets. Values represent groundwater concentrations at Whitefish Lake.</p> <table><tr><td>Scenario</td><td>As, µg/L</td><td>Se, µg/L</td><td>U, µg/L</td></tr><tr><td>Base case</td><td>0.782</td><td>0.835</td><td>0.550</td></tr><tr><td>5 (highest combined K values for LSS and ISA)</td><td>0.982 (25.6% )</td><td>1.28 (53.3 %)</td><td>1.54 (180 %)</td></tr><tr><td>6 (highest K value for LSS)</td><td>1.10 (40.7% )</td><td>1.44 (72.4 %)</td><td>1.81 (229 %)</td></tr><tr><td>7 (increased ore zone K)</td><td>1.58 (102%)</td><td>1.47 (76.0 %)</td><td>0.769 (39.8 %)</td></tr><tr><td>Screening Criteria</td><td>5</td><td>2</td><td>15</td></tr></table> <p>The Proponent also should provide an explanation for the chosen parameter values for Scenario 7. Post-mining hydraulic conductivity (K) of the ore zone is consequential to understanding contaminant migration in groundwater.</p> <p>It should also be noted that the fate and transport simulations of the COCs are highly dependent on groundwater flow in the desilicified zone and acceptance of this IR will depend on the response to IR-89. Additional modelling has been requested in response to IR-89 that considers higher K values in the desilicified zone. Such additional modelling would assist in assessing if ore zone permeability is not important to the fate and transport of COPCs, as asserted by the Proponent.</p>	Scenario	As, µg/L	Se, µg/L	U, µg/L	Base case	0.782	0.835	0.550	5 (highest combined K values for LSS and ISA)	0.982 (25.6% )	1.28 (53.3 %)	1.54 (180 %)	6 (highest K value for LSS)	1.10 (40.7% )	1.44 (72.4 %)	1.81 (229 %)	7 (increased ore zone K)	1.58 (102%)	1.47 (76.0 %)	0.769 (39.8 %)	Screening Criteria	5	2	15	scenarios presented in the revised Draft EIS and additional scenarios presented in IR-89-R1 remain below groundwater quality screening criteria (except for a small number of constituents that have naturally elevated concentrations relative to criteria).	
Scenario	As, µg/L	Se, µg/L	U, µg/L																														
Base case	0.782	0.835	0.550																														
5 (highest combined K values for LSS and ISA)	0.982 (25.6% )	1.28 (53.3 %)	1.54 (180 %)																														
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7 (increased ore zone K)	1.58 (102%)	1.47 (76.0 %)	0.769 (39.8 %)																														
Screening Criteria	5	2	15																														
IR-71	-	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	Context: The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge	<p>This response has not been accepted.</p> <p>The effect of climate change on groundwater recharge in Prairies or Canada is generally</p>	In response to the comment, the following text has been added to the revised Draft EIS, Section 7.7.1.	<p>Yes</p> <p>Revised Draft EIS Section 7.7.1.</p>																								

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					<p>correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p> <p>Rationale: It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.</p>	<p>for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.</p>	<p>uncertain due to the large degree of uncertainty in the modelling of future recharge although future changes in temperature and precipitation are expected to alter groundwater recharge (through changes to runoff, evapotranspiration, and snow accumulation). While CNSC staff accepts the response on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area, no justification has been provided on why quantitative analysis was not completed to address the effect of climate change on groundwater recharge.</p>	<p>“Quantification of the effects of climate change were not specifically addressed because the case of reduced groundwater recharge (i.e., the most relevant parameter which could change within the groundwater flow system), and thus a lower driving force for transport, was considered less conservative than the scenarios tested.”</p> <p>The text above has been added to Section 7.7.1 of the revised Draft EIS based on the following. To confirm this assumption, (two) additional modelling sensitivity scenarios were run where groundwater recharge was varied by +/- 20%, which recognizes the uncertainty in future climatic conditions. The 20% range of recharge variability is conservatively estimated based on predictions from Environment Canada (climatedata.ca – Key Lake; Precipitation will increase by 11 to 15%, and temperature will increase by 2.5 to 4.6°C) and is consistent with the range of variability that others (e.g., Erler et. al, 2019) have found for the foreseeable future (i.e., end of century). Details of these additional scenarios are included with Attachment IR-89-R1.</p> <p>Both scenarios did not appreciably change peak COPC concentrations in groundwater reaching Whitefish Lake relative to the base case conditions, and all constituent concentrations remain below groundwater quality screening criteria. Consequently, climate change is not considered to change the overall groundwater risk as presented in the EIS documentation provided to date.</p> <p><b>References:</b></p> <p><i>Erler, A. R., Frey, S. K., Khader, O., d’Orgeville, M., Park, Y.J., Hwang, H. T., et al.</i> (2019). Evaluating climate change impacts on soil moisture and groundwater resources within a Lake affected region. <i>Water Resources Research</i>, 55, 8142–8163. <a href="https://doi.org/10.1029/2018WR023822">https://doi.org/10.1029/2018WR023822</a></p>	
IR-72	-	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<p>Context: Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.</p> <p>Rationale: It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?</p>	<p>Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.</p>	<p>This response has not been accepted.</p> <p>CNSC staff request that Denison discuss the potential for excursions of brine from freeze wells and that they include a summary of plans to monitor these using key indicators of freeze wall brine migration, such as electrical conductivity (EC) and chloride (CaCl2), in the EIS (even at a high level if these are still being currently developed).</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>In consideration of the review comment, the following text has been added to the revised draft EIS to address this IR.</p> <p>Section 7.8.2: “One additional parameter, chloride, has been included as a key parameter. It is possible that mobilized chloride concentrations are higher in the injected fluids than in groundwater; however, this is not the primary intent of including this parameter in the routine monitoring. Rather, calcium chloride brine makes up fluids that maintain the freeze wall. Thus, a change in the concentration of chloride - and EC - may indicate that a loss of freezing capacity has occurred in the freeze wall, representing an excursion, and delineate the extent of brine migration. However, loss of freezing is considered as an accident and malfunction, and loss of freezing is expected to be signaled much earlier by operational monitoring (e.g., pressure changes in the cooling circuit) than through monitoring of water quality.”</p> <p>Section 7.8.2.2.2: (The text in italics has been added)</p>	<p>Yes.</p> <p>Revised Draft EIS, Sections 7.8.2 and 7.8.2.2.2, Executive Summary Section 3.4.2.1.</p>

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								“The groundwater monitoring network during Operation will focus on groundwater conditions within and on the outside perimeter of the freeze wall, and evaluation of changes in groundwater quality including detection of excursions from potential loss of freezing capacity.”	
IR-75	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<p>Context: The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the Proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.</p> <p>Rationale: By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the Proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.</p>	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.	<p>This response has not been accepted.</p> <p>As stated in the original comment, the geomechanical study (Appendix K of Appendix 7-A of EIS, RESPEC 2021) showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays. Although the Proponent has conducted additional numerical modelling by adding the desilicified sandstone into the model with conservative mechanical properties for this zone, the mechanical properties of other materials are basically same as the original modelling (i.e., empirically derived average material properties of key stratigraphic layers). The new modelling (RESPEC 2023, i.e., Attachment IR-21) does not address the uncertainties associated with the non-site specific physical and mechanical parameters of different rock formations used for the modeling. Some mechanical parameters used appear to be inadequate, e.g., the mechanical properties of overburden and rock-mass modulus of desilicified sandstone. The use of isotropic in-situ stress state is non-conservative. No sufficient justification/rationale is provided on the excavation of 30 percent of rock by volume from the high-grade ore zone to which 50% was used in the RESPEC (2021), which could have significant impact on the modelling results. In addition, Figure 2 of Attachment IR-21 does not show the desilicified sandstone although it is stated that the desilicified sandstone is considered in the modeling. Also see CNSC’s disposition to Denison’s response to IR-83.</p>	<p>There are a number of second round IRs on the theme of effectively 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p><u>Material Properties and the Desilicified Sandstone:</u> An update to the geomechanical study (RESPEC, 2024) is presented as Appendix K to Appendix 7-A, that clearly shows the Desilicified Sandstone in Figure 2a and 2b (versus the previous version of the report; Annex 1, Attachment IR-21 starting on page 134/419). In the modelling, sandstone that has been hydrothermally altered includes the Altered Sandstone and Desilicified Sandstone. Details on how the Altered and Desilicified Sandstones were delineated is provided as part of IR-83. The Desilicified Sandstone was included in the updated modelling to provide a more conservative approach from prior models. Cohesion values were set to ‘0’ to demonstrate a conservative approach. Material properties for the Altered Sandstone and other stratigraphy remained unchanged from prior models as these values are deemed appropriate based on site-specific knowledge and comparable to other Athabasca Basin uranium deposits of similar settings.</p> <p><u>Excavation of rock mass:</u> Random rock removal was adopted to represent the in-situ leaching process in the numerical model and included the instantaneous removal of 30% of the rock mass by volume from the high grade zone and 3% volume from the low grade zone. The volume of rock removed in the model is consistent with values achieved through site specific long-term testing of high and low grades cores at an accredited lab facility. As the high and low grade zones of the deposit encompass several stratigraphic layers, these values incorporated into the model represent a conservative approach.</p> <p>Denison believes it has fulfilled its requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on this topic for concluding the EA process. Notwithstanding that, Denison recognizes that further information may be required as the Project moves past the EA and into the licensing and permitting phases. To support licensing, Denison will provide further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their potential impacts on the mine operation and closure.</p>	No



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								We also highlight the role of the Project's decommissioning plan and associated cost estimate as a core document guiding Project aspects in the post-decommissioning period in general, and the mining area decommissioning objectives in particular. As the Project advances, the details of the decommissioning plan will naturally become more refined and will build on experience gained during operations, including mining, monitoring, and additional laboratory studies. The decommissioning plans are built on a 'decommission tomorrow' scenario and the financial guarantees will be developed in consideration of potential well breakages.	
IR-76	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<p>Context: Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.</p> <p>Rationale: Failure of steel casing may result in process loss or alter groundwater flow and quality.</p>	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.	<p>This response has not been accepted.</p> <p>CNSC staff request that Denison include summary of the potential for steel casing failure and plans for monitoring and mitigating its effects (such as the response to IR-76) within the EIS, for SME review and acceptance.</p>	<p>With regards to steel casing failure and plans for monitoring and mitigating its effects, the following is noted:</p> <p>Mitigation of steel casing failure is accomplished by the injection and recovery well designs and operational monitoring of the wellfield. The well design is already described in the revised draft EIS in Sections 2.2.1.4.1 and 2.2.1.4.2. Each well will have double containment: mining solution will travel inside an inner casing with the outer casing acting as secondary containment for the mining fluids. See below for operational monitoring discussion.</p> <p>Potential for steel casing failure: Conditions with respect to the potential for steel casing failure are addressed in IR-75. An additional hazard scenario has been added to the revised Draft EIS (Annex 1, IR-213 on page 76/419), to further address the potential for failure conditions associated with the steel piping. The new hazard scenario was added to Table 3-2 in Appendix A of Appendix 14-A (Accidents and Malfunctions Assessment) as Scenario 2.4 Well Casing Yield and/or Damage. For reference and based on hazard screening analysis provided in Appendix A of Appendic 14-A, this scenario is evaluated to be a low likelihood scenario (2) with moderate consequence (score 3) for an overall risk ranking of low, and accordingly was not advanced for further more detailed analysis beyond initial risk screening. The scenario is viewed as a low likelihood scenario due to the proposed multilayer design of the injection / recovery well design.</p> <p>Monitoring: The following details of monitoring of injection and recovery wells will be added to Section 2.8 of the revised Draft EIS: “Well casing integrity will be monitored in a rigorous fashion, thereby allowing Denison to respond to any steel casing failures in a timely manner. A network of monitoring wells installed within the freeze wall area will be equipped with pressure instrumentation for the determination of the vertical strain/stresses placed on the formation. This monitoring network is designed to detect if these strains may be deviating from their acceptable levels and beyond the design tolerance prior to failure. The injection and recovery wells will also be equipped with continuous monitoring devices for pressure and temperature that can detect a breach in the well casing if one were to occur. These data will be transmitted to the processing plant for remote monitoring through a master control system. Through the master control system, operators will be capable of controlling pumphouse production lines remotely. Wellfield monitoring will facilitate detection of any issues with the injection and recovery wells. As a further preventative measure, annual mechanical integrity testing is conducted on the wells to ensure their containment and compliancy. Active monitoring will allow for operational shutdown of the individual well in</p>	<p>Yes</p> <p>Revised Draft EIS, Section 2.8</p>

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								the instance that conditions that could lead to a failure are indicated to prevent loss of process related chemicals into the freeze wall area”.	
IR-78	-	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity  Appendix 7-C, Section 2.3.2.1, Porosity Values	<p>Context: This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally,, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p>Rationale: The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests, were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.</p>	<p>This response has not been accepted.</p> <p>Effective porosity is an important parameter to understanding groundwater flow and contaminant transport. The Proponent states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, including porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to explain this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p>In response to the IR, the Proponent explained and supported their methodology for selecting a value for effective porosity. This method included consideration of literature values and a regional analogue at Cigar Lake. ECCC notes that a tracer test was conducted, the results of which were not considered in the selection of the effective porosity parameter.</p> <p>If field test data is available that is potentially relevant to determining effective porosity, it should be included in the EIS when discussing effective porosity. The field test data should also be made available for ECCC to review, to confirm the conclusions reached by the Proponent. ECCC acknowledges that other sources of information can be useful when explaining the most appropriate value for effective porosity such as literature values and regional analogues, as per the Proponent’s IR response. However, field test results should be presented in the EIS and considered as a part of such an explanation. If the</p>	<p>There are a number of second round IRs associated with the theme of 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done to date adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p>The forced gradient tracer test undertaken by Petrotek (2022) was designed to evaluate the degree of capture that could be achieved using injection and extraction wells oriented in a star pattern within a relatively small (i.e., 5 to 10 m radius surrounding GWR-040) portion of the ore zone. Based on the purpose and relatively small scale of the test, Denison and its SMEs do not consider the test conditions/results to be representative of groundwater migration pathways post-decommissioning. Further, the tracer test was performed after permeability enhancement efforts (e.g., MaxPerf, Gas Gun and Kraken tools) which are designed to enhance the effective porosity beyond the natural state. Effective porosity values from this testing were never published and were not considered relevant to the scale of the EA modelling based on the small scale of the evaluation, and the impact of permeability enhancement measures. However, effective porosity values derived from the peak arrival time at extraction wells were computed to range from 1 to 7%, which is in line with the effective porosity value assigned for the ore zone pre-mining (i.e., 1%); higher values are expected within the ore zone post-mining which will result in increased travel times.</p> <p>The discussion above has been summarized in the revised Draft EIS, in Section 4.5. Additionally, it is noted that effective porosity values applied in the groundwater flow and transport models were selected to be consistent with the available literature, including those applied by AECL at Cigar Lake (AECL, 1994).</p> <p>Despite the above, and in consideration of the review comment, an additional conservative sensitivity geochemical reactive transport scenario was performed to evaluate a lower effective porosity within the paleo-weathered zone (PWZ). The PWZ is simulated to be the area wherein mass is most persistent and so reducing the effective porosity within this zone allows initial source mass to migrate out of the paleoweathered zone toward receptors faster. For this scenario, the effective porosity was lowered by a factor of 10 for this unit to reflect a more fracture-dominated transport condition, with limited matrix diffusion. Slightly higher peak concentrations were simulated for a number of COPCs (including As, Cd, Co, Cu, Ra-226, Se, and Zn) relative to base case concentrations, but all peak concentrations remained below groundwater quality screening criteria beneath Whitefish Lake. Details of the scenario are provided in Attachment IR-89-R1 for reference.</p>	Yes,  Appendix 7-C, Section 4.5

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							<p>Proponent feels that not utilizing field test data is the most accurate approach when selecting an effective porosity value, then this conclusion should be reached with consideration of the field test data as a part of the evaluation.</p> <p>Provide a discussion of how the effective porosity values are selected, including a discussion of how field test results were considered. This information is necessary to confirm that the selected effective porosity values are valid. This also relates to IR-52.</p>	<p>The results of the additional simulation confirm our understanding that uncertainty in effective porosity does not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon.</p>	
IR-81	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p>Context: The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p>Rationale: Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	<p>Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., <math>\delta^2\text{H}</math>, <math>\delta^{18}\text{O}</math>) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.</p>	<p>This response has not been accepted.</p> <p>CNSC staff agree with the interpretations drawn from the information presented in the response to IR-81. However, it remains that the EIS does not contain an assessment of the tritium data presented, aside from the text quoted in the original IR-81 relating to Section 4.3.3 of Appendix 7-A. As such, CNSC staff request that Denison revise the EIS to include a high-level summary of the tritium data presented in the response to IR-81, being (i) the data is limited in value to conceptual model development, (ii) conclusions from tritium data at Cigar Lake at not reproducible with the current dataset, and (iii) Denison will continue to monitor tritium to further evaluate the usefulness in refining the conceptual model.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The discussion of tritium has been added as Appendix L of Appendix 7-A of the revised Draft EIS. Text referring to Appendix L of Appendix 7-A has been updated in the following Sections:</p> <p>Section 4.2.2. of Appendix 7-A: “Groundwater Ageing: Tritium Values”.</p> <p>This new subsection has the following text, summarizing what is presented in Appendix L to Appendix 7-A</p> <p>“The potential for analysis of tritium concentrations in groundwater to support ageing of groundwater and the development of the CSM for the Wheeler River program was evaluated using the available analytical data and information on tritium concentrations in precipitation. The analysis is presented in Appendix L. It was concluded that, beyond supporting recent groundwater recharge in the overburden and the upper sandstone aquifer – discussed further below (Section 4.3.3) - tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface for the Wheeler River Project. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.”</p> <p>Section 4.3.3 of Appendix 7-A, subsection: “Local Groundwater Flow System”. The following text has been added:</p> <p>“Recharge Conditions: Analysis of tritium values in groundwater from the Local Groundwater flow system is presented in Appendix L. Results suggest that groundwater in this flow system has been recently recharged, in the last approximately 12-25 years, but that residence times can be longer in localized areas of the flow system”.</p> <p>Revised draft EIS Section 7.8.2:</p> <p>“In addition to the above parameters, tritium concentrations will also be measured in groundwater to further analyze the potential to age groundwater in the subsurface.”</p>	<p>Yes</p> <p>Appendix L of Appendix 7-A.</p> <p>Appendix 7-A Section 4.2.2 and 4.3.3</p> <p>Revised Draft EIS, Section 7.8.2</p>
IR-83	-	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p>Context: Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the</p>	<p>Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip</p>	<p>This response has not been accepted.</p> <p>As stated in the CNSC’s disposition to Denison’s response to IR-75, Figure 2 of Attachment IR-21</p>	<p>The RESPEC (2024) study is provided as Appendix K to Appendix 7-A and has been updated to show the desilicified zone in Figures 2a) and 2b). The material properties of the</p>	<p>Yes</p> <p>Appendix K to Appendix 7-A.</p>



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					<p>developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p> <p>Rationale: Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.</p>	<p>model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.</p>	<p>(RESPEC 2023) does not show the desilicified sandstone although it is stated that the desilicified sandstone is considered in the numerical modeling. Therefore, the extent of desilicified sandstone modelled is not clear. It is also not clear where the vertical plane represented by Figure 2 is cut from Figure 1. The linkage between the geomechanical model represented by Figure 2 in RESPEC (2023) and the geological model in EIS S07 is not provided.</p> <p>Please provide the requested information.</p>	<p>desilicified zone are given in Table 1 of Appendix K, and represent conservative values for the purpose of collapse / subsidence analysis.</p> <p>The vertical plane represented in Figure 2a) is now explicitly shown as part of Figure 2a).</p> <p>To clarify the linkage between the models presented in the geomechanical study and the regional hydrogeology Conceptual Site Model (CSM) developed in Appendix 7-A and associated groundwater flow and transport model presented in Appendix 7-C, the following text was added to the revised Draft EIS as a preface to Appendix K of Appendix 7-A (page K.1 of Appendix 7-A).</p> <p>“The information presented in Appendix K was based on the same geologic information as was used herein to develop the regional hydrogeology CSM for the Project. A clarification is provided, however, on differences in terminology for the desilicified zone used between the two reports.</p> <p>Herein, the desilicified zone was delineated using rock core RQD, friability and fracture frequency (Section 3.4.4). Specifically, to delineate the desilicified zone in the hydrogeology CSM, core with a friability of 3 or greater was interpreted to be hydrothermally altered sandstone of high relative porosity and permeability in comparison to the unaltered Athabasca Supergroup Sandstones, through substantive loss of matrix silica content (10% or more; Sorba and Tetland, Personal Communication).</p> <p>In the RESPEC (2024) report, differentiation was made with respect to the level of desilicification of the altered sandstones using the terms “Altered Sandstone” and “Desilicified Zone”. The “Altered Sandstone” was delineated using the same friability criteria as was used in the hydrogeology CSM to define the desilicified zone (i.e., a friability of 3 or more). The “Desilicified Zone” was delineated in RESPEC (2024) using a friability of 4, which represents extreme desilicification of the rock matrix (loss of matrix silica of up to 30% or more; Sorba and Tetland, Personal Communication). The zones of extreme desilicification were differentiated from the rest of the Altered Sandstone and ascribed very conservative average material properties presented in Table 1 of Appendix K. These average material properties included zero cohesion. As the objective of the geomechanical study was to evaluate the potential for bedrock collapse within the freeze wall above the ore zone, it was important to differentiate these zones of no cohesion for a worst-case scenario assessment.</p> <p>Thus, the linkage between the two studies is as follows: the combined Altered Sandstone and Desilicified Zones shown in Figure 2a and 2b of Appendix K correspond to the “Desilicified Zone” shown in this report as Figures 9, 10, 12, and 29.”</p> <p><b>References:</b></p> <p>Sorba, C. and Tetland, M. Discussion of Project geology and minerals in once open fractures. Oral communication, Chad Sorba and Mikkel Tetland, Denison Mines to the Ecometrix team.”</p>	
IR-84	-	CNSC	Geology and Groundwater	Appendix 7-C	<b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge	1. Please clarify in Figure 2-10 where the point streamflow measurements were conducted	This response has not been accepted, as the issue has not been sufficiently clarified.	The reviewer is perhaps confused about what is being referred to as Whitefish Lake in the reporting, and this may be due to the placement of the label for the lake on the referenced figures. Whitefish Lake consists of two lobes. A northern lobe and southern	Yes

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					<p>to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.</p> <p><b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.</p>	<p>upstream and downstream of Whitefish Lake.</p> <p>2. Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.</p>	<p>1. In Appendix 7-C of the EIS, Figure 2-10 shows that Whitefish Lake is between SA-5 and SA-6, not SA-2 and SA-6. Additionally, under the heading "Surface Water Stations" of Table 2-7 are “SA-6 <b>to</b> SA-2”, not “SA-6 <b>and</b> SA-2”.</p> <p>2. Figure 2-10 does not show SA-7. Surface water flow direction should be illustrated to help understand the relative location of upstream and downstream. Additionally, under the heading of “feature monitored” of Table 2-7 is “flow from LA-6 to Whitefish Lake”. Figure 2-10 shows LA-2, but no LA-6.</p>	<p>lobe, separated by a narrow segment where station SA-6 is located. To avoid the label for Whitefish Lake interfering with information presented on multiple figures, the label appears overlying the northern portion Whitefish Lake. However, the northern portion of the lake is upstream and distant from the ore zone. There is no discharge of groundwater from the ore zone to the northern portion of Whitefish Lake, and that is why it is not discussed within the EIS.</p> <p>Conversely, the southern portion of Whitefish Lake (i.e., between SA-6 and SA-2) is the area of primary interest with respect to potential environmental effects due to groundwater discharge, as that portion overlies the interpreted desilicified zone. The southern portion of the lake is entirely within the groundwater model domain and receives groundwater discharge from both the east and west directions. As such, simulated discharge to the lake can be directly compared to the measured increase in stream baseflow between the monitoring station upstream (SA-6) and downstream (SA-2) of the portion of Whitefish Lake which is of interest.</p> <p>For brevity, we have referred to the southern portion (i.e., also referred to as LA-5) as “Whitefish Lake” in the modelling assessment (Appendix 7-C).</p> <p>The revised draft EIS has been revised by updating the label location for Whitefish Lake on the figure, and adding a bold outline of the portion of the lake we are referring to as “Whitefish Lake”. In addition, have updated the text within Table 2-7 to clarify that the “Feature Monitored” is the “Flow through the Southern portion of Whitefish Lake as indicated on Figure 2-10”.</p>	Appendix 7-C, Section 2.5.2.5 (Table 2-7) and Figure 2-10
IR-86	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.</p> <p><b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.</p>	<p>Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.</p>	<p>This response has not been accepted.</p> <p>The response is acceptable, but the information as explained in the response should be incorporated in the appropriate sections of Appendix 7-C.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The text in Appendix 7-C, Section 2.7.2, of the draft EIS has been updated with the following paragraph:</p> <p>“The calibrated, steady-state model was used as the basis for the transient model used to evaluate drawdown during operations. Only conditions immediately at the mining zone were altered within the transient model to reflect the proposed changes during mine operation. All boundary conditions that drive regional groundwater flow were unchanged for the transient model, and all hydrogeologic properties outside of the mining area were left unchanged. Changes made to the hydrogeologic properties were implemented transiently to represent the phased implementation of the freeze wall. Groundwater recharge changes were made to reflect alterations to surficial land use and the implication to groundwater recharge, and transient pumping boundary conditions were added to simulate the planned pumping demand for camp and ISR water requirements. The transient version of the model was used to evaluate changes to the groundwater discharge occurring at Whitefish Lake.”</p>	Yes  Appendix 7-C, Section 2.7.2
IR-88	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water</p>	<p>It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active:</p> <ol style="list-style-type: none"><li>Determine the groundwater residence</li></ol>	<p>This response has not been accepted, as the following point was not adequately addressed:</p> <p>1. It is recommended that groundwater residence time in the lower sandstone aquifer be estimated and compared with the simulated residence time in</p>	<p>We believe that the reviewers’ question on residence time is a function of a misunderstanding of the figures presenting the groundwater plume evolution, and the portions of the model which represent the lower sandstone, ore zone, and paleoweathered zone on Figures 4-6, 4-7, 4-8, and 4-9 of Appendix 7C. This includes an apparent misunderstanding of the conservative distribution of the source area assumed to contain “Restored solution” post-decommissioning (see Figure 4-1, Appendix 7-C).</p>	Yes  Revised Draft EIS, Section 7.6.2.2.3

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					<p>for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p> <p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left</p>	<p>time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</p> <p>2. Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</p> <p>3. Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</p>	<p>the numerical model. Otherwise further justification should be provided why this is not possible.</p> <p>Groundwater residence time can be estimated using isotopes (the reference below is an example paper in this regard).</p> <p>Reference: Martin Kralik (2015), How to Estimate Mean Residence Times of Groundwater. Procedia Earth and Planetary Science, Volume 13, Pages 301-306.</p>	<p>To avoid cluttering the time-snapshot sequence figures (Figures 4-6 to 4-9), the location of the hydrogeologic units is labelled on Figure 4-6 only. As indicated on this figure, the most persistent portion of the source area for all constituents is contained within the paleoweathered zone (PWZ). The source is persistent within the PWZ due to the lower hydraulic conductivity of this weathered basement rock. The portions of the source area containing restored solution (refer to Figure 4-1) overlying the PWZ in Figures 4-6 to 4-9, are shown to contain significantly lower concentrations over time and eventually return to inflowing background concentrations.</p> <p>To clarify the above within the revised Draft EIS, the following has been added to Section 7.6.2.2.3:</p> <p>“The area simulated to be a source of contaminant mass Post-Decommissioning includes the Ore Zone, the overlying Lower Sandstone Aquifer (i.e., 50 m above the Ore Zone), and the underlying Paleoweathered bedrock (Section 7.6.2.1). As indicated in Figure 7.6-7, elevated concentrations of even conservative COPCs persist within the Paleoweathered zone due to its lower hydraulic conductivity (i.e., it takes longer for COPCs to be flushed out of this zone).”</p> <p>For addition reference the following are noted.</p> <p>Isolation of Ore Zone: There is no simulated isolation of the ore zone or the lower sandstone aquifer. In contrast, the mass contained within the ore zone is simulated to freely exit that zone and migrate through the overlying desilicified zone, as is the source mass that originates within the overlying lower sandstone units.</p> <p>Residence times within the lower sandstone aquifer include both the time for advective transport as well as the time for sorbed mass to de-sorb and re-join the advective-dispersive transport. The desorption process continues over time, with the mass of a given constituent partitioned to groundwater from this process continually decreasing (i.e., as sorbed mass overall decreases), resulting in a source tail effect within the lower sandstone, ore zone and within underlying PWZ.</p> <p>Regardless, to demonstrate the robust nature of the hydrogeologic setting, an additional transport simulation was performed wherein the effective porosity of the paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate out of the paleoweathered zone toward receptors 10-times faster. The results of that simulation are discussed as part of the response to IR-78 and do not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon. Details of the scenario are presented as part of Attachment IR-89-R1.</p> <p>With respect to the use of isotopes, although potentially informative, the isotope methods presented in Kralik (2015), are for the most part impractical, in that they require substantive volumes of water (e.g.&gt; 200 L of water), and thus would be required to be applied in a very targeted fashion to address very specific matters. This is worthy of consideration, but outside of the scope of the EIS. The use of stable isotopes of oxygen and hydrogen in water (<math>\delta^2\text{H}</math>, <math>\delta^{18}\text{O}</math>) were determined to offer little value for CSM</p>	

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					<p>unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be If the mined-out zones collapse.</p>			<p>development for the Project in terms of source of groundwater. Determining water source and groundwater ageing in the study area was discussed in the first-round response to IR-81 (Annex 1, IR-81 starting on page 216/419). Tritium concentrations in groundwater are considered potentially informative to the CSM and will be measured as part of ongoing groundwater monitoring for the Project as outlined for IR-81.</p>	
IR-89	-	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REdox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more</p>	<p>This response has not been accepted.</p> <p>The Proponent used calibration-constrained uncertainty analysis to establish boundaries when conducting sensitivity analysis of hydraulic conductivity in the groundwater model.</p> <p>For sensitivity analysis to adequately manage uncertainty, parameter values that are outside of those determined by calibration-constrained uncertainty analysis should be used. There always exists some degree of uncertainty in using hydrogeologic data as a complete representation of a regional groundwater system. This uncertainty can be accounted for by broadening parameter</p>	<p>In our SME’s experience, traditional “sensitivity analysis” where individual parameters are arbitrarily varied by within a subjective range can produce simulations which are inconsistent with the field-observed data. Such simulations should not be part of an EIS, as they can provide misleading results.</p> <p>Calibration-constrained uncertainty approach does not assume the data or the representation of the system are perfect or complete. Calibration-constrained models do not require a perfect fit to all the observed data, which is a recognition that there is measurement noise and structural noise present in every model. In addition, potential error in that data was accounted for by rounding the observed water levels to the nearest 0.1m (i.e., the data were not considered “perfect”) and allowing a general fit to all data (i.e., residuals are present at each observation point). Further, the analysis does not consider the data provide a “complete representation of the broader groundwater system” nor does it imply the data provides a “perfect and complete representation of the broader groundwater system”. Instead, the calibration-constrained approach tests sets of</p>	No



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.	conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.  See also related: IR-96.	ranges in a sensitivity analysis. Limiting sensitivity analysis to calibration-constrained values implies that available field data is a perfect and complete representation of the broader groundwater system, which may not be an accurate assumption.  Considering the limitations of available physical data in the Desilicified Zone, a more conservative sensitivity analysis is required in order to adequately assess how contaminants may flow towards Whitefish Lake.  Please also see follow-IR-89-R1, and AD-66 in the Advice to Proponent table.	parameters within a broad range, wherein only parameters which are well informed by available observation data are constrained, while parameters not constrained by calibration data are allowed to vary more freely (i.e., to the degree that they do not otherwise impact the well-informed parameters).  For the uncertainty assessment presented in the draft EIS, hydraulic conductivity parameters along the flow path between the ore zone and Whitefish Lake were allowed to vary within a 4-order of magnitude range (i.e., 1x10 <sup>-8</sup> to 1x10 <sup>-4</sup> m/s) to find alternative parameter sets that achieve a reasonable match to observation data. With this approach, values are not varied independently, but rather parameter combinations are sought that explore the potential 4-order of magnitude range for parameters, while maintaining a match to field-observed conditions.  The most conservative of the calibrated scenarios obtained through the calibration-constrained approach presented within the EIS (i.e., those which achieved acceptable calibration statistics) were chosen for additional transport simulations. The scenarios tested hydraulic conductivity values for the desilicified zone as high as 3.7x10 <sup>-5</sup> m/s (realization 7 – predictive uncertainty case 5), which is two times higher than any measured value within this hydrogeologic unit, and 7.4 times higher than the base case calibration. Hydraulic conductivity values as high as 8.1x10 <sup>-5</sup> m/s were also tested within portions of the lower sandstone aquifer. In addition, the simulation documented as part of IR-55 presents a model wherein the hydraulic conductivity of the desilicified zone is 1x10 <sup>-4</sup> m/s, which is 20 times higher than the base case.  In summary, we reaffirm that we have already provided an ample demonstration of the potential range of outcomes which are supported by the observation data at the site.	
IR-89	IR-89-R1	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone  IR-89 Response from Denison	<b>Context:</b> The Proponent states that the range of hydraulic conductivities considered in sensitivity analysis was limited to values that fit within a calibration constrained uncertainty analysis of the model.  Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on the aquatic environment.  The Proponent clarified the details of the calibration-constrained uncertainty analysis that was used for parameter bounding within the model, with hydraulic conductivity sensitivity bounds determined based on model calibration values that were supported by the available physical data.  <b>Rationale:</b> ECCC agrees that calibration constrained uncertainty analysis using hydraulic head field data is useful to	Expand the sensitivity analysis of hydraulic conductivity outside of calibration constrained parameters to account for the lack of physical data in the Desilicified Zone.		See the Response to IR-89 for discussion regarding the calibration-constrained uncertainty analysis approach. As stated, we believe that asking for scenarios outside of the range supported by the available monitoring data is inappropriate as it suggests that unrepresentative, potentially misleading scenarios should be tested, documented, and presented as potential outcomes. We do not believe that should be part of an EIS.  While we do not support development of un-calibrated scenarios for inclusion within the EIS, additional scenarios that did not violate field observation data were evaluated as part of this response and presented as Attachment IR-89-R1. These scenarios further demonstrate the robust nature of the hydrogeologic setting, which has been shown to have a high assimilative capacity.  Additional groundwater flow and transport modelling scenarios were performed in response to:  <ol style="list-style-type: none"><li>IR-55, wherein the hydraulic conductivity of the Intermediate Sandstone Aquitard was increased to a maximum value of 1.0E-7 m/s, and other parameter values, including the hydraulic conductivity of the Desilicified Zone, were increased to maintain a calibrated condition.</li></ol>	No

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					determine probable upper limits of K values. However, there is always some degree of uncertainty in groundwater data and models. Sources of such uncertainty may include errors, lack of complete and representative field data to determine key parameters, or any number of heterogeneities associated with groundwater systems over large scales. Such uncertainties will always exist and can be accounted for by conducting a sensitivity analysis that accounts for the lack of physical data in the Desilicified Zone by running modelling scenarios using parameters that are outside of the calibration constrained values.			<div>2. IR-70, wherein a higher hydraulic conductivity within the Ore Zone post-decommissioning was tested. This is an uncertain parameter which is unconstrained by calibration data.</div> <div>3. IR-71, wherein uncertainty in future groundwater recharge rates were evaluated by varying rates by +/- 20%. Future groundwater recharge is an uncertain parameter which is unconstrained by calibration data.</div> <div>4. IRs 78 &amp; 88, wherein the effective porosity of the Paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate toward receptors 10-times faster. Effective porosity of the Paleoweathered zone is an uncertain parameter which is unconstrained by calibration data.</div> <div>5. IR-96, wherein the transverse dispersivity was reduced to 1m to be consistent with ratios of longitudinal-to-transverse dispersivity published in the literature (e.g., Gelhar et al.; 1992) based on anisotropic settings. Transverse dispersivity is an uncertain parameter which is unconstrained by calibration data.</div> <div>The results of these simulations are presented as part of an attachment, however in summary all scenarios produced concentrations of primary COPCs at Whitefish Lake that are below the Groundwater Quality Screening Criteria established. Exceptions include pH, iron and manganese due to naturally high background levels, as reported within the EIS.</div> <div>The scenarios presented do not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon. Thus, we did not see the need to modify the EIS.</div>	
IR-96	-	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (1x10-9 m2/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)” . The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.</p>	<div>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</div> <div>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</div> <div>See also related: IR-89.</div>	<div>This response has not been accepted.</div> <div>CNSC staff appreciate the comprehensive information provided relating to longitudinal dispersivity and variation based on scale. However, it should be noted that guidance from Gelhar et al. (1992) and the BC MOE (2012) indicate that horizontal transverse dispersivity values should be approximately 1 order of magnitude lower than longitudinal dispersivity values, and vertical transverse dispersivity values should be approximately 2 orders of magnitude lower than longitudinal dispersivity. For the model presented in the EIS, transverse dispersivity is represented by a singular value of 5 meters, with the supporting rationale that the Gelhar et al. (1992) identified 5 meters as a representative value. It is important to note that the Gelhar et al. (1992) paper considered 5 meters to be representative for horizontal transverse dispersivity and identified that vertical transverse dispersivity is smaller than horizontal transverse dispersivity. Additionally, it is important to note that Petrotek (2021) used a transverse dispersivity of 1 m in their numerical models of the</div>	<div>As with all parameters, the values applied in the modelling analyses were intended to provide appropriate, but conservative transport predictions. It is the opinion of Denison and its SME that the dispersivity values applied are appropriate, conservative and supported by the literature values, as highlighted within the previous response to this IR (Annex 1, Attachment IR-96 starting on page 251/419). We acknowledge that Gelhar et al. (1992) recommend a 1 order of magnitude lower horizontal transverse dispersivity value, and a 2-order-of-magnitude lower vertical transverse dispersivity value, but note that such recommendation was based on observations of horizontal plume migration within overburden sand aquifers with highly anisotropic conditions (i.e., Borden and Cape Cod), which is <b>not</b> representative of the current setting. In their paper they state: “The vertical transverse dispersivity is seen to be much smaller than the horizontal transverse dispersivity, apparently reflecting the roughly horizontal stratification of hydraulic conductivity encountered in permeable sedimentary materials“. The BC MOE Guidance (2012) is considered to be a derivative of the Gelhar paper and does not add any further value.</div> <div><b>Transverse</b> dispersivity refers to spreading of the plume in the directions perpendicular to the primary advective (i.e., groundwater flow) direction. As noted in the previous response to this IR (Annex 1, Attachment IR-96 starting on page 251/419)., the transverse dispersivity value of 5 m is supported by Gelhar et al. (1992) for the scale of this site. If a 10:1 ratio of longitudinal to transverse dispersivity were implemented, a much higher longitudinal dispersion coefficient would be suggested (and supported by Gelhar et al. (1992)), which would result in even lower breakthrough concentrations at Whitefish Lake.</div>	<div>Yes</div> <div>Appendix 7-C, Section 4.4.4</div>

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					<p>Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p><b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>		<p>ore zone aquifer. CNSC staff thus request that Denison provide further information relating to why horizontal and vertical transverse dispersivity are represented using a singular value, and how this value is considered appropriate to represent both dimensions.</p> <p><b>Reference:</b> Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.</p>	<p>Recognizing this, we submit that the values applied within the scenarios documented as part of the EIS are already conservative.</p> <p><b>Vertical and Horizontal transverse</b> dispersion were treated as being equivalent (i.e., as having the same value) for this site as the dominant plume transport occurs within the desilicified zone, which is interpreted to be, and simulated, as isotropic. In isotropic media, transverse spreading should be allowed to occur equally in any transverse direction; this differs in anisotropic media, where vertical transverse spreading of the plume is lower than horizontal transverse spreading due to restricted vertical connections (i.e., joints in fractured rock, or sediment layers in sedimentary media). Further, during the vertical migration through the desilicified zone, transverse dispersion is in the X, and Y cartesian coordinates; we have no reason to expect dispersion in either of these directions is preferential, and therefore the horizontal and vertical transverse dispersivity values should be the same.</p> <p>The above discussion, supporting the dispersivity values used in the numerical modelling for the EIS, has been summarized (and references provided) in Section 4.4.4 of Appendix 7-C of the revised Draft EIS.</p> <p>Regardless, to demonstrate the robust nature of the hydrogeologic setting, an additional geochemical reactive transport simulation was performed with a longitudinal dispersivity of 10, and a transverse dispersivity of 1 for both the horizontal and vertical directions. The results of that simulation indicate that with lower transverse dispersion the concentrations reaching Whitefish Lake would be higher than the base case for some COPCs. All simulation constituents were below the groundwater quality screening criteria within the 10,000 year simulation. Details of the scenario are presented as part of Attachment IR-89-R1.</p>	
IR-100	-	HC	Indigenous Peoples' health / Socio- economic conditions	<p>Section 8, (p. 8-195)</p> <p>Section 8.5.3, Table 8.5-2, (p. 8-226)</p>	<p>Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.</p> <p><b>Context:</b> Section 8 states “Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.</p> <p>However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment” (p. 8-195).</p> <p>Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies</p>	<p>1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the Project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.</p> <p>2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health</p>	<p>This response has not been accepted.</p> <p>Health Canada does not support the responses to points 1 and 2 of IR-100.</p> <p>1. The response to IR-100 point 1 indicates that mercury (including methylmercury) was not included as a COPC in the assessment because mercury is not associated with the local geology and therefore not expected to be released in the effluent at measurable levels, and because prediction of methylmercury production, based on a variety factors, is not practical. Health Canada continues to recommend that mercury (including methylmercury) be included in the assessment given</p> <p>1) the detected presence of mercury in fish under baseline conditions, and</p> <p>2) the high consumption rates of fish and other country foods by Indigenous land</p>	<p>1. The EA scope does not include quantifying current risks that don’t have project activity connections. Per CSA N288.6 <i>Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills</i>, Section 6.2.5.4 "<b><u>The goal is to identify and describe the contaminants and physical stressors that are relevant to the site and operations and that require further quantitative evaluation</u></b>". The contaminants identified for further evaluation are then referred to as COPCs. These decisions are based on information gathered during site characterization."</p> <p>Mercury was not identified as a project issue based on mining and milling methods and though it is understood that mercury is a ubiquitous earth element at trace levels it is not identified as uniquely being associated with the local geology; as such, Denison does not believe it is appropriate to quantify existing risk when there is no incremental project risk. Public or existing concerns about mercury do not make this topic an EA question. At this time there is no way to accurately predict potential methylation rates.</p> <p>While the draft EIS (Section 8) highlights increased sulphate concentrations downstream of the Site during period of effluent discharge as a potential factor related to increased methylation (in the presence sulphate reducing bacteria in sediment), it is one of several factors in combination that would need to occur. For example, the IR highlights nutrient enrichment as a contributing factor –significantly increased primary productivity via enrich</p>	No



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					<p>within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.</p> <p>In Section 8.5.3, fish tissue concentrations are compared to Health Canada’s human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.</p> <p><b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.</p> <p>Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day (<a href="#">Health Canada, 2007</a>) is a more appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing fetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>	<p>Canada’s pTDI for methylmercury (<a href="#">Health Canada, 2007</a>).</p> <p>3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.</p> <p>See also related Advice to the Proponent: AD-31.</p>	<p>users, particularly intensive land users such as the Trapper receptor.</p> <p>2. The response to IR-100 point 2 continues to state that the HC maximum level (ML) for mercury of 0.5 µg/g (or 0.5 ppm) will be used to assess risks to human health from fish consumption during monitoring. The use of the HC ML for mercury is not appropriate in this case as it was developed for retail fish using consumption rates for the Canadian general population. Health Canada’s provisional tolerable daily intake (pTDI) values of 0.20 µg/kg bw/day day for young children and women of childbearing age (<a href="#">Health Canada, 2007</a>) are more appropriate reference levels when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from those used to develop the ML for retail fish and is protective of the most sensitive sub-group (i.e., developing fetus).</p> <p>For instance, the HC Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption (<a href="#">Health Canada, 2007</a>) currently employs 40 g as an estimate of daily fish intake by adults who are at the high end of fish intake. This rate is below the rate of consumption for intensive land users for the Project, which is ~500g of fish per day, meaning that the HC ML may not be protective of all land users/receptors.</p> <p>Health Canada reiterates its recommendation to assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada’s pTDI values for methylmercury (<a href="#">Health Canada, 2007</a>).</p>	<p>resulting in high levels of organic carbon in sediments (through algal senescence, deposition, decomposition). This could in fact be a contributing factor, but no such nutrient enrichment has been predicted in the draft EIS as no incremental Project-related nutrient source has been identified. Additionally, the draft EIS does not raise a concern that the Project would cause anoxia in study area lakes, another prerequisite for methylation driven by sulphate reducing bacteria. Denison and its SME’s believe that the treatment of mercury in the draft EIS is appropriate given the level of risk related to the Project. Denison acknowledges the concerns that have been raised by the Indigenous Communities of Concern through its engagement process, as well as those by the FIRT, and in response to those concerns has committed to implementing a mercury monitoring program.</p> <p>In addition to Denison's future monitoring programs, there are provincial fish consumption guidelines for consumers available at: <a href="https://pubsaskdev.blob.core.windows.net/pubsask-prod/76439/76439-Mercury_in_SK_Fish_-_Guidelines_for_Consumption_-_2015.pdf">https://pubsaskdev.blob.core.windows.net/pubsask-prod/76439/76439-Mercury_in_SK_Fish_-_Guidelines_for_Consumption_-_2015.pdf</a>. The guidelines in Saskatchewan for Russell Lake indicate the recommended number of meals per month for northern pike for the general and sensitive population. Further, the Eastern Athabasca Regional Monitoring Program (<a href="https://www.earmp.ca/">https://www.earmp.ca/</a>) provides information on community monitoring programs which includes analysis of mercury in fish tissue. In the most recent 2022 EARMF report mercury was measured in lake trout and lake whitefish and the conclusions were that mercury levels were low (ranging from &lt;0.01 mg/L to 0.5 mg/kg) and it was concluded that fish are safe to eat. Monitoring will continue as part of the program (<a href="#">EARMF+2022+2023+Community+Report.pdf (squarespace.com)</a>). The results of the Wheeler River baseline fish tissue sampling program showed measured fish tissue concentrations near the Project in the range of 0.01 to 0.48 mg/kg, which is consistent with that observed in the EARMF. This would indicate that based on baseline conditions fish are considered safe to eat, and no further baseline assessment is warranted.</p> <p>2. As previously indicated, it is currently not practical to calculate hazard quotients for baseline and predicted methylmercury levels in country foods as there is no information on baseline methylmercury and no way to realistically predict the project related methylmercury. Denison has previously committed to a mercury monitoring program which will include assessment of mercury and methylmercury in fish tissue. That information can feed into future hazard quotient calculations if warranted. Denison agrees to use Health Canada’s 2007 provisional tolerable daily intake (pTDI) values of 0.20 µg/kg bw/day for young children and women of childbearing age for future assessments, or the relevant updated value at that time. Denison has committed to a monitoring and follow-up program, which will include measurements of fish health for comparison to baseline data and regulatory criteria (i.e., Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota [e.g., CCME 2000], MDMER [Government of Canada 2022], CSA N288.4-19 (CSA Group 2019), and applicable United States Environmental Protection Agency criteria (e.g., US EPA 2021). At a minimum, this will include collection of representative fish species from multiple trophic levels and size classes to investigate the bioaccumulation potential of non-radiological (e.g., molybdenum, selenium, mercury, methyl mercury and other metals) and radiological parameters. Fish will also be assessed for their general health condition</p>	

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								through assessment of condition and growth metrics consistent with those described in current or updated MDMER EEM technical guidance (e.g., Environment Canada 2012) (See commitments register – commitment #s 834 and 844).  <b>References:</b>  Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. March.	
IR-101	-	ECCC CNSC	Fish and fish habitat Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>This response has not been accepted for the following reasons:</p> <p>1. The response (#1(d)) by the proponent states that “Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 Figure 1 Elevations of wetland features in the LSA” but it is not indicated that this information will be placed in the EIS. CNSC staff requests proponent to include the information provided in response #1(d) and Attachment IR-101 Figure 1 (Elevations of Wetland Features in the LSA) and Attachment IR-101 Figure 2: (Denison Wheeler River Project SSA and Wetland Feature Distribution) in the EIS.</p> <p>2. The Proponent stated in response #2 (a) and (b) that “surface water quality and sediment quality in wetlands were not specifically sampled in the wetland complexes adjacent to the Project footprint during the original baseline assessment.” CNSC staff requests the proponent to provide justification why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas. It is recommended to conduct direct measurements in the wetland areas.</p> <p>3. The information provided did not satisfy the IR. Additional information regarding the potential impacts to wetlands due to changes in surface water quality and sediment quality should be included within Section 8.3 of the main EIS. This is needed to fully understand the scope of potential effects to the aquatic environment.</p> <p>a. Update Section 8.3 to include additional information on predicted water and sediment quality impacts to wetlands from the</p>	<p>1. This information has been incorporated into the EIS as Appendix 8-F.</p> <p>2. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the effectiveness of mitigation measures.</p> <p>3(a). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of their potential to provide fish and fish habitat. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>3(b). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of changes to water quality and sediment quality within the LSA due to the Project. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>4. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the success of mitigative measures.</p>	<p>Yes</p> <p>Appendix 8-F (added as a new appendix in support of Section 8 of the revised Draft EIS)</p> <p>Revised Draft EIS, updates to sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9, Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 for alignment with Section 8.</p>

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							<p>Proponent’s response to directly consider wetlands as fish and fish habitat for the purpose of assessing water quality impacts.</p> <p>b. Update Section 8.3 to provide an assessment of potential effects to wetlands from water and sediment quality changes within the LSA.</p> <p>4. It is stated in response #4 that “[...] Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project” and CNSC staff agrees with the proponent and recommend collection of monitoring information on the wetland areas.</p>		
IR-102	-	ECCC CNSC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including Appendix II, Table 1 (p. 2)	<p><b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>	<p>1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.</p> <p>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</p> <p>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</p>	<p>This response has not been accepted for the following reasons:</p> <p>1. Given the limitation of data availability extension of flow records based on the nearest active WSC hydrometric station (Wheeler River (06DA005)) is acceptable although other methods are not shown to be explored by the proponent including rainfall-runoff modelling techniques (such model can be calibrated at 06DA005 thus computed flow at subbasins or sub watershed can be estimated with good degree of confidence), drainage area ratio method, etc. CNSC staff recommends proponent to consider aforementioned methods or similar or provide justification why other methods were not considered.</p> <p>2. In Attachment IR-102 Figure 1 to 7 show the plots of measured versus the estimated daily flows using the relationship developed for extension of daily flows at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB-3, LA-1 and LA-5. CNSC staff however finds it difficult to determine the predictive accuracy of the relationships based on visual comparisons. Therefore, CNSC staff requests that the proponent provide quantitative measures of prediction accuracy, for example in the form of Root Mean Square Error, correlation coefficient, etc., for the Equations presented in Table 1 of Attachment IR-102.</p>	This response is provided in Attachment IR-102	Yes  Appendix 8-C – the Attachment IR-102 added as Appendix III.

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							<p>In addition, CNSC staff requests that the proponent provide clarification on whether the current relationships are only limited to baseline characterization or will also be considered for estimation of design flows at SA-4 and SA-5 for culvert/crossing design for the access road.</p> <p>3. Response to third part of the IR to be re-assessed when proponent addresses the above two comments ([1] and [2]).</p>		
IR-103	-	ECCC CNSC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<p><b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.</p> <p>The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.</p> <p><b>Rationale:</b> IDF trends exhibit random behavior at some locations and correlated behavior at other locations. The choice of gauged locations will infer the statistics for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.</p>	Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.	<p>This response has not been accepted.</p> <p>In the Context and Rationale of AD-15 in the Annex 1 – Denison Response, ECCC recommends that the Proponent consult CSA PLUS 4013:19 (2019) <i>Technical guide: Development, interpretation and use of rainfall intensity-duration-frequency (IDF) information: Guideline for Canadian water resources practitioners</i> regarding the consideration of future changes in short-duration precipitation extremes. In IR-103, ECCC indicated that in order to assess the accuracy of the Intensity duration frequency (IDF) curves, ECCC required that the Proponent provide the gauged stations generating the values for the modelled data. The Proponent provided the closest gauged stations, however, the future short duration precipitation values were based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes.</p> <p>Additionally, on page 15-19 of the draft EIS states that: “Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” Denison did not provide details on how climate factors will be considered within their adaptive management plans.</p> <p><b>Rationale:</b> Estimates of future short duration precipitation that are based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes, such as the approach used by the</p>	Please see Attachment IR-103	No

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							<p>Proponent, are unlikely to provide reliable projections. This is because the amount of information regarding changes in local-scale observed extreme precipitation contained in short records is not sufficient to constrain a regression (model the statistical relationship) between local and larger scale simulations (Li et al., 2019; ECCC 2022). An alternative approach is to base future projections on a comprehensive assessment that integrates climate science understanding and model projections over a large region. The recent Canadian Standards Association (CSA 2019) guidance on IDF for Canadian Water Resources practitioners provides such an assessment.</p> <p>In terms of adaptive management, the Proponent should clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p> <p>In order to assess the Proponent’s adaptive management strategies for future extreme precipitation events, ECCC requests that the Proponent consult the CSA (2019) guidance when using future IDF projections in the Project design and provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration.</p> <p>1. Provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration as relevant to the Project design.</p> <p>2. Demonstrate how the CSA (2019) guidance will be incorporated in the Project design when developing and considering future IDF projections and estimates of the potential future changes in short-duration precipitation extremes.</p> <p><b>References</b> CSA Group. (2019). Technical guide: Development, interpretation and use of rainfall</p>		



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							intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners. <i>CSA PLUS 4013 :19.</i> <a href="https://www.csagroup.org/store/product/2703080/">https://www.csagroup.org/store/product/2703080/</a> ECCC (2022). Draft Technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience. <a href="https://www.strategicassessmentclimatechange.ca/28896/widgets/117114/documents/77106">https://www.strategicassessmentclimatechange.ca/28896/widgets/117114/documents/77106</a> Li, C., Zwiers, F., Zhang, X., & Li, G. (2019). How much information is required to well constrain local estimates of future precipitation extremes? <i>Earth’s Future</i> , 11-24.																																	
IR-104	-	ECCC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>This response to part 1. has not been accepted.</p> <p>There are an additional 24 years of meteorological datasets since the 1999 study thus all historical rainfall extremes including those since 1999 study should be considered to estimate up to date PMP at the Project site The proponent’s justification on whether the 1999 or 1994 PMP estimates are current and conservative should be substantiated based on meteorological data analysis. An estimation of updated PMP is achievable by the proponent as meteorological data is freely available and accessible from ECCC and the proponent should provide a revised PMP.</p> <p>The Proponent should also clarify how recent the data used to calculate the PMP or the time series is and explain the use of an older data set that will not produce as accurate of a PMP value as a more recent data set would produce, even when estimates are conservative.</p> <p>Specifically, a. Explain the rationale for the use of the data set which was used to derive the PMP. B. Clarify if the PMP and/or the time series was calculated using more recent data.</p> <p>This will allow for an accurate evaluation of the validity of results derived from the data sets selected by the Proponent.</p>	<p>To provide comfort to the reviewer that the PMP of 493 that was retained for design purposes is appropriate, we have undertaken an analysis of the available empirical data available for the Max 1-day precipitation annual average historical data for Tomblin Lake, high carbon (RCP8.5) is provided with 90% confidence intervals. The data set used is from 1950 to 2016 and is historical measured precipitation data (<a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line</a>) . The period of 2023 to 2065 is considered a good representation of the period of mine life from construction through to early post-decommissioning (i.e. &gt; 40 years).</p> <p>As shown in Table 1, the maximum 1-day precipitation event from historical records for the area is 52 mm. This average is based on empirical collected data and not a simulated or predicted hindcast value. As, such the PMP that has been adopted for design basis measures is 9.6 x the maximum 1-day precipitation event that has been recorded since 1950 and is inclusive of data up to 2016. The predicted Ensemble data shows a reduction in the maximum 1-day precipitation event. Therefore, we assessed the maximum value of all 24 models that make up the ensemble values. For Tomblin Lake grid, the greatest maximum 1-day value was shown for the period of 2023 to 2065 was 96.1 mm, which is 5.2x less than the design basis PMP. Denison feels strongly that the presentation of this historical data provides clear indication that the design basis PMP is of a magnitude that will be reasonable for water management at the site during in the short-term and for the life of the mine.</p> <table><tr><th colspan="4">Table 1: Maximum 1-Day Precipitation for the Tomblin</th></tr><tr><th rowspan="2">Statistic</th><th colspan="3">Maximum 1-Day Precipitation Event (mm)</th></tr><tr><th>Historical (1950-2013)</th><th>Predicted Ensemble (2023 to 2065)</th><th>Predicted (2023 to 2065)</th></tr><tr><td>Mean</td><td>23.82</td><td>25.91</td><td>32.35</td></tr><tr><td>SD</td><td>8.75</td><td>2.09</td><td>14.90</td></tr><tr><td>Min</td><td>9.40</td><td>21.00</td><td>13.20</td></tr><tr><td>Max</td><td>52.00</td><td>31.00</td><td>96.10</td></tr><tr><td>10% Confidence Interval</td><td>22.06</td><td>25.38</td><td>31.82</td></tr></table>	Table 1: Maximum 1-Day Precipitation for the Tomblin				Statistic	Maximum 1-Day Precipitation Event (mm)			Historical (1950-2013)	Predicted Ensemble (2023 to 2065)	Predicted (2023 to 2065)	Mean	23.82	25.91	32.35	SD	8.75	2.09	14.90	Min	9.40	21.00	13.20	Max	52.00	31.00	96.10	10% Confidence Interval	22.06	25.38	31.82	No
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IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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								90% Confidence Interval	25.57	26.44	32.88		
								Despite Denison’s reiteration that the PMP is adequate for the EA level design basis, Denison is committed to revisiting the estimates per CNSC’s recommendations, as applicable, for the licensing phase of the Project.					
IR-107	-	CNSC  ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the Project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”</p> <p>In addition, the “applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”</p>	<p>Please clarify which data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline</p>	<p>This response has not been accepted.</p> <p>From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions.</p> <p>CNSC and ECCC staff have the following expectations:</p> <ol style="list-style-type: none"><li>1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices.</li><li>2. Confirm which federal requirements were used when assessing potential impacts through EA.</li><li>3. Confirm which data quality objectives were used to establish the baseline, provide references if available</li><li>4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.</li></ol>	The response to this IR is provided in Attachment IR-107.					No
IR-108	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance</p>	<ol style="list-style-type: none"><li>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</li><li>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds,</li></ol>	<p>This response has not been accepted.</p> <p>There are incorrect guidelines remaining in the updated tables, and the supporting information on parameter values used to derive benchmarks has not been provided. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect</p>	The response to this IR is provided as Attachment IR-108 and details can be found therein. Briefly, Tables 8.2-2 and 8.2-3 in Section 8 of the revised Draft EIS have been updated as requested.					Yes  Revised Draft EIS, Section 8.2.3.3, Tables 8.2-2 and 8.2-3.



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					<p>requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<p>and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>	<p>threshold could allow for effluent to be discharged at concentrations exceeding MDMER limits.</p> <p>See also follow-up IR-108-R1.</p>		
IR-108	IR-108-R1	ECCC	Change to an environmental component due to	<p>Section 8.2.3.3 Aquatic Environment</p> <p>IR-108 Response from Denison</p>	<p><b>Context:</b> Incorrect benchmark environmental quality guidelines and guidelines that cannot be verified remain within the updated Tables 8.2-2 and 8.2-3 provided in the Proponent’s response. The Proponent provided an Aluminum Saskatchewan Environmental Quality Guidelines (SEQG) value of 0.005 mg/L in both tables. This is incorrect and appears to be the guideline for irrigation, not the guideline for protection of aquatic biota. The Proponent provided a Molybdenum SEQG of 26 mg/L in both tables. This value is incorrect. The correct SEQG for Molybdenum is 31 mg/L and the Canadian Water Quality Guideline (CWQG) is 0.073 mg/L. The Proponent provided a Nitrate SEQG of 13.29 mg/L in both tables. This value is incorrect. The correct SEQG for Nitrate is 3 mg/L and the CWQG is 13 mg/L.</p> <p><b>Rationale:</b> In order to verify the benchmark environmental quality guidelines that are calculated based on environmental modifying factors such as pH, hardness and dissolved organic carbon (DOC), the specific concentrations of these environmental modifying parameters used in the calculations must be provided. Additionally, incorrect benchmarks for Aluminum, Molybdenum, and Nitrate remain within the updated tables provided by the Proponent. No benchmark was provided for Manganese. It is not clear if Total Chromium or Hexavalent Chromium was measured as the table does not specify, and the benchmark provided was for Hexavalent Chromium. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect threshold could allow for effluent to be discharged at the wrong concentration.</p>	<p>1. Update Tables 8.2-2 and 8.2-3 to include footnotes with the concentrations of environmental modifying parameters such as pH, hardness and DOC used to derive guidelines for Aluminum, Cadmium, Copper, Lead, Manganese, Nickel and Zinc.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include the correct benchmark guideline value for Aluminum, Molybdenum and Nitrate. Include the concentrations of environmental modifying parameters needed for deriving guidelines. If the most stringent guideline value is not selected for use, provide a rationale for use of the chosen guideline.</p> <p>3. Update Tables 8.2-2 and 8.2-3 to include the calculated guideline value for manganese and the environmental modifying parameter concentrations used to calculate the guideline. A benchmark environmental quality guideline has not been provided for Manganese, however a chronic CWQG guideline exists that can</p>		<p>Please see response to IR-108 and Attachment IR-108.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 8.2.3.3, Tables 8.2-2 and 8.2-3.</p>

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						be derived based on environmental modifying parameter concentrations.  Update Tables 8.2-2 and 8.2-3 to specify if Total Chromium or Hexavalent Chromium was measured.  See also related IR-115-R1.			
IR-109	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. From the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.	<p>This response has not been accepted.</p> <p>There are statements made throughout the EIS that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the Proponent has confirmed that all treated effluent will be discharged to Whitefish Lake through a final discharge point to ensure it meets <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER) requirements.</p> <p>It is not clear why the above statement regarding effluent release to groundwater via deep well injection has been included in the EIS when this is not part of the confirmed effluent discharge management plan. The Proponent should update the EIS to remove text regarding effluent release to groundwater via deep well injection or provide explanation as to why this information has not been excluded from the EIS to clarify if this is an intentional part of the Project design or if this was an accidental inclusion.</p> <p>The Proponent should update the EIS to remove text regarding effluent release to groundwater via deep well injection or provide additional explanation.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	Section 8 of the revised Draft EIS has been revised to remove text on effluent release to groundwater via deep well injection.	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.1.1, 8.2.6.1, 8.3.6.1, and 8.4.6.1.</p>
IR-110	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0</p>	Provide confirmation of the diffuser depth and location.	<p>This response has not been accepted.</p> <p>ECCC requests confirmation that the finalized diffuser design will be available for review once it is completed as reviewing it will be necessary to</p>	It is noted that basic design criteria (e.g., depth, location, port configuration) have been provided in the Draft EIS (Section 8.2) and Appendix 8-E on which modeling was based. While some minor adjustments may be made during preparation of the final diffuser engineering design, the level of mixing predicted in the assessment will be maintained	No

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				Appendix 8-E, Section 2.1	<p>of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Updated Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p> <p>A review of the final discharge design is necessary to confirm the location and depth of the proposed diffuser and modelling predictions for effluent discharged into the receiving environment.</p>	ECCC requests the opportunity to review the finalized diffuser design once it is available.	confirm the location and depth of the proposed diffuser and modelling predictions for effluent discharged into the receiving environment.	<p>(minimally). The final designs will follow standard engineering practice and be stamped and signed by a professional engineer.</p> <p>As for Denison’s understanding of the regulatory process, the finalized diffuser design information will be included in Denison's license to operate application that will be submitted to the CNSC. Such information will also be provided to the province as part of the provincial approvals process. Should CNSC, or the province, choose to provide this information to ECCC that is their discretion, but Denison doesn’t believe it is within their purview (or appropriate) to make commitments on behalf of others, nor act outside the normal licensing/ approvals processes.</p>	
IR-113	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>This response has not been accepted.</p> <p>Based on the information provided it is not possible to assess the resiliency of the Project to potential adverse effects from climate change and potential impacts to surface water and sediment quality. The Proponent should review the guidance documents available on the <a href="#">Strategic Assessment of Climate Change</a> (SACC) website with regards to climate change resilience and provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling.</p> <p>Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, lake levels, flow rates, etc., on COPC concentrations in surface water and sediment. The Proponent should refer to the <a href="#">SACC website</a> for guidance on conducting this quantitative analysis.</p> <p>See also follow-up IR-113-R1.</p>	Please refer to Attachment IR-113_IR-113-R1 for the response.	No
IR-113	IR-113-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment  IR-113 Response from Denison	<p><b>Context:</b> The Proponent states the following, “The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change)”. This statement suggests that the PMP value utilized considers future climate changes such as possible changes in the frequency or intensity of extreme precipitation events.</p>	Clarify if climate change has been considered in the PMP value provided. If it has not been considered, discuss how potential increases in PMP have been and/or need to be considered in the Project design.		Please refer to Attachment IR-113_IR-113-R1 for this response.	No

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					<b>Rationale:</b> As noted by the Proponent, increases in extreme rainfall are anticipated with a warmer climate. For precipitation extremes across Canada, the relative change in event frequency is expected to be larger for more extreme and rarer events. Given that the extreme precipitation is expected to intensify in the future (Kunkel et al. 2013), the Proponent should consider how these potential changes will influence design values such as PMP.	<u>Reference</u> Kunkel, K., Karl, T. R., Easterling, D. R., Redmond, K., Young, J., Yin, X., & Hennon, P. (2020). Probable maximum precipitation and climate change. <i>Geophysical Research Letters</i> , 1402-1408.			
IR-114	-	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface</p>	<p>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</p> <p>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p> <p>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</p> <p>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</p>	<p>This response has not been accepted.</p> <p>The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER.</p> <p>The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations.</p> <p>All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds.</p> <p>Please:</p> <p>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</p> <p>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO<sub>3</sub>) in effluent and the receiving environment.</p> <p>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</p> <p>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p>	Please see Attachment IR-114. Briefly, Tables 8.2-9, 8.2-10 and 8.2-13 have been updated in the revised Draft EIS as requested.	Yes  Revised Draft EIS, Sections 8.2.4.2.3 and 8.2.4.2.4, Tables 8.2-9, 8.2-10 and 8.2-13

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					<p>water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>				
IR-115	-	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p><b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>	<ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li><li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li></ol>	<p>This response has not been accepted.</p> <p>Items 1. And 3. In the Proponent’s response adequately responded to the IR. However, the water quality thresholds in item two have not been derived using baseline receiving environment concentrations and not all COPCs which require monitoring under the MDMER have been included in the updated table. Additionally, the Proponent did not account for changes in baseline hardness concentrations in the receiving environment due to the deposition of effluent. Water hardness is an environmental modifying factor which can influence the toxicity of COPCs in the aquatic environment, therefore requiring the mentioned COPCs as well as background concentrations of total hardness in the receiving environment to accurately determine potential effects of COPCs upon the receiving aquatic environment. The Proponent should also provide rationale to support that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also follow-up IR-115-R1.</p>	<p>Please see Attachment IR-115_IR115-R1. Briefly, Table 8.2-8 has been updated in the revised Draft EIS as requested.</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.2.3 Table 8.2-8</p>
IR-115	IR-115-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> In the Proponent’s response to item two, it is mentioned that the derived water quality thresholds used in Table 8.2-8 and in the assessment (Section 8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) are based on hardness concentrations found in effluent. The Proponent mentions that hardness derived from IWWTP discharge will consider IWWTP discharge on the receiving environment and provide “a reasonable estimate of expected hardness in</p>	<p>1. Update Table 8.2-8 to include the following COPCs: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS).</p>		<p>Please see Attachment IR-115_IR115-R1. Briefly, Table 8.2-8 has been updated in the revised Draft EIS as requested.</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.2.3 Table 8.2-8</p>



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				IR-115 Response from Denison	<p>effluent”. However, this does not consider induced hardness (i.e., hardness concentration increases in the receiving environment over the lifecycle of the Project) from effluent contributions as a Project effect; the receiving environment baseline concentrations of hardness have been altered due to inputs from Project effluent. Providing only one estimate of expected effluent hardness in the receiving environment is not an appropriate means of conducting the effects assessment.</p> <p>Additionally, the following COPCs have not been included in the updated table provided in the Proponent’s response: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS). It is noted that these COPCs are also subject to monitoring requirements under the <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER).</p> <p><b>Rationale:</b> Background concentrations of un- ionized ammonia, aluminum, iron, thallium, manganese and TDS are required to determine potential effects to the environment. The Proponent will also require this information to satisfy their obligations under the MDMER.</p> <p>The purpose of the surface water quality assessment is to determine if changes to the receiving environment over the project lifecycle will have significant adverse effects on biota. Changes from baseline in hardness concentrations in the receiving environment due to the deposition of effluent is a Project related effect and therefore providing a single baseline water quality threshold which is applicable only to one set of conditions is not an appropriate method to evaluate impacts across a shifting hardness baseline.</p> <p>Water hardness is an environmental modifying factor, various concentrations of hardness influence the toxicity of other COPCs in the aquatic environment. Using water quality thresholds that have been derived from high effluent hardness concentrations will not be protective of aquatic biota, particularly in the early stages of the project lifecycle when receiving environment water quality will be similar to baseline water quality.</p>	<p>2. Update Table 8.2-8 to include background concentrations of total hardness (in mg/L CaCO<sub>3</sub>) in the receiving environment.</p> <p>3. Provide rationale that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also related IR-108-R1</p>			
IR-124	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment	<b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated:	<p>1. Provide the information on baseline exceedances of COPCs in sediment.</p> <p>2. Provide an assessment of risk for any COPCs that have baseline</p>	<p>This response has not been accepted.</p> <p>An updated risk assessment for COPCs that requires monitoring under the MDMER with effluent concentrations that exceed guidelines has not been completed. This information is necessary</p>	<p>1. Section 8.4.3.2.3 of the Draft EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines. Table 8.4-3 and Table 8.4-7 of the revised Draft EIS were updated to include sediment quality guidelines as recommended.</p>	<p>Yes</p> <p>Revised Draft EIS Section 8, Table 8.4-3, Table 8.4-7</p>

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					<div><div><div>1. COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</div><div>2. COPCs that exceed water quality guidelines in effluent, and,</div><div>3. COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</div></div><div><b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.</div></div>	<div>exceedances of sediment quality thresholds in the receiving environment.</div> <div>3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.</div>	<div>to facilitate the determination on risk to sediment quality and aquatic biota.</div> <div>See also follow-up IR-124-R1.</div>	<div>2. The were no instances where constituent concentrations in the baseline sediment samples were greater than their respective of sediment quality guidelines; therefore, no further action is needed to address this part of the IR.</div> <div>3. This is not applicable. No additional COPCs need to be carried forward in the environmental risk assessment as the concentrations of COPCs in effluent do not exceed water quality guidelines (see Table 3-1 in the ERA in Appendix 10-A). All relevant constituents identified in Schedule 4 and Schedule 5 in MDMER were considered in the ERA screening with the exception of cyanide and mercury which are not identified as present in the effluent (see IR-100 regarding mercury). Phosphorus and nitrate will be present in the effluent at low levels and estimates of these constituents via the near-field water quality model indicate that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment (see Tables 8.2-10 and 8.2-13 of Section 8).</div>	Appendix 8E
IR-124	IR-124-R1	ECCC	Change to an environmental component due to hazardous contaminants	<div>Section 8.4.4.2.3, Aquatic Environment</div> <div>IR-124 Response from Denison</div>	<div><b>Context:</b> In the Proponent’s response it is stated, “Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.”</div> <div>If concentrations of Schedule 5 parameters in effluent exceed water quality thresholds, these parameters are necessary for ECCC to examine in the risk assessment to determine the potential for effluent to be acutely lethal and for adverse effects to aquatic biota. These parameters will also be required to be characterized under Section 4, 5 and 7 of the MDMER. As per CSA N288.6-22 Section 7.2.5.2.1, “Screening of environmental concentrations of chemical and radiochemical substances released to the environment should be performed to identify COPCs for further evaluation in the risk assessment. Both measured concentrations and concentrations calculated from release rates may be used in the screening analysis. The screening concentrations should be compared to screening criteria, and chemicals that exceed screening criteria should be identified as COPCs.”</div> <div>As per CSA N288.6-22 Section 7.2.5.4.2, “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit.”</div> <div>Additionally, updated Table 8.2-13 of attachment IR-114 has been found to be insufficient due to maximum concentrations in</div>	<div>Provide an assessment of risk from any MDMER Schedule 5 parameters that are required to be characterized in effluent and in surface water quality in the receiving environment and that have effluent concentrations that will exceed water quality guidelines derived from environmental baseline conditions.</div>		<div>See response to IR-124 and revised Draft EIS Section 8, Table 8.4-3 and Table 8.4-7 and supporting updated documentation in Appendix 8E.</div>	<div>Yes</div> <div>Revised Draft EIS Section 8, Table 8.4-3, Table 8.4-7</div> <div>Appendix 8E</div>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																							
					surface water for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus being absent and the use of incorrect water quality thresholds.  <b>Rationale:</b> Due to the lack of information on COPCs with concentrations that exceed water quality thresholds in effluent, a determination on risk to sediment quality and aquatic biota cannot be made.																																																											
IR-126	-	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	<p>This response has not been accepted.</p> <p>The selenium fish tissue assessment has not been updated to reflect the ECCC Federal Environmental Quality Guidelines (FEQG). A predicted effluent concentration of 0.042 mg/L of selenium has been provided for the Project (updated Tables 8.2-9 and 8.2-10 Attachment IR-114 Denison’s Response). ECCC acknowledges that the Proponent prefers the use of the US EPA guidelines due to the ability to perform fish tissue muscle TRV, however, Environmental Effects Monitoring (EEM) would require a study on fish tissue selenium whole- body or egg-ovary concentrations. The current baseline data will not be comparable to future EEM studies using fish tissue muscle concentrations of selenium and US EPA guideline methodology. There is currently EEM guidance under development for conducting selenium fish tissue sampling in fish populations that will utilize the FEQG which applies to fish tissue egg-ovary and whole-body concentrations of selenium. Additionally, the Proponent has made a commitment to utilize the most stringent guidelines available.</p> <p>Based on the Project’s proposed effluent concentrations of selenium, fish tissue sampling will be required as part of the EEM monitoring for the Project. The ECCC FEQG is the guideline applied to these studies, and the current use of this guideline will facilitate the comparison to future monitoring studies.</p> <p>Furthermore, the Proponent has not provided sufficient explanation in their response for the use of the less stringent US EPA guideline compared to the more conservative FEQG.</p>	<p>The EIS assessed selenium in fish in terms of muscle tissue because the available baseline data were for muscle tissue. Since the review comment highlights the EEM program and the fish tissue selenium study component more specifically we note that the MDMER (2023) allows use of muscle tissue in the EEM study of selenium in fish (see Schedule 5, 12(1)(e)(iv). It is further noted that Denison has committed to a pre-operational EEM study and will conduct that study in accordance with the regulation and available federal guidance. The pre-operational EEM study will include a study respecting selenium in fish tissue.</p> <p>Regarding the EIS, Denison and its SME stand by the current assessment approach, using muscle tissue. Nevertheless, to address the reviewer’s concern, we have calculated whole-body concentrations from the predicted selenium in muscle (Table B.5 of the revised draft EIS Appendix 10-A), using EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. No change to the EIS is warranted.</p> <table><tr><th>Fish Species</th><th>Lake</th><th>Muscle ug/g fw</th><th>Muscle ug/g dw</th><th>Whole ug/g dw</th></tr><tr><td rowspan="6">N. Pike</td><td>Ref</td><td>1.89E-01</td><td>7.56E-01</td><td>5.95E-01</td></tr><tr><td>WL North</td><td>1.86E-01</td><td>7.44E-01</td><td>5.86E-01</td></tr><tr><td>WL Mid</td><td>1.57E+00</td><td>6.28E+00</td><td>4.94E+00</td></tr><tr><td>WL South</td><td>1.51E+00</td><td>6.04E+00</td><td>4.76E+00</td></tr><tr><td>McGowan</td><td>1.02E+00</td><td>4.08E+00</td><td>3.21E+00</td></tr><tr><td>Russell</td><td>8.12E-01</td><td>3.25E+00</td><td>2.56E+00</td></tr><tr><td rowspan="6">W. Sucker</td><td>Ref</td><td>1.46E-01</td><td>5.84E-01</td><td>4.60E-01</td></tr><tr><td>WL North</td><td>1.43E-01</td><td>5.72E-01</td><td>4.50E-01</td></tr><tr><td>WL Mid</td><td>1.74E+00</td><td>6.96E+00</td><td>5.48E+00</td></tr><tr><td>WL South</td><td>1.66E+00</td><td>6.64E+00</td><td>5.23E+00</td></tr><tr><td>McGowan</td><td>1.06E+00</td><td>4.24E+00</td><td>3.34E+00</td></tr><tr><td>Russell</td><td>8.06E-01</td><td>3.22E+00</td><td>2.54E+00</td></tr></table> <p><u>Notes:</u> dry wt = fresh wt / (1-0.75) [EPA (2021)] whole = muscle / 1.27 [EPA (2021)]</p> <p><b>References:</b>  MDMER. 2023. Metal and Diamond Mining Effluent Regulations. SOR/2002-222. Last amended June 9, 2023. Minister of Justice.</p>	Fish Species	Lake	Muscle ug/g fw	Muscle ug/g dw	Whole ug/g dw	N. Pike	Ref	1.89E-01	7.56E-01	5.95E-01	WL North	1.86E-01	7.44E-01	5.86E-01	WL Mid	1.57E+00	6.28E+00	4.94E+00	WL South	1.51E+00	6.04E+00	4.76E+00	McGowan	1.02E+00	4.08E+00	3.21E+00	Russell	8.12E-01	3.25E+00	2.56E+00	W. Sucker	Ref	1.46E-01	5.84E-01	4.60E-01	WL North	1.43E-01	5.72E-01	4.50E-01	WL Mid	1.74E+00	6.96E+00	5.48E+00	WL South	1.66E+00	6.64E+00	5.23E+00	McGowan	1.06E+00	4.24E+00	3.34E+00	Russell	8.06E-01	3.22E+00	2.54E+00	No
Fish Species	Lake	Muscle ug/g fw	Muscle ug/g dw	Whole ug/g dw																																																												
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							<p>The Proponent should explain their use of the US EPA guidelines over the ECCC FEQG or update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA as needed using ECCC’s FEQG.</p> <p>As noted in IR-126, please update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10- A (ERA) in Section 10) as needed using ECCC’s FEQG. If the FEQG will not be used, provide further rationalization for the use of the US EPA guidelines when creating the study on fish tissue selenium concentration in the EEM.</p>	<p>EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.</p> <p>ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</p>	
IR-130	-	CNSC	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the Project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the Project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the Project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the Project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>	<p>This response has not been accepted.</p> <p>Denison has agreed to update the final EIS (Sections 9.3 and 9.4) to include vibration as a physical stressor to fauna in the project area.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The text in Section 9 of the attached revised Draft EIS includes vibration as a physical stressor on fauna.</p> <p>Updates can be found in Section 9.3.3.3.2, pages 9-197 and Section 9.3.4.2.1, pages 9-211, 9-212, and 9-274.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 9.3.3.3.2, pages 9-197 and Section 9.3.4.2.1, pages 9-211, 9-212, and 9-274</p>
IR-134	IR-134-R1	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided. Knowing the survey methodology for pre-construction and pre-clearing for little brown myotis and northern myotis is important for assessing cumulative impacts, effectiveness of adaptive management strategies as well as determining how bat species were considered in the EIS.</p> <p><b>Rationale:</b> ECCC can determine whether the methodology the Proponent will use to collect data is appropriate and if the methodology would contribute to a more complete understanding cumulative effects and adaptive management strategies.</p>	<p>The information provided by the Proponent regarding the roosting dates and potential habitat for bats is complete, however, the information related to the pre-construction and pre-clearing surveys is missing details on important habitat features for bat species at risk. As two Species at Risk Act (SARA) schedule 1 listed bat species, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis) have been identified in the Project</p>		<p>For clarification, the pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will to be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and</p>	<p>No</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					A clear outline of how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods for bats, such as roosting, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the effectiveness of mitigation strategies and adaptive management strategies which are being developed by the Proponent.	area, effects need to be identified, avoided, lessened and monitored.		appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.	
IR-137	-	ECCC	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The</p>	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"><li>Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>Re-do the assessment with the RSA at the scale of the range</li></ul>	<p>This response has not been accepted.</p> <p>A biologically relevant explanation for the chosen RSA for caribou was not provided. It is not clear if the RSA is representative of the SK1 range for factors such as variability and biophysical features. Describe how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range. This clarification is necessary to ensure the RSA is representative of the entire SK1 Caribou range, including the natural variability of the landscape, and to assess any project effects that may be affected by an inaccurate RSA. It is also required to verify the Proponent’s assessment of cumulative impacts to caribou.</p> <p>See also AD-56 in the Advice to Proponent table.</p>	<p>The SK1 conservation unit as envisioned by the province is not meant to represent a biologically relevant area based on our understanding of this through discussion with the province as implied by the review comment. Per ECCC (2020) information available to delineate boreal caribou ranges varies in certainty and therefore caribou ranges are categorized into three types: conservation units (low certainty), improved conservation units (medium certainty) and local population units (high certainty). ECCC (2020) also recognizes that there will be changes to conservation units and improved conservation units as more information becomes available. The SK1 conservation unit is a conglomerate of various habitats and ecosites types (rocky shield, sandy plains and varying topography of the Athabasca Plain ecoregion in the northwest and Churchill River Upland ecoregion in the southeast). Denison and its SME believe the approach utilize in the analysis provides an appropriate scale on which to consider local caribou populations relative to the Project. The EA guidelines do not require the proponent to do a range-wide assessment, nor does the delineation of the SK1 range imply that such an assessment is an appropriate scale on which to consider effects. As we understand it, the delineation of SK1 and SK2 is a function of the separation of more southern productive habitat types vs more northern ones, and even that distinction (though maybe useful and appropriate from a planning perspective) is arbitrary from a life history point of view since it is known that animals move between the ranges freely.</p> <p>As per accepted environmental assessment methodology, the spatial boundaries were established to capture the extent of the expected/likely adverse effects, both direct and indirect, on the various valued components, that were expected as a result of the Project.</p> <p>The Project Footprint was delineated as the maximum extent of physical, direct disturbance resulting from the Project.</p> <p>The LSA was delineated to capture the extent of all direct, and most indirect effects of the Project on the wildlife VCs, including woodland caribou.</p> <p>The RSA was delineated to capture the extent of all potential Project indirect effects, in consideration of the life-requisites and behavior of the various VCs being assessed (i.e., a habitat-based assessment) including ungulates (e.g., woodland caribou) which are known to have large home ranges. The RSA was also delineated in the context of the cumulative effects assessment. Further the RSA is considered representative, as it includes habitat (ecosite types) that are found throughout the SK1 range. In particular, the habitat (and its potential to support woodland caribou, as classified by the Saskatchewan Ministry of Environment) in the RSA is relatively consistent with the remainder of the habitat in the SK1 range. To help display habitat suitability an appendix to Section 9 of the revised Draft EIS (Appendix 9-F) has been developed and is provided with the IR response package and</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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					<p>Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA</u>: The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above-mentioned effects.</p> <p>For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p> <p><u>RSA</u>: The Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul> <p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada.</p> <p><b>Reference:</b></p>	See also related IRs: IR-154 and IR-156.		<p>revised Draft EIS submission. The reader is referred specifically to Figure 2-1 in revised Draft EIS Appendix 9-F as it concerns the above reference to habitat in the SK1 range.</p> <p>These study areas are appropriate, in that they capture the extent of the likely adverse effects of the Project on the VCs, to provide an ecologically relevant determination as to the likely adverse effect on the regional population of all assessed VCs, including woodland caribou (i.e., no dilution of the effects over the entire SK1 range – although this has been provided for context).</p> <p>The 500 m buffer around a physical disturbance was considered in the context of the extent of sensory disturbance, to allow Denison to determine the geographical extent of an effect (i.e., limited to the LSA, limited to the RSA) to allow the appropriate characterization of the effect to inform the determination of significance.</p> <p>Cumulative effects occur when the adverse effects of the Project, overlap in time and space, with the adverse effects from other projects and activities. As such, the RSA is the appropriate scale to appropriately conduct a defensible cumulative effects assessment – i.e., the effects of projects that are beyond the RSA spatial extent would not likely result in residual effects that could act cumulatively with the Project’s effects, and consideration of effects that do not overlap spatially or temporally, are not cumulative, by definition.</p> <p>For the reviewer’s context and consideration, refer to Attachment IR-137 for a summary of the Wheeler River Project’s expected direct footprint (74.8 ha) and Project Area (area of maximum disturbance; 169.9 ha) compared to expected landscape disturbances from: a proposed underground uranium mining project in the Athabasca Basin (NexGen’s Rook I Project), an underground mining project which recently completed the Saskatchewan EA process (Foran’s McIlvenna Bay Project), and an open pit mining project which recently completed the federal EA process (Generation PGM’s Marathon Palladium Project). Attachment IR-137 contains Table IR-137-1 and Figure IR-137-1; we also refer the reviewer to Section 2.2.8 Project Area and Figure 2.2-28 in the revised draft EIS for an overview of the Project spatial areas. Denison suggests that the FIRT’s review of terrestrial environment IR responses be framed within the context of the Project’s spatial boundaries.</p> <p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p> <p>Saskatchewan Ministry of Environment (ENV). 2023. Woodland Caribou in the Boreal Shield (SK1): Background Information.</p>	



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					[1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011).				
IR-142 IR-159 IR-167	IR-142-159-167-R1	ECCC	Wildlife and Wildlife Habitat	<b>Reference to EIS:</b> Section 9.3.3.3, Baseline Studies Section 9.3.5 Mitigation Measures  IR 142, 159, and 167 Responses from Denison	<b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided.  <b>Rationale:</b> Knowing the survey methodology for pre-construction and pre-clearing surveys across multiple species is important because the Proponent is intending to collect data so that ECCC can determine whether the methodology used to collect the data is appropriate and if the methodology would contribute to understanding cumulative effects and adaptive management. Understanding how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods, such as nesting, breeding, foraging and migration, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the effectiveness of mitigation strategies and adaptive management being developed by the Proponent for each species mentioned in IR-142, IR-159 and IR-167.	Provide survey methodology and timing for all preconstruction and pre-clearing surveys, including avian and species at risk surveys (caribou, wolverine).		<p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se, but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snow pack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017)), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.</p> <p><b>References:</b></p> <p>B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119</p>	No

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								<p>Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.</p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	
IR-143	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"><li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>• Description of seasonal use of the LSA, RSA and caribou range.</li><li>• Description of Project areas used by caribou.</li><li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul> <p>Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).</p> <p>See also related: IR-152.</p>	<p>This response has not been accepted.</p> <p>The information provided by the Proponent is insufficient to understand potential Project impacts and appropriate mitigation that would be required.</p> <p>Information on important habitat features and how caribou are using the landscape is required to complete an accurate assessment of the Project impacts to caribou habitat and habitat use. In the absence of this information, ECCC will assume a conservative estimate that all habitat features are high value and are used for important life functions.</p> <p>Although the Proponent provided a map showing telemetry points (provided by the Province of Saskatchewan), this map doesn’t have sufficient detail to assess habitat use and important biophysical features of the Project area. These details are necessary to assess habitat use and important biophysical features of the Project area.</p> <p>See follow-up IR-143-144-R1 and IR-143-145-R1.</p>	<p>In the Proponent’s and its SME’s view, the information provided in the habitat-based environmental assessment is considered to adequately describe the baseline conditions of woodland caribou and allow the assessment of likely adverse effects of the Project on woodland caribou, using accepted environmental methods and approaches. To further address the reviewer’s comment, we have prepared additional figures (below) to consider the Project study areas and Project footprint + 500 m area; however, these are provided as supplemental information and will not change the assessment presented in the draft EIS.</p> <p>The baseline data and telemetry points (i.e., best data available at the time) were used to document the habitat use (by type and season) at an appropriate scale and detail to inform the assessment of the Caribou VC in terms of: alteration/loss of habitat; change in movement patterns; and change in mortality – the likely effects selected to inform and focus the assessment.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown in Figure 3). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>(forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>Knowledge holders confirmed that woodland caribou utilize the area and might be encountered in the Terrestrial RSA (19-LK-ERFNTrip-134.149; 19-LK-ERFNTrip-134.151), and that local trappers encounter caribou regularly at their traplines in winter and see them during summer (19-LK-ERFNTrip-134.151). They have not observed any changes in densities and suggest that the same number of caribou have been found in the area over the years (19 -LK-ERFNTrip-134.156). Caribou are reported to calve near the Wheeler River, which has lots of heavy muskeg in the area (16-EN-ERFN-100.15). Knowledge holders identified the area east of Highway 914 and northeast of Russell Lake, between Russell Lake and McDougall Lake (corresponding with Omnia winter tracking transects #5 and #9; see revised draft EIS Appendix 9-B, Omnia Terrestrial Environment Wildlife and Vegetation Baseline Inventory Figure 2.6-1) as an area where caribou are commonly observed in the winter. “There are tall trees here, some small hills with protected valley areas, and it seems sheltered. There is caribou moss in this area” (19-LK-ERFNTrip-134.154). Caribou are known to travel through areas of younger forest and burns to get to preferred habitat types (19-LK-ERFNTrip-134.152), such as more mature forests and areas with abundant lichen growth. “Caribou [...] eat low bush cranberries and lichen; lichen takes many years to grow and recover” (18-EN-ERFN-5.76). Caribou have been observed to use areas of younger forest stands with regenerating pine. In years with deep snow or when there is a hard crust on the snow, they may eat the tips of fresh growth off the younger pine trees (19-LK-ERFNTrip-134.155).</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project</p>	



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								permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.	
IR-144	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<p><b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i></p> <p><i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i></p>	<p>Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.</p>	<p>This response has not been accepted.</p> <p>The information provided by the Proponent is insufficient to understand potential Project impacts to this species and characterize the risk to determine impacts from the Project to caribou and appropriate level of offsetting mitigation that would be required. The revised map 9.3-8 shows seasonal use, however, it is challenging to see the overlapping features. The map does not allow the reader to get a good understanding of the seasonality of the data. Due to the fact that caribou use different habitat types in differing ways over the course of a year, seasonality of the data will allow for a deeper understanding of habitat use.</p> <p>The scale provided on the current map does not allow for a proper assessment of seasonal use, including differentiation of habitat use.</p> <p>Individual maps by season and survey type with larger scale insets that show areas with overlapping points would help to clarify the map and allow for a greater understanding of spatial and temporal features of caribou habitat.</p> <p>See follow-up IR-143-144-R1.</p>	<p>In the Proponent’s and its SME’s view, the baseline surveys in combination with information from other sources related to caribou were appropriate to adequately inform the habitat-based environmental assessment. The data collected and the analysis completed to inform the environmental assessment represent the best-available information on caribou relative to the Project, which has been updated to include up-to-date caribou habitat potential mapping for the SK1 range obtained in December 2023.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment, 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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								<p>in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p>	
IR-143-144-R1	IR-143-144-R1		Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 144 Responses from Denison	<p><b>Context:</b> In the IR-143 response, the Proponent states: “As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from Indigenous Knowledge (IK) was included in the EIS, including potential calving areas in the Terrestrial RSA.” The Proponent provided a revised Map 9.3-8 to display these features.</p> <p><b>Rationale:</b> While the revised Map 9.3-8 shows seasonal use, it is challenging to see the overlapping spatial and temporal features. The map is not adequate for fully understanding the seasonality of the data. The scale provided does not allow for a proper assessment of seasonal use, including differentiation of habitat use such as calving, movement or wintering habitats.</p> <p>Some habitats, based on use, may be more used for more critical functions than others and this information cannot be adequately assessed based on the information provided.</p>	Provide individual maps by season and survey type or with larger scale insets that show areas with overlapping spatial and temporal features.		<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>The baseline surveys for caribou were appropriate to adequately inform the habitat-based environmental assessment, considering the low suitability of the habitat expected to be disturbed by the Project and the low caribou use indicated. The data collected and the analysis used to inform the environmental assessment represent the best-available information on caribou relative to the Project.</p> <p>Figure 9.3-8 in revised draft EIS shows the EA study areas and the caribou observed within the ecosite types, while Figure 2-2 in revised Draft EIS Appendix 9-F shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low, moderate, high). These figures include larger scale insets to provide greater detail in relation to the location of the woodland caribou observations in context to the habitat (ecosite) types and the habitat suitability (as classified by Saskatchewan Environment) within the Study Areas.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with</p>	Yes  Appendix 9-F incorporated (added) into the revised Draft EIS Appendices

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the draft EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the</p>	

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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								<p>Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p> <p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p>	
IR-145	-	ECCC	Wildlife and Wildlife habitat	<p>Section 9.3.3.3, Woodland Caribou</p>	<p><b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).</p> <p>The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.</p> <p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>	<p>1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada:</p> <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul> <p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p>	<p>This response has not been accepted.</p> <p>The map provided by the Proponent lacks spatial and temporal details needed to complete an assessment of habitat importance to caribou relative to the Project. The Proponent did not provide information or mapping on known important habitat features, habitat quality or biophysical attributes and mapping was not provided at the different scales as requested in the IR.</p> <p>ECCC recommends that the Proponent provide mapping of important caribou habitat features, such as those used for calving, wintering, and movement to assess how caribou utilize the landscape and assess potential impacts to caribou due to impacts to these areas. Knowing detailed data on caribou habitat use will contribute to identifying mitigation measures and potential offsetting.</p> <p>In the absence of telemetry data, mapping of habitat quality, based on a combination of known ecosites and known important biophysical features will provide a reasonable alternative, where known important caribou habitat features cannot be mapped.</p> <p>The provision of information on habitat use and biophysical features will facilitate the verification of the Proponent’s effects assessment.</p> <p>See follow-up IR-143-145-R1.</p>	<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>The baseline surveys for caribou were appropriate to adequately inform the habitat-based environmental assessment. The data collected and the analysis used to inform the environmental assessment represent the best-available information on caribou relative to the Project.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown in Figure 3). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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						<b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.		<p>majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p>	
IR-143 IR-145	IR-143-145-R1	ECCC	Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 145 Responses from Denison	<b>Context:</b> Information presented on boreal caribou in the study areas in the Proponent’s response is insufficient to: <ul style="list-style-type: none"><li>characterize and determine the risk of Project impacts,</li><li>and</li><li>calculate the appropriate level of offsetting required.</li></ul> Information on important habitat features and how caribou are using the landscape is required to complete an assessment of the Project impacts.	<p>1. Provide maps at the Project Development Area (PDA)/Local Study Area (LSA)/Regional Study Area (RSA) scale showing caribou habitat quality.</p> <p>2. Provide maps at the PDA/LSA/RSA scale showing areas with the appropriate biophysical attributes for calving and other life stages, such as important wintering habitats and</p>		<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>Figure 9.3-8 in revised Draft EIS shows the study areas and the caribou observed within the ecosite types, while Figure 2-2 in revised Draft EIS Appendix 9-F shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low,</p>	Yes  Updates to Figure 9.3-8 and Appendix 9-F has been incorporated into the revised Draft EIS Appendices



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					<p>Although the Proponent provided a map showing telemetry points (provided by the Province of Saskatchewan), the map lacked sufficient detail to assess habitat use and important biophysical features of the Project area.</p> <p>The IR-145 response states: “Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.” As a part of the analysis, calving areas are particularly important to delineate if information is available as a key part of all life stages.</p> <p>In the draft EIS, the habitat types that are considered non-habitat for caribou are open bogs (BS20), leatherleaf shrubby fens (BS22), graminoid fens (BS24), open fens (BS25), rush sandy shorelines (BS26), sedge sandy shorelines (BS27) and waterbodies.</p> <p><b>Rationale:</b> Woodland caribou are known to use treed bog and open fen (Section 9.3.3.3.1 of the draft EIS), however open fens and bogs are excluded from the identified available Woodland Caribou habitat, based on not detecting presence or not detecting presence as frequently.</p> <p>Mapping of important caribou habitat features is required to assess important potential impacts to caribou. In the absence of telemetry data, mapping of habitat quality, based on a combination of known ecosites and known important biophysical features will provide a reasonable alternative where known important caribou habitat features cannot be mapped.</p>	<p>movement corridors.</p> <p>Indicate the source of telemetry data (i.e., University of Saskatchewan and/or the Province of Saskatchewan).</p>		<p>moderate, high).</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations are presented in Figure 9.3-8 in revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised Draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River</p>	

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								Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.	
IR-148	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>an account (and GIS file if available) of existing habitat affected, using the following formula: (Project footprint + 500m buffer) – overlapping (permanent alteration(s) + 500m buffer)</li></ul></li><li>A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</li><li>Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and</li></ol>	<p>This response has not been accepted, due to outstanding information related to #2.</p> <p>ECCC’s role is to provide advice to the CNSC under the Species at Risk Act and/or the Migratory Birds Convention Act to support compliance with these pieces of legislation in their decision making. Having access to project study area shapefiles allows ECCC to do their due diligence in validating any overlapping Critical Habitat, important habitat features, species at risk ranges, migratory birds ranges and other potentially important local or landscape characteristics. Obtaining project shapefiles from proponents is standard practice for our analysis of environmental impacts of projects.</p> <p>ECCC requested for more detailed mapping at the level of the project footprint in order to be able to have higher confidence in our analysis relative to potential effects on caribou Critical Habitat. However, as the requested mapping was not provided by the Proponent, ECCC is required to make assumptions that could impact our determination of potential effects and possible offsetting requirements to mitigate impacts to caribou Critical Habitat (as per the Federal Recovery Strategy for Woodland Caribou). We are aware that the project footprint may change, which may result in changes to the final recommended offset amount. We are prepared to work with a draft file with the understanding that it is still being finalized. The fact that the landscape may change over time based on data available does not negate the fact that baseline analysis is still required to determine impacts on caribou, and we still require the study area shapefiles to continue with our general analysis of the study area, given</p>	<p>Firstly, Denison would like to clarify the chronology associated with this IR for the record.</p> <ul style="list-style-type: none"><li>The GIS files in question were not viewed as a requirement during the first round of comments. The reviewer asked Denison to provide GIS files for all existing habitat affected in SK1 (if available).</li><li></li><li>Denison notes that the direct request for the Project footprint shape files was received from the CSNC via email on November 21, 2023 (email from Way to Switzer); however, the files were requested following a meeting between the Saskatchewan Ministry of Environment and ECCC where Project offsetting was being discussed (i.e., not in relation to the original IR topic).</li><li>Denison acknowledges that there was some confusion regarding the reviewer’s request through the FIRT process versus the requests received to support offsetting and mitigation plans outside of the EA process.</li><li>Denison will provide the Project specific shapefiles to the CNSC separately from this response table.</li></ul> <p>For reference, the relevant data (including field observations in relation to ecosite types) have been collated into new maps. Figure 9.3-8 in the revised Draft EIS shows the EA study areas and the caribou observed within the ecosite types, while Figure 2-2 in Appendix 9-F of the revised Draft EIS shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low, moderate, high) in relation to the SK1 conservation unit.</p>	<p>Yes</p> <p>Updates to Figure 9.3-8 and Appendix 9-F have been incorporated into the revised Draft EIS Appendices</p>



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						provide a rationale for the conclusion.  See also related: IR-154.	the limited data that was provided by the proponent.  Please provide the requested shape files.		
IR-149	-	ECCC  CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife-specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the Project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the</li></ol>	<p>This response has not been accepted.</p> <p>The Conceptual Caribou Management Plan does not provide sufficient detail to understand if using the restoration trials as an offset will produce satisfactory habitat compensation to address the Project effects to caribou.</p> <p>Additional clarity on the Proponent’s role in the Developing Eco-restoration Together program is required, such as how the outcomes of these programs will result in mitigation measures and offsetting requirements. Additional clarity on the scope of the program should also be provided so that ECCC can understand the objectives and deliverables of the program.</p> <p>See follow-up IR-149-R1A, IR-149-R1B and AD-71 in the Advice to Proponent table.</p>	<p>For context, the responses that have been provided to caribou IR-related elsewhere in this response table (IRs 37, 143, 143-144-R1, 143-145-R1, 144, 145, 148, 151, 155, 156) have relevance to the this, and other IR responses, and it is recommended that all of this information be considered in its entirety. The afore-referenced IR responses include descriptions of additional data that have been obtained and collated and analyses and interpretation that have been completed in relation to the presence of caribou and suitable habitat in Project study areas. At time therefore, Denison and its SME believe there are no material data/information gaps the prevent or constrain the analysis of Project and cumulative effects, defining the appropriate mitigation measures, and establishing the required offset within the provincial offsetting framework.</p> <p>With respect to data gaps, the following is noted:</p> <ul style="list-style-type: none"><li>• As described herein, additional data have been obtained and presented in Appendix 9-F. These data help to link caribou data, habitat/ecosite data and habitat suitable into the analysis. It is noted based on the new perspectives the overall conclusions of the caribou assessment are unchanged. While it is acknowledged that data may be lacking on the range level, Denison as a Project proponent is not responsible for and need not a complete a range assessment for the purpose of a Project-specific cumulative effects assessment.</li></ul> <p>With respect to mitigation measures, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison and its SME have re-considered the mitigation measures presented in the EIS documentation to date in light of updated caribou-related information and does not see that further mitigation measures are needed at this time.</li></ul> <p>With respect to offset, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The updated document is provided with this second round IR submission.</li></ul> <p>With respect to monitoring, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison has committed to monitor for the presence of woodland caribou primarily within the Project Footprint as well as other areas within the Terrestrial RSA based on accepted methods that will be developed as part of its wildlife monitoring follow-up program as part of the implementation of its Environmental Management System. As it is understood, aerial surveys to document presence and habitat use are not permitted by the Saskatchewan Ministry of Environment at this time, Denison conceptually proposes to document the presence of woodland caribou using remote cameras placed strategically within representative habitat types within the Terrestrial RSA and a wildlife observation tracking log (based on the Project-wide implementation of the current wildlife card system Denison has in place). As Denison works collaboratively with the Saskatchewan Ministry of</li></ul>	No

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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						<p>avoidance and minimization measures.</p> <p>4. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</p> <p>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</p> <p>6. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-157.</p>		<p>Environment to finalize the Caribou Management Framework, further details on monitoring in conjunction with the offset commitment will be developed.</p> <p>In direct response to the questions raised in the review comment the following is noted:</p> <ul style="list-style-type: none"><li>Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</li><li>We also note that the Eco-restoration Together (ERT) program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The ERT program will focus primarily on site restoration techniques for decommissioning. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</li><li>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</li></ul>	
IR-149	IR-149-R1A	ECCC	Wildlife and Wildlife Habitat	Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149	<b>Context:</b> Much of the information presented in the Conceptual Caribou Management Plan is qualitative in nature and does not present specific details regarding a quantitative assessment of impacts following measures to avoid, minimize, and restore on-site and then assess residual effects and determine the offset required to counterbalance the remaining impacts. This is	1. Provide a quantitative assessment of impacts following measures to avoid, minimize and restore on-site and then assess residual effects and determine the offset required to		<p>Please see response to IR-149.</p> <p>In addition, in direct response to IR-149-R1A the following is noted.</p> <p>1. Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison</p>	No

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
				IR-149 Response by Denison	<p>required to understand if offsetting is sufficient to address impacts to caribou. The Proponent also does not provide details on methods that will be used for pre- disturbance wildlife clearance surveys. ECCC is aware that that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program.</p> <p><b>Rationale:</b> ECCC requires the quantitative details on the assessment of impacts to be included within the Conceptual Caribou Management Plan to adequately assess how the Proponent has applied the mitigation hierarchy. Details on the methods that will be used for pre- disturbance wildlife clearance surveys will also be required to verify that the Proponent has adequately considered how they have avoided, mitigated, or restored impacts to caribou.</p> <p>While ECCC understands that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program, however, more clarity on the Proponent’s role in the program and the scope of the program is required. Details such as how the outcomes of these programs will result in mitigation measures and offsetting requirements and additional clarity on the scope of the program should also be provided so that ECCC can understand the objectives and deliverables of the program.</p>	<p>counterbalance the remaining impacts.</p> <p>2. Provide details on methods to be used for pre- disturbance wildlife clearance surveys.</p> <p>3. Provide details on the Proponent’s role in the Developing Eco-restoration Together program and how that work may be used in offsetting requirements.</p> <p>4. Provide the scope (i.e., quantitative habitat amount) of the Eco-restoration Together program.</p>		<p>has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</p> <p>2. For clarification, the pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including woodland caribou) that may potentially be using habitats at certain times of the year. For example, in the event the sweeps are conducted during the winter period, methods would include snow tracking to identify woodland caribou presence based on tracks and feeding craters observed within the study areas, based on survey protocols provided by the Government of Saskatchewan (2014). This effort would also be combined with use of remote cameras that have been in place throughout the Terrestrial RSA for the past several years, and the photos captured from the cameras can be used to further verify caribou presence with the study areas. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.</p> <p>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</p> <p>3. The Eco-restoration Together program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</p> <p>4. The Eco-restoration Together program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</p> <p><b>References:</b></p>	

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								Government of Saskatchewan. 2014. Snow Track Survey Protocol. Fish and Wildlife Branch, Ministry of Environment. 8 pp.	
IR-149	IR-149-R1B	ECCC	Wildlife and Wildlife Habitat	Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149  IR-149 Response by Denison	<b>Context:</b> Section 4.2.2 of the Conceptual Caribou Mitigation plan states: “locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;”. However, no specific mitigation measures are mentioned for impacts to caribou due to noise generated from the Project air strip.  <b>Rationale:</b> Noise from the air traffic using the air strip will also generate excessive noise that can impact caribou. Additional information on the timing and frequency of air traffic, as well as specific mitigations related to impacts from air traffic, including mitigations related to frequency and timing of flights, will be necessary to evaluate impacts to caribou due to air strip noise.	1. Provide additional information on the timing and frequency of air traffic using the Project air strip.  2. Provide specific mitigations related to impacts from air traffic, including mitigations related to frequency and timing of flights.		Please see response to IR-149.  In addition, in direct response to IR-149-R1B the following is noted.  The flight schedules have not yet been determined at this relatively early stage of planning for the Project.  Mitigation measures likely to be incorporated into the operation of the airstrip, with respect to air traffic, would include, as safety allows, maintaining as direct approach and departure flight paths as possible, and obtaining appropriate altitudes, and leaving the LSA and RSA, as quickly as is safely reasonable.	No
IR-151	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.	1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.  2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.	This response has not been accepted.  There is insufficient information to support the Proponent’s conclusion that there are no impacts to landscape connectivity. Additional information on habitat quality, caribou use of the landscape for different life stages, and important habitat features within the study area is required to understand effects of the Project on habitat connectivity.  Provide maps of caribou habitat quality and an assessment of Project impacts to high quality habitat including habitat that may be associated with landscape connectivity.	The woodland caribou found in the SK1 range are non-migratory, in the sense that barren-ground caribou are. Rather based on information received from the Saskatchewan Ministry of Environment it is understood that they utilize a variety of habitat types across both the SK1 and SK2 ranges and are distributed and move broadly across the landscape. To date, western science has not identified any known “corridors” used specifically by woodland caribou in the SK1 range. As such, the Project will not hinder or exclude woodland caribou from moving across the landscape within the SK1 range; rather, they will be able to move around the Project Footprint unimpeded through the habitat types that are available.  Knowledge holders confirmed that woodland caribou occur in the Terrestrial RSA (19-LK-ERFNTrip-134.149; 19-LK-ERFNTrip-134.151), and that local trappers encounter caribou regularly at their traplines in winter and see them during summer (19-LK-ERFNTrip-134.151). They have not observed any changes in densities and suggest that the same number of caribou have been found in the RSA over the years (19 -LK-ERFNTrip-134.156). Caribou are reported to calve near the Wheeler River, which has lots of heavy muskeg in the area (16-EN-ERFN-100.15). Knowledge holders identified the area east of Highway 914 and northeast of Russell Lake, between Russell Lake and McDougall Lake (corresponding with Omnia winter tracking transects #5 and #9; see revised draft EIS Appendix 9-B, Omnia Terrestrial Environment Wildlife and Vegetation Baseline Inventory Figure 2.6-1) as an area where caribou are commonly observed in the winter. “There are tall trees here, some small hills with protected valley areas, and it seems sheltered. There is caribou moss in this area” (19-LK-ERFNTrip-134.154). Caribou are known to travel through areas of younger forest and burns to get to preferred habitat types (19-LK-ERFNTrip-134.152), such as more mature forests and areas with abundant lichen growth. “Caribou [...] eat low bush cranberries and lichen; lichen takes many years to grow and recover” (18-EN-ERFN-5.76). Caribou have been observed to use areas of younger forest stands with regenerating pine. In years with deep snow or when there is a hard crust on the snow, they may eat the tips of fresh growth off the younger pine trees (19-LK-ERFNTrip-134.155).	Yes  Appendix 9-F incorporated (added) into revised Draft EIS Appendices

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								<p>English River First Nation and SVS (2022) compiled an IK study documenting current and past land use, knowledge of the land, and participants’ perspectives on potential Project effects, as well as cumulative effects from past mining and other developments. The report identified a wildlife corridor used by several species, including woodland caribou. The corridor runs between Cree Lake (approximately 40km southwest of the Terrestrial RSA and Russell Lake (in the southern portion of the Terrestrial RSA (Feature 1001-09; ERFN and SVS 2022). The report identified a caribou calving area: Feature 1009-07 covering large portions of the Terrestrial RSA with the exception of the most western, northern, and eastern extents. This area is also described as offering good caribou habitat year-round (ERFN and SVS 2022).</p> <p>In September 2011, Environment Canada gathered Aboriginal Traditional Knowledge from Indigenous groups across Canada to support their recovery efforts for boreal woodland caribou (ERFN 2011). In the report, most interviewees stated that caribou lost their calving areas to fires and they moved elsewhere to have their calves. It is more difficult to find the caribou now (ERFN 2011).</p> <p>Figure 2-2 in revised Draft EIS Appendix 9-F shows the location of woodland caribou observed during the baseline field program in association with the ecosite types classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou. As shown in the figure, the majority of the caribou location data points are located beyond the Project Footprint and to the northern and eastern portions of the RSA.</p> <p>Based on the information presented in Figures 2-3 to Figure 2-8 provided in Appendix 9-F, related to the life requisite habitat potential for calving, forage and refuge habitat, as characterized by the SK MOE (2023), the majority of the ecosite types within the RSA are relatively uniform with no discernable differences in habitat quality across the region. As such, there are no definitive differences in habitat quality (i.e., these ecosite types provide the same quality of habitat for use by woodland caribou). Further, there are no barriers preventing woodland caribou from moving throughout the Terrestrial RSA through the habitat types that offer a similar level of quality for the various life requisites for this species. In this context, potential Project-related effects on connectivity are not expected.</p> <p><b>References:</b></p> <p>English River First Nation (ERFN). 2011. English River First Nation: English River First Nation, ATK (Aboriginal Traditional Knowledge) Summary Report. Compiled by Environment Canada.</p> <p>English River First Nation (ERFN) and Shared Value Solutions (SVS). 2022. Wheeler River Project – Summary of Traditional Knowledge Study Results – English River First Nation. Prepared for English River First Nation. March 2022.</p>	
IR-155	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou Habitat in	1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine available habitat based	This response has not been accepted.  The Proponent’s response to IR-155 states “Available woodland caribou habitat was identified	Denison has created a series of maps utilizing existing habitat (ecosite) data in combination with the habitat potential classifications from the Saskatchewan Ministry of Environment in response to this and related IRs, as outlined below (see Appendix 9-F).	Yes  Appendix 9-F incorporated



IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>	<p>in the draft EIS to comprise the ecosites with observations of caribou and caribou sign during the baseline studies. This was done without seasonal differentiation because it was assumed that caribou may use these ecosites during all seasons and life stages.” The methodology used to determine available caribou habitat does not accurately represent use of the documented habitat.</p> <p>The trail camera and pellet survey methods used do not satisfy the IR as they may lead to an underestimation of available caribou habitat.</p> <p>Trail camera and pellet surveys are not normally used to determine available habitat, as they only show presence. Using observations within ecosites to determine what is available habitat for caribou may lead to an underestimation of available habitat. Some smaller or rare ecosites may not have been sampled, leading to their exclusion as available habitat.</p> <p>Additionally, trail cameras were only placed on linear features, which are not representative of the whole landscape. Survey locations and camera trap placement may not provide an accurate representation of the study area or the SK1 range.</p> <p>To adequately determine available caribou habitat, ECCC requires a new habitat-based analysis that captures important biophysical features outlined in Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020.</p>	<p>Figure 2-2 in Appendix 9-F of the revised draft EIS shows the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat (Saskatchewan Ministry of Environment 2019).</p> <p>Figures 2-3, Figure 2-5, and Figure 2-7 in the revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figures 2-4, Figure 2-6, and Figure 2-8 in the revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p>	<p>(added) into the revised Draft EIS Appendices</p>
IR-156	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>	<p>This response has not been accepted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 2020, the SK1 range is currently at its disturbance threshold. All remaining habitat in this range is considered to be critical habitat.</p> <p>As the development of this Project will result in loss of critical habitat for boreal caribou, the Project will have an impact on boreal caribou.</p>	<p>It is Denison’s and its SME’s understanding that the SK1 range is not at its disturbance threshold (60% undisturbed) based on the most recent information that we are aware of from the province that was confirmed in November of 2023. As at that date, it was estimated that the disturbance, almost exclusively due to natural factors (fire), was at 53% (SK ENV 2023). This is material to the consideration of both potential Project-related and cumulative effects that are reviewed below.</p> <p>Denison used a conservative approach in that the EA assumed that all habitat types were suitable and available to caribou and were used by caribou during all seasons in support of caribou life requisites - which is highly conservative considering the indicated low caribou population levels within the LSA and RSA.</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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					<p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the Proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the Project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the Proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p> <p>The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.</p>		<p>The assessment does not contain adequate information on habitat quality or representativeness of the RSA to the SK1 range. The Proponent did not consider disturbance in the regional context, therefore their conclusions are not based on the best available information. Considerations of disturbance in a regional context is required to accurately represent residual and cumulative effects to caribou within the SK1 range.</p> <p>The Proponent has not provided sufficient information to support their conclusion of a “not significant” impact to boreal caribou as the Recovery Strategy wasn’t fully considered. Since all remaining habitat in this range is critical habitat, the Project will negatively affect critical habitat necessary for the survival and recovery of the species. The Proponent should provide a revised assessment of residual and cumulative effects, taking into consideration the Recovery Strategy and that the disturbance within the SK1 range is at the disturbance management threshold, and Projects impacts to critical habitat.</p>	<p>The EA for the Project considered that the habitat types in the Project Footprint and the RSA have largely been disturbed, primarily by past fire events. This has been acknowledged and documented by local knowledge keepers. In September 2011, Environment Canada gathered Aboriginal Traditional Knowledge from Indigenous groups across Canada to support their recovery efforts of boreal woodland caribou (ERFN 2011). Forest fires are considered the main threat to woodland caribou in the English River area, and most interviewees stated that caribou lost their calving areas to fires and they moved elsewhere to have their calves. It is more difficult to find the caribou now (ERFN 2011).</p> <p>Figure 2-1 in revised Draft EIS Appendix 9-F shows the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou in relation to the SK1 range. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat for caribou (Saskatchewan Ministry of Environment 2019).</p> <p>The disturbance of the SK1 conservation unit has little relevance to the LSA and RSA, which were selected to inform and focus the EA for the Project, as per accepted EA methodology. As described in Section 9.3.7, existing habitat disturbances due to past and ongoing anthropogenic development have altered the Terrestrial RSA resulting currently in 1.5% of habitat loss in the Terrestrial RSA. The Project is likely to add another 0.4% of anthropogenic disturbance (considering the Project Area of 169.6 ha) to the disturbance resulting in up to 1.9% of total anthropogenic disturbance in the Terrestrial RSA. While the Terrestrial RSA currently provides 30,541.63 ha (76.1%) of habitat that are currently available for woodland caribou (Section 9.3.7), which is located within the SK1 Boreal Shield Woodland Caribou Management Unit. Environment and Climate Change Canada (2020) identified the caribou population in the SK1 conservation unit as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in the SK1 Boreal Shield range should not exceed 5% with the remainder (i.e., 55%) being attributed to natural disturbance (while maintaining a minimum of 40% undisturbed habitat in the range). Based on 2010-2015 mapping, Environment and Climate Change Canada (2020) calculated that approximately 58% of the SK1 Boreal Shield range is currently affected by past forest fires and 3% of the range is affected by anthropogenic disturbances. Based on the federal assessment and recent preliminary disturbance assessment from ENV, an estimated 53% of SK1 is considered disturbed, with 47% undisturbed (ENV 2023), indicating that the land use and overall disturbance in the conservation unit remains below the recovery strategy disturbance threshold.</p> <p>The size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020), resulting in an estimated additional Project-related disturbance of 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. The incremental increase of the disturbance at the SK1 Range is 0.001%, but for context that habitat is primarily disturbed and regenerating as a result of past fire disturbance, which is not anticipated to be suitable habitat for caribou in the next 40-50 years. As such, the contribution of the Project effects to the cumulative effects on woodland caribou within the SK1 conservation unit are deemed to be negligible.</p>	



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								<p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p> <p>Saskatchewan Ministry of Environment (ENV). 2023. Woodland Caribou in the Boreal Shield (SK1): Background Information.</p>	
IR-157	-	ECCC	Wildlife and Wildlife habitat	<p>Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary</p>	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets. ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of</p>	<p>This response has not been accepted.</p> <p>The Proponent provided a conceptual Woodland Caribou Monitoring Plan, however, this plan does not include an assessment of the Proponent’s determination of the required amount of habitat offset.</p> <p>ECCC currently recommends a minimum offset multiplier of 4:1 (offset outcome: residual adverse effect) for a project that has a low severity impact of adversely affecting a low vulnerability ecological component. This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum; for example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context.</p> <p>Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p> <p>The Proponent provided a conceptual Woodland Caribou Monitoring Plan, however, this plan does not include an assessment of the Proponent’s determination of the required amount of habitat offset.</p> <p>ECCC currently recommends a minimum offset multiplier of 4:1 (offset outcome: residual adverse effect) for a project that has a low severity impact of adversely affecting a low vulnerability ecological component. This is a benchmark ratio applied to a</p>	<p>Please see response to IR-149.</p> <p>In addition, in direct response to IR-157 the following is noted.</p> <p>Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</p> <p>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</p>	No

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						<p>the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p>	<p>project that is in the lower end of the risk spectrum; for example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context.</p> <p>Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets.</p> <p>In the absence of sufficient data or information required to validate the level of risk that this Project is likely to have on the species recovery, the implementation of the mitigation hierarchy and offsetting measures to address Project adverse effects, ECCC’s views are based on the precautionary approach.</p> <p>Thus, ECCC preliminary analysis regarding the likelihood of this Project having an adverse effect on boreal caribou recovery is identified as moderate to high, resulting in a precautionary offsetting requirement that should be in terms of amount, much greater than 4:1. The assumptions of ECCC’s risk assessment include:</p> <ul style="list-style-type: none"><li>• The biophysical attributes required for boreal caribou recovery (i.e. habitat for calving, post-calving, rutting, winter and travel) are present within the study area and will be directly or functionally lost,</li><li>• Sensory disturbance arising from project activities (e.g. air traffic) will cause functional habitat loss for boreal caribou within important habitat areas required for different life stages.</li></ul>		

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							<p>Additionally, lack of information supporting the Proponent’s offsetting plans creates uncertainty and thereby warrants a higher offset ratio.</p> <p>ECCC is available to provide information to the Proponent on how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>		
IR-158	-	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p><b>Updated Rationale:</b> The Proponent should identify additional focal species that can serve as indicator species by representing anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects, such as species at elevated risk of collision with vehicle traffic.</p> <p>By identifying focal species or guilds for each key indicator species within the Migratory Breeding Birds Valued Components (VCs), ECCC would be able to accurately review the Proponent’s assessment of impacts and mitigation measures in order to assess the accuracy of the Proponent’s conclusions and provide expert advice on the mitigation measures.</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	<p>This response has not been accepted.</p> <p>The Proponent did not identify focal species for each key indicator species within the Migratory Breeding Birds valued components. This information is needed to accurately review the Proponent’s assessment of impacts and mitigation measures in order to assess the accuracy of the Proponent’s conclusions and provide expert advice on the mitigation measures.</p>	<p>The information provided in the Draft EIS did include a discussion of bird guilds/focal species in the Existing Environment, see Section 9.4.3.2 Migratory Breeding Birds. Section 9.4.6.3.1 in the revised Draft EIS has been updated so that discussion regarding guilds/focal species was carried forward within the effects assessment and specifically within the context of the habitat-based assessment to link habitat related effects to bird species identified in the study areas.</p> <p>For reference it is noted that no focal species/guilds were initially included as part of the VC determination as the approach used in the EA was focused on the key habitat types (i.e., habitat-based assessment) that all migratory bird species, regardless of guild, would be expected to use on a seasonal or year-round basis depending on the species. For example, it is recognized that waterbirds and waterfowl use different habitat types as part of their individual life requisites, in that they all require open water for foraging but may nest in either upland or wet meadow or aquatic habitats. Upland game birds typically use a variety of upland forest ecosite types, whereas migratory songbirds will be found in all ecosite types throughout the RSA. As such, the EA considered the potential effects on all available habitat types used by these key indicator species and appropriate mitigation measures have been proposed and will be implemented which will address all migratory bird species regardless of focal species/guild. Nevertheless, as indicated above, discussion of focal species/guilds has been carried forward more directly into the effects assessment. It is noted that this discussion does not change the mitigation measures proposed, nor the conclusions of the assessment.</p>	<p>Yes</p> <p>Section 9.4.6.3.1</p>
IR-159	-	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	<p>This response has not been accepted.</p> <p>The Proponent’s response indicated that their opinion is that the data presented in the draft EIS is sufficient and that no updates to the draft EIS are needed.</p> <p>However, a single year of baseline data from 2017 is insufficient to assess Project impacts during the follow-up and monitoring program. Although pre-construction surveys prior to clearing can give a very localized picture of the avian community, it does not provide a baseline within the Regional Study Area (RSA) of the bird community and will be</p>	<p>Denison and its SME continue to be of the opinion that the data on which the effects assessment is based are sufficient and fit for purpose as it concerns the EA process. The effects assessment was not based on the 2017 field survey data alone. The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including IK. The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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					<p>avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p> <p><b>Updated Rationale:</b> ECCC recommends that for major projects, a minimum of two years of field surveys should be provided so that temporal variability can be considered when comparing post-construction against baseline records and other available data. More recent data is needed due to landscape changes that may have occurred since 2017 as well as cumulative effects that have occurred in that time. Additionally, if there was an unusually high population density of birds in 2017 due to extraneous circumstances, Project effects may be attributed to a non-existent decline in the population when the discrepancy can be due to natural variability.</p> <p>A more recent baseline will account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p>		<p>of limited use for comparing construction and operational monitoring data to baseline conditions. Use of more recent data or supplemental data can account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures.</p> <p>See follow-up IR-142-159-167-R1.</p>	<p>songbird species were documented. A summary of the total number of individuals observed for each species across all plots is provided in Appendix 9-F of the revised Draft EIS. While the supplemental data do provide further context for the RSA, they would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA.</p> <p>The above does not preclude the implementation of further breeding bird surveys prior to site development and operations. Denison accepts the comment that additional, more recent information, as well as supplemental data as available, and will provide the basis for a more effective review of mitigation and follow-up measures as the Project moves forward. The details of such follow-up monitoring will be defined as part of the further consideration of planning related to follow up programs.</p> <p>For clarification the pre-clearance wildlife sweeps are intended to identify sensitive wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects. The spatial scale of where these pre-construction sweeps would be completed could be expanded to include other areas beyond the Project Area but within the RSA.</p>	
IR-160	-	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p><b>Updated Rationale:</b> Results regarding the effects of the Project, including a discussion on habitat types that will be lost or indirectly impacted during the life of the Project, and a discussion on the overall impact on the avian community including results from baseline studies as well as other supplemental information as per IR-159 are required to assess the validity of the Proponent’s conclusions and should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>	<p>This response has not been accepted.</p> <p>The Proponent did not provide the information requested in IR-159. This information is required to assess the accuracy of the effects assessment.</p>	<p>Table 9.4-15: Summary of Available Habitat for Migratory Songbirds in the Project Study Areas provides an overview of the ecosite types that are present with the Project Area, Wildlife LSA, and Terrestrial RSA that are available for use by all migratory bird species.</p> <p>Direct effects, specifically habitat loss, are calculated as the area of available habitat for migratory songbirds expected to be lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during the Construction Phase. In the Project Area, 113.5 ha or 100% of available habitat is assumed to be removed and will not be available to the migratory songbird species for the duration of the Project. This represents the removal of 4.5% of available habitat within the Wildlife LSA and of 0.6% within the Terrestrial RSA (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds, Direct Habitat Loss, and Habitat Alteration in the Study Areas). Further, revisions included in Figure 9.4-11: Available Habitat for Migratory Songbirds provides further context as to the habitat (ecosite) types within the Project Area that will be affected by Project activities.</p> <p>An additional 28.5% (719.4 ha) of available habitat for migratory songbirds in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance. In the Terrestrial RSA, 3.5% of available habitat may experience habitat alteration (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds,</p>	<p>Yes</p> <p>Revised Draft EIS, Table 9.4-15, Table 9.4-16 and Figure 9.4-11 have been updated</p>



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								Direct Habitat Loss, and Habitat Alteration in the Study Areas). Mitigation measures outlined in Section 9.4.5 are anticipated to reduce the effects of alteration and/or loss of habitat on migratory songbirds, but not eliminate them.	
IR-162	-	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<p><b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.</p> <p>In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow (<i>Hirundo rustica</i>) and Horned Grebe (<i>Podiceps auratus</i>) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”</p> <p>Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.</p> <p><b>Updated Rationale:</b> The management plans for these three species demonstrate the variability in their habitat selection.</p> <p>The Management Plan for the Yellow Rail (<i>Coturnicops noveboracensis</i>) in Canada (Environment Canada, 2013) states “Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert 1999, COSEWIC 2009), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). “</p> <p>The Management Plan for the Rusty blackbird (<i>Euphagus carolinus</i>) in Canada (Environment Canada 2015), states: “Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka et al. 2010a, Matsuoka et al. 2010b, Greenberg et al. 2011).”</p>	<p>1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>3. Assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>See also related IRs: IR-160 and IR-161.</p>	<p>This response has not been accepted.</p> <p>Part 1. Of the IR was accepted, however the answer for part 2. And 3. Of the IR are insufficient in order to understand the Proponent’s rationale for using yellow rail and rusty blackbird to represent horned grebe. These species are all associated with wetlands, however, their specific habitat requirements and wetland types differ.</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures to allow for a more accurate review of the chosen mitigation measures.</p>	<p>As noted elsewhere in the IR responses, per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project’s effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA.</p> <p>Nesting habitat requirements of the horned grebe are similar at a landscape level to those represented by yellow rail and rusty blackbird in that they are typically found associated with northern waterbodies and watercourses with various forms of emergent vegetation. At a site-specific scale, there are subtle differences in nesting habitat requirements, as summarized previously by ECCC in the Context and Rationale response.</p> <p>Given the nesting habitat requirements of these species, the available habitat types within the Denison study areas (e.g., Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area) for use by these species include the following ecosite types: Labrador tea shrubby bog (BS18), graminoid bog (BS 19), graminoid bog/graminoid fen (BS19/BS24), open bog (BS 20), leatherleaf shrubby poor fen (BS22), willow shrubby rich fen (BS23), graminoid fen (BS24), open fen (BS25), and waterbodies and lakes. The habitat-based methodology of the environmental assessment adequately and appropriately addresses effects on these habitat types and the associated migratory bird species that could potentially use these habitat types. Further assessment of each species would not be expected to affect or alter the findings of the habitat-based environmental assessment.</p> <p>The characterization of the alteration and/or habitat loss residual effect considers the Project effects on available habitat used by these three migratory breeding birds within the Wildlife LSA and Terrestrial RSA. As outlined in Table 9.3 18, 0.05% of the Project Area, 11.5% of the Wildlife LSA, and 24.2% of the Terrestrial RSA provide habitat types that are potentially available to these three migratory breeding bird species.</p> <p>Direct habitat loss is calculated as the area of available habitat lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during Construction. In the Project Area, 0.09 ha or 100% of available habitat is assumed to be removed and will not be available to these species for the duration of the Project (Table 9.3 19). This considers that the Project Area has previously been disturbed (i.e., almost 15% of the Project Area is disturbed by anthropogenic activities) and includes only 0.02 ha (0.01%) of landscape covered by waterbodies. This relates to a removal of 0.02% of available habitat within the Wildlife LSA and 0.001% in the Terrestrial RSA.</p> <p>An additional 93.9 ha (17.0%) of available habitat in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance (Table 9.3 19). This area of indirect effect represents 1.0% of available habitat in the Terrestrial RSA that may experience habitat alteration.</p>	No

IR Response Table  
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					<p>The Management Plan for the Horned Grebe (<i>Podiceps auritus</i>), Western population, in Canada (ECCC, 2022) states: “The Horned Grebe breeds in small (generally 0.5 to 2 ha, but ranging from 0.24 to 18.2 ha), shallow (at least 20 cm deep, but on average 40 cm), and usually fishless, perennial wetlands, but they can also nest on larger lakes with shallow edges and sufficient emergent vegetation. Breeding sites usually contain at least 40% open water with beds of emergent vegetation, such as sedges (<i>Carex</i> spp.), rushes (<i>Juncus</i> spp.) and cattails (<i>Typha</i> spp.) (Faaborg 1976, Kuczynski et al. 2012, Routhier 2012, Stedman 2018).”</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures. This will allow for a more accurate review of the chosen mitigation measures.</p>				
IR-164	-	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<p><b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).</p> <p>As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.</p> <p><b>Updated Rationale:</b> A greater level of detail, including a discussion on impacts to different focal species and/or guilds within the Migratory Breeding Birds Valued Component, is required for a more fulsome assessment of effects and identification of mitigation measures. Additionally, mapping detailing important features or habitat types that will be lost due to the Project for different guilds of migratory birds will be required to assess Project effects. This information will be required in order for the Proponent to apply adaptive management, and for ECCC to review the adequacy of these management plans.</p>	<p>1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.</p> <p>2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.</p>	<p>This response has not been accepted.</p> <p>The Proponent did not provide the information requested in the previous Information Requirement. The discussion of impacts to different focal species/guilds within the Migratory Breeding Birds VC and mapping of important features or habitat types lost for these guilds of birds is required for the Proponent to apply adaptive management, and for ECCC to review the adequacy of these management plans.</p>	<p>As noted elsewhere in the IR responses, as per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project’s effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA. Further, the approach used in the EA was focused on the key habitat types that all migratory bird species, regardless of guild, would use. The EA considered the potential effects on all available habitat types used by these key indicator species and appropriate mitigation measures have been proposed and will be implemented which considered all migratory bird species regardless of focal species/guild.</p> <p>Direct habitat loss is based on the removal of habitat (ecosites) during site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during the Construction Phase. In the Project Area, 113.5 ha or 100% of available habitat is assumed to be removed and will not be available to the migratory songbird species for the duration of the Project. This represents the removal of 4.5% of available habitat within the Wildlife LSA and of 0.6% within the Terrestrial RSA (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds, Direct Habitat Loss, and Habitat Alteration in the Study Areas). Further, revisions have been made to Figure 9.4-11 in the revised draft EIS provides further context as to the habitat (ecosite) types within the Project Area that will be affected by Project activities.</p> <p>No important wildlife features were identified within the Project Area during the baseline surveys, although several raptor nests were found within the Wildlife LSA and Terrestrial RSA (see Figure 9.4-6 in the revised draft EIS:). The pre-clearance wildlife sweeps will be completed to identify important wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects.</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Figure 9.4-6 and Figure 9.4-11</p>
IR-165	-	CNSC ECCC	Birds (all species)	Section 9.4.4.2.2	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p>	<p>Please perform an ecological risk assessment with avian receptors</p>	<p>This response has not been accepted.</p>	<p>The CCME livestock guidelines are intended to protect both birds and mammals. As per the CCME “Protocols for Deriving Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water)”, the livestock guidelines are</p>	<p>No</p>

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				Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment  Appendix 10-A (ERA)	<p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>located at the contaminated waste ponds, including:</p> <ol style="list-style-type: none"><li>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</li><li>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</li><li>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>	<p>Please provide an explanation for the appropriateness and conservatism of using the Canadian Council of Ministers of the Environment (CCME) water quality guidelines (WQG) for the protection of livestock for avian receptors, or update the tables provided in Attachment IR-165 using the CCME Water Quality Guidelines for the Protection of Aquatic Life.</p> <p>In order to protect migratory birds from the quality of water in the water management pond, it is recommended that the use of the CCME water quality guidelines for the protection of aquatic life to assess potential impacts to aquatic birds from water management facilities because they are more protective than the CCME water quality guidelines for livestock with lower acceptable levels for contaminants. The water quality guidelines for the protection of aquatic life should also be used to compare predicted contaminant concentrations in water management ponds. The FIRT is unable to verify predicted Project impacts to migratory birds using water management ponds as the selected CCME Water Quality Guidelines for livestock do not accurately reflect the exposure levels and pathways experienced by waterfowl and shorebirds.</p>	<p>based on toxicological datasets and follows toxicological dataset requirements for derivation of the guidelines. Livestock are defined in the Protocol as “any terrestrial animal kept for economic profit or personal use (e.g., cattle, pigs, poultry, waterfowl, etc.)”. The Protocol identifies that aquatic organisms such as fish should be addressed by the water quality guidelines for protection of aquatic life. The IR is asking about avian receptors located at the water management ponds . It is not appropriate to assess avian receptors (which are considered riparian and/or terrestrial) against guidelines for the protection of aquatic life (which are considered to be fish, aquatic plants, aquatic invertebrates, etc.). As identified in the Protocol, the livestock guidelines consider the potential for bioaccumulation in the animal. Additionally, for each species, the livestock guidelines are based on the data from the most sensitive livestock species, and the sensitivities of life stages are considered as well. As such, the livestock guidelines are considered sufficiently protective in the unlikely case that avian birds land on and drink from the process water pond or the effluent monitoring and release ponds. The previous response to IR-165 (Attachment IR-165) outlined the numerous mitigation measures Denison plans to implement to minimize the potential for avian exposure to pond water, as well as additional visual and auditory deterrent techniques. As such, no additional changes are needed to address this IR.</p> <p><b>References:</b></p> <p>CCME. 1999. Protocols for Deriving Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water).</p>	
IR-169	-	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds, Table 9.4-15 and Map 9.4-11	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density</p>	<ol style="list-style-type: none"><li>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</li><li>2. Explain why other habitat types were not considered as available habitat for migratory songbirds.</li></ol>	<p>This response has not been accepted.</p> <p>In their response to IR-169, the Proponent states, “As per accepted methodology, to appropriately focus the habitat- based effects assessment, as per accepted EA methodology, the most frequently used habitat types (i.e., the ecosites experiencing the highest species richness, highest mean number of breeding songbird pairs, and highest species diversity) within the Project study areas were included as “available habitat” as shown in draft EIS Table 9.4-15 Summary of Available Habitat for Migratory Songbirds in the Project Study Areas and Figure 9.4-11 Available Habitat for Migratory Songbirds.”</p> <p>The methodology used to determine available habitat is not appropriate. The methodology used</p>	<p>Updates to Table 9.4-15 and 9.4-16, as well as Figure 9.4-11 have been completed in the revised Draft EIS to include all habitat (ecosite) types. See separate response to IR-169: Available Habitat for Migratory Songbirds. Figure 9.4-11 will be replaced in the EIS with a revised figure that includes all ecosite types.</p> <p>Although of interest, these observations with the RSA would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA.</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Table 9.4-15 and Table 9.4-16, as well as updates to Figure 9.4-11.</p>



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					and diversity, it is expected that all ecosites provide migratory songbird habitat.		<p>by the Proponent would be appropriate for the identification of higher quality habitat, but not as a representation of all available habitat. The methods used to determine available habitat may underrepresent rare ecosite types that were not sampled or were sparsely sampled, including ecosite types that may be important for species at risk. Avian habitat mapping/analyses should be corrected to reflect all available habitat to understand the location of habitat and the presence/absence of species.</p> <p>Repeat the analysis of available habitat to include all habitats used by birds, or</p> <p>a. Change mapping and analyses to indicate that areas identified are ecosites with the highest frequency of use, or</p> <p>b. Change mapping and analyses to show relative habitat use.</p>		
IR-170	-	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p><b>Rationale:</b> Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>This response has not been accepted.</p> <p>Part 1 of the IR was addressed, however, part 2 has not been addressed. ECCC requires this information to properly assess potential the mitigations and adaptive management for Common Nighthawk.</p>	<p>Based on the baseline field survey observations (n=38) for common nighthawk, the majority of observations (n=20) were in association with anthropogenic (disturbed) ecosite types, while the remainder (n=10) were associated with the jack pine-blueberry/black spruce-blueberry/lich (BS3/BS7) ecosite.</p> <p>Updates to Figure 9.4-7, Figure 9.4-12 and Table 9.4-19 of the revised draft EIS have been completed to include all habitat (ecosite) types. See separate response to IR-170: Available Habitat for Common Nighthawk. Figure 9.4-12 in the revised draft EIS has been replaced in the EIS with a revised figure that includes all ecosite types.</p> <p>Mitigation measures that would pertain to common nighthawks are included in Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance, which state that site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, whenever practicable. The nesting season for the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs in Saskatchewan spans a period from March 15 to August 31.</p> <p>Further, in the event site clearing is necessary within this time frame, pre-clearance wildlife sweeps will be completed where common nighthawks are suspected of nesting; if an occupied nest is found, applicable activity restriction guidelines would be implemented (as per SK MOE 2017).</p> <p><b>References:</b></p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Figure 9.4-7, Figure 9.4-12, and Table 9.4-19</p>

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IR-174	-	ECCC	SAR – Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p><b>Rationale:</b> Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<p>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</p> <p>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</p> <p>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</p> <p>4. Describe any pre-construction/pre-clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</p>	<p>This response has not been accepted.</p> <p>Items 1., 3. And 4. of IR-174 are accepted, however, item 2. Of IR-174, which asked for mapping of suitable myotis habitat, was not addressed.</p> <p>Mapping of suitable habitat or results from baseline studies is required to understand Project impacts to Species At Risk (SAR) bat species. This may include providing mapping of bat acoustic results, including locations along with frequency of detections.</p> <p>See also IR-134 and follow-up 134-R1.</p>	<p>Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure 2.9 of Appendix 9-F of the revised draft EIS.</p> <p>The EA used a habitat-based approach to predict the effects of the Project on bat species. Further, in the event that site clearing is necessary, pre-clearance wildlife sweeps will be completed and appropriate mitigation will be developed and implemented.</p> <p>The pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These sweeps are intended to identify sensitive wildlife features (including hibernacula or potential roosting sites for myotis species) that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these surveys, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>
IR-189	-	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<p><b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”</p> <p>In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”</p> <p><b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.</p>	<p>Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70% lichen in the diet.</p> <p>See also related: IR-138.</p>	<p>This response has not been accepted. Please:</p> <p>1. Provide a summary table of all hazard quotients for the second woodland caribou model assuming a diet of 70% lichen, 20% browse, and 10% macrophytes, for completeness.</p> <p>2. Clarify if the Appendix 10-A (ERA) will be updated to include the second woodland caribou model.</p>	<p>1. Summary tables of all hazard quotients (HQs) and the maximum radiological dose for the second woodland caribou model assuming a high lichen diet (HLD) of 70% lichen, 20% browse, and 10% macrophytes (woodland caribou HLD) and the woodland caribou assuming a low lichen diet (LLD) of 50% browse, 20% lichen and 30% macrophytes (woodland caribou LLD) are provided below.</p>	<p>Yes</p> <p>Appendix 10-A, New Section 6.2.1 added</p>

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								<table><tr><th rowspan="2">Biota</th><th rowspan="2">Location</th><th colspan="5">Maximum HQs during Project Phases</th></tr><tr><th>Arsenic</th><th>Cadmium</th><th>Cobalt</th><th>Chromium</th><th>Copper</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.70E-04</td><td>2.79E-04</td><td>1.62E-04</td><td>2.30E-04</td><td>2.74E-02</td></tr><tr><td>Whitefish Lake</td><td>3.85E-04</td><td>2.84E-04</td><td>1.66E-04</td><td>2.33E-04</td><td>2.83E-02</td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.90E-04</td><td>3.28E-04</td><td>2.00E-04</td><td>3.72E-04</td><td>2.15E-02</td></tr><tr><td>Whitefish Lake</td><td>4.06E-04</td><td>3.33E-04</td><td>2.04E-04</td><td>3.76E-04</td><td>2.29E-02</td></tr><tr><th>Biota</th><th>Location</th><th>Molybdenum</th><th>Selenium</th><th>Uranium</th><th>Vanadium</th><th>Zinc</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.30E-04</td><td>4.63E-03</td><td>3.10E-04</td><td>7.79E-03</td><td>2.80E-03</td></tr><tr><td>Whitefish Lake</td><td>2.54E-03</td><td>7.65E-03</td><td>9.19E-03</td><td>8.98E-03</td><td>2.82E-03</td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>4.50E-04</td><td>6.41E-03</td><td>4.20E-04</td><td>9.97E-03</td><td>3.53E-03</td></tr><tr><td>Whitefish Lake</td><td>2.43E-03</td><td>8.40E-03</td><td>1.66E-02</td><td>1.10E-02</td><td>3.54E-03</td></tr></table> <table><tr><th rowspan="2">Biota</th><th rowspan="2">Location</th><th colspan="7">Maximum Radiological Dose During Project Phases (mGy/d)</th></tr><tr><th>Uranium-238</th><th>Uranium-234</th><th>Thorium-230</th><th>Radium-226</th><th>Lead-210</th><th>Polonium-210</th><th>Total Dose</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.34E-06</td><td>3.81E-06</td><td>6.25E-06</td><td>6.81E-04</td><td>1.20E-05</td><td>6.24E-03</td><td><b>6.95E-03</b></td></tr><tr><td>Whitefish Lake</td><td>8.19E-05</td><td>9.32E-05</td><td>7.30E-06</td><td>6.86E-04</td><td>1.20E-05</td><td>6.26E-03</td><td><b>7.14E-03</b></td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.61E-06</td><td>4.12E-06</td><td>4.44E-06</td><td>6.05E-04</td><td>1.99E-05</td><td>1.09E-02</td><td><b>1.15E-02</b></td></tr><tr><td>Whitefish Lake</td><td>1.43E-04</td><td>1.62E-04</td><td>4.74E-06</td><td>6.09E-04</td><td>1.99E-05</td><td>1.09E-02</td><td><b>1.18E-02</b></td></tr></table> <p>Compared with the woodland caribou LLD, the predicted maximum HQs for the woodland caribou HLD generally increased by 5 to 81% with the exception of copper and molybdenum where the HQ decreased by 4 to 22% due to copper and molybdenum concentrations in lichen being lower than in browse. However, all HQs for woodland caribou HLD are below the benchmark of 1 for all non-radiological COPCs. The predicted maximum total radiological dose for the woodland caribou HLD increased by 65% compared to that for the woodland caribou LLD. However, the total dose for woodland caribou HLD is still far below the radiation dose benchmark of 2.4 mGy/d for terrestrial biota, as recommended in CSA N288.6-22.</p> <p>2. Appendix 10-A (ERA) was updated to include the second woodland caribou model as part of the sensitivity analysis presented in Section 6.2, “Section 6.2.1 Woodland Caribou Diet”. Additional text in this updated section is as follows: “The food source for the woodland caribou in the winter is terrestrial or arboreal lichens; terrestrial and aquatic vegetation are also food sources in the remainder of the year. For the ecological risk assessment, a low lichen diet (LLD) comprised of 50% browse, 20% lichen and 30% macrophytes was assumed to represent the year-round diet for woodland caribou (woodland caribou LLD). Research has noted that arboreal lichen could make up 70% of the caribou’s winter diet (MNRW, 2006). To make sure that woodland caribou who may have higher consumption rates of lichen remains protected, a high lichen diet (HLD) comprised of 70% lichen, 20% browse and 10% macrophytes was assumed as a sensitivity scenario for woodland caribou who may have higher consumption rates of lichen (woodland caribou HLD).”</p>	Biota	Location	Maximum HQs during Project Phases					Arsenic	Cadmium	Cobalt	Chromium	Copper	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.70E-04	2.79E-04	1.62E-04	2.30E-04	2.74E-02	Whitefish Lake	3.85E-04	2.84E-04	1.66E-04	2.33E-04	2.83E-02	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	3.90E-04	3.28E-04	2.00E-04	3.72E-04	2.15E-02	Whitefish Lake	4.06E-04	3.33E-04	2.04E-04	3.76E-04	2.29E-02	Biota	Location	Molybdenum	Selenium	Uranium	Vanadium	Zinc	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.30E-04	4.63E-03	3.10E-04	7.79E-03	2.80E-03	Whitefish Lake	2.54E-03	7.65E-03	9.19E-03	8.98E-03	2.82E-03	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	4.50E-04	6.41E-03	4.20E-04	9.97E-03	3.53E-03	Whitefish Lake	2.43E-03	8.40E-03	1.66E-02	1.10E-02	3.54E-03	Biota	Location	Maximum Radiological Dose During Project Phases (mGy/d)							Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-210	Polonium-210	Total Dose	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.34E-06	3.81E-06	6.25E-06	6.81E-04	1.20E-05	6.24E-03	<b>6.95E-03</b>	Whitefish Lake	8.19E-05	9.32E-05	7.30E-06	6.86E-04	1.20E-05	6.26E-03	<b>7.14E-03</b>	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	3.61E-06	4.12E-06	4.44E-06	6.05E-04	1.99E-05	1.09E-02	<b>1.15E-02</b>	Whitefish Lake	1.43E-04	1.62E-04	4.74E-06	6.09E-04	1.99E-05	1.09E-02	<b>1.18E-02</b>	
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								For reference, the modelled results (shown above) have been included as Table 6-1 and Table 6-2 in Section 6.2.1.  <b>References:</b> Ministry of Natural Resources and Wildlife (MNRW) Quebec Wildlife Sector, 2006. Gaspésie Woodland Caribou Recovery Plan (2002-2012). <a href="https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_gaspesie_woodland_caribou_final_1007_e.pdf">https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_gaspesie_woodland_caribou_final_1007_e.pdf</a>	
IR-190	-	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)  Appendix 6, Table 5 (p. 16)	NO2 criteria is not being consistently compared.  <b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.  Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.  <b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.	1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.	This response has not been accepted, as the rationale for not applying the CAAQS in the assessment is not accurate.  Health Canada acknowledges the commitment to use the 2025 CAAQS for NO <sub>2</sub> in future mitigation and follow-up plans. However, the response to IR-190 did not compare the predicted maximum concentrations to the most protective applicable air quality standards available (i.e., CAAQS), and included the following rationale:  <i>The CAAQS are applicable to measured ambient air concentrations over a three-year period and are not applicable to modelled results from a single facility; and, Use of the CAAQCs would require a three-year site specific data set.</i>  The statement is incorrect. The CAAQS are national air quality standards, but they are not restricted to applications within the context of the Air Quality Management System (AQMS). The comparison with CAAQS may be considered in determining the nature and severity of the Project’s impact on air quality levels and the resulting mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS.  The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, Health Canada suggests using model results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The modelling results should be able to indicate the frequency of CAAQS exceedances, which can	Table 3-9 and Table 3-10 in the ERA (Appendix 10-A) have been updated to use the available Federal CAAQS for NO <sub>2</sub> and SO <sub>2</sub> as the screening criteria instead of the Provincial SAAQS. Accompanying text was also updated to acknowledge exceedances of the NO <sub>2</sub> 1-hour CAAQS during all project phases instead of just during decommissioning. Additional text was added to Section 3.2.1.3.1 to acknowledge the number of hours in a year where exceedances of the CAAQS may occur.  For reference purposes the following further information is noted. While Denison is committed to applying the CAAQS in future monitoring and mitigation programs, it is important to note that the CAAQS are not legally binding or enforceable standards under federal law. The AQMS (Air Quality Management System) that underpins CAAQS is not a regulation, but merely a cooperative arrangement between the federal and provincial governments that informs decision-making at the provincial level. As such, the current provincial air quality criteria remain the only legally enforceable standards that are applicable to the Project, until such time that the province chooses to fully adopt the CAAQS.	Yes  Appendix 10-A Table 3-9, Table 3-10, Section 3.2.1.3.1 "Nitrogen Dioxide"

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>be used in the discussion as to whether any anticipated human health impacts are anticipated.</p> <p>Please see the Advice to the Proponent table for further discussion on the use of CAAQS (AD-69), which also notes that, while being more conservative than the NAAQO, Saskatchewan &amp; Alberta’s screening value do not reflect the most recent science, which indicates that there is no apparent threshold for NO<sub>2</sub>, meaning that health effects may occur at any level of exposure.</p> <p>See also follow-up IR 190-R1.</p>		
IR-190	IR-190-R1	HC	Change to an environmental component due to hazardous contaminants	<p>Section 6.1.3.2.2 (p. 6-21) Table 6.1-8 (p. 6-22); and, Table 6.1-9 (p. 6-22)</p> <p>Section 6.1.8 (p.6-44)</p> <p>IR-190 Response from Denison</p>	<p>Limitations with the proposed use of passive NO<sub>2</sub> monitoring would not allow comparison of measurement results to the 2025 CAAQS for 1-hour NO<sub>2</sub>.</p> <p><b>Context:</b> In response to IR-190, there was agreement to using the 2025 CAAQS for NO<sub>2</sub> in future mitigation and follow-up plans, which Health Canada supports. However, the proposed air quality monitoring and follow-up plans (Chapter 6.1.8) anticipate continued use passive NO<sub>2</sub> samplers, which do not measure hourly (1-hour) concentrations.</p> <p>Section 6.1.3.2.2 indicates that the assessment makes use of passive samplers to measure NO<sub>2</sub> at two sampling locations. The results from those samplers are presented in tables 6.1-8 and 6.1-9, for a ~30-day sampling period (i.e., a total concentrations for NO<sub>2</sub> in ambient air over ~30 days).</p> <p>While passive samplers provide measurement data for comparison to the annual 2025 CAAQS for NO<sub>2</sub>, measurement data for the 1-hour NO<sub>2</sub> standard commonly requires use of an active sampler.</p> <p><b>Rationale:</b> Health Canada encourages the monitoring of air contaminants when exceedances or near-exceedances of air quality criteria, standards and/or guidance values are predicted or reported, to:</p> <ul style="list-style-type: none"><li>• determine the accuracy of predictions;</li><li>• help verify whether standards are being met; and,</li><li>• assist with implementing or modifying mitigation measures.</li></ul>	<p>1.Provide additional details on proposed air quality monitoring for NO<sub>2</sub> that will allow for comparisons to both the 1-hour and annual 2025 CAAQS and how that will be used to support mitigation and follow-up plans. Distinguish between comparisons with measured and modelled monitoring data, as well as use of passive and active samplers.</p> <p>2. If multiple approaches will be used to monitor NO<sub>2</sub> (e.g., use of passive and/or active samplers, modifications due to differences between project phases, etc.), describe their intended contribution to the monitoring objectives and outcomes (e.g., determine the accuracy of predictions; assist with implementing or modifying mitigation measures).</p>		<p>1. Air quality monitoring for NO<sub>2</sub> is proposed as monthly collection using passive samplers, during all Project phases. The objective of the program is to demonstrate compliance with provincial and federal ambient air quality standards including the CAAQSs. Monitoring data will also be compared against the modelled data provided in the EIS. Passive samplers will allow for direct comparison against the annual 2025 CAAQSs. To compare against the 1-hour CAAQSs Denison will use a commonly utilized averaging equation (such as the Ontario MECP averaging equation <a href="#">Air Dispersion Modelling Guideline for Ontario</a>) to allow for conversion from the monitoring period to a 1-hour averaging period. Denison acknowledges that short-term peaks may not be captured through the passive sampling approach; however, Denison plans to first utilize passive sampling during site preparation and will consider based on an adaptive management process whether there is a need to switch to continuous monitoring.</p> <p>2. See response to #1. Denison intends to use passive samplers for NO<sub>2</sub> monitoring.</p> <p><b>References:</b></p> <p>Ontario MECP. 2017. AIR DISPERSION MODELLING GUIDELINE FOR ONTARIO [GUIDELINE A-11] Version 3.0. <a href="#">Air Dispersion Modelling Guideline for Ontario</a>.</p>	No
IR-193	-	ECCC	Change to an environmental component due	Appendix 10-A (ERA), Section 3.1.1.2	<b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all	1. Provide acute and chronic water quality thresholds for all required	This response has not been accepted, as the Proponent has not included un-ionized ammonia, mercury and phosphorous in Table 3-1 in Appendix	1.) The ERA in Appendix 10-A is focused on chronic long-term exposure due to routine effluent release during the Project Phases. As such the screening criteria used were chronic criteria. It is acknowledged that effluent quality will not be allowed to exceed	Yes



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			to hazardous contaminants	Section 8.2.4.2.3	<p>COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>10-A or provided acute and chronic water quality thresholds for all COPCs, including those with monitoring required under the MDMER, in Table 3-1 in Appendix 10-A (ERA). Water quality thresholds derived from receiving environment baseline parameters have not been consistently applied throughout the draft EIS. It is unclear from the current information provided if predicted effluent concentrations exceed acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end of pipe.</p> <p>The Proponent should:</p> <p>1. Update Table 3-1 in Appendix 10-A to include un-ionized ammonia, mercury and phosphorous. Update the risk assessment to incorporate these parameters as needed.</p> <p>2. Update Table 3-1 in Appendix 10-A and Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS to include both acute and chronic water quality thresholds derived from receiving environment baseline parameters and in accordance with IR-114.</p>	<p>acute guidelines. Acute guidelines are now provided in the updated Table 8.2-10 as presented in Attachment IR-114 and in the Final Draft EIS. This table (Table 8.2-10) also includes guidelines for unionized ammonia, phosphorous and mercury. Phosphorus will be present in the effluent at low levels and the near-field water quality model indicates that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment. Mercury is not identified as present in the effluent (see response to IR-100). No updates to Table 3-1 in Appendix 10-A are needed.</p> <p>2.) Tables 8.2-8 and 8.2-10 have been updated as requested. Please refer to Attachment IR-114 and Attachment IR-115 and Section 8.2.4.2.3 of the updated EIS. No updates to Table 3-1 in Appendix 10-A are needed. The guidelines were derived using baseline environmental conditions such as baseline hardness, DOC, pH, etc.</p>	Revised Draft EIS, Section 8, Tables 8.2-8 and 8.2-10
IR-194	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li><li>Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</li></ol> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from</p>	<p>1. As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</p> <p>2. Provide the information on predicted maximum receiving environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</p> <p>3. Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</p> <p>4. Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment</p>	<p>This response has not been accepted, as the Proponent has not updated the ERA to assess elevated baseline concentrations to delineate potential Project effects from background conditions.</p> <p>The Proponent’s response states: “The ERA followed the guidance in CSA N288.6-22 which does not require COPCs with elevated baseline concentrations to be considered COPCs for further quantitative assessment in the ERA. Clause 6.2.5.9 indicates that constituents with naturally elevated concentrations should be excluded from further consideration as a COPC.”</p> <p>Section 6.2.5.9 of N288.6-22 is specific to the Human Health Risk Assessment, and this statement does not apply to the Ecological Risk Assessment (EcoRA). Section 7 of N288.6-22 is specific to the development of the EcoRA methodology, and in Section 7.2.5.2.6 of N288.6-22 it states: “In addition to screening of effluent</p>	<p>1. See response to IR-114. Additional information has been provided for COPCs with requirement for monitoring under Schedule 5 of MDMER. Note that predicted effluent quality for all Schedule 5 parameters, with the exception of mercury, nitrate, and phosphorous were provided in Table 3-1 of the ERA in Appendix 10-A (these constituents were not identified as COPCs in the ERA).</p> <p>2. Information on predicted maximum receiving environment surface water concentrations for COPCs with required monitoring under the MDMER is in the updated EIS (Tables 8.2-10 and 8.2-13 and Appendix 8E. Please refer to Attachment IR-115.</p> <p>3. This is not applicable. No additional COPCs need to be carried forward in the ERA as the concentrations of COPCs in effluent do not exceed water quality guidelines (see Table 3-1 in the ERA in Appendix 10-A). All constituents identified in Schedule 4 and Schedule 5 were considered in the ERA screening with the exception of cyanide and mercury which are not identified as present in the effluent (see IR-100 regarding mercury). Phosphorus and nitrate will be present in the effluent at low levels and estimates of these constituents via the near-field water quality model indicate that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment (see Tables 8.2-10 and 8.2-13 of Section 8).</p> <p>4. The CSA guidance referenced by the reviewer in this IR (Section 7.2.5.2.6 of N288.6-22) is for exposure situations and not for baseline. The text in Section 7.2.5.2.6 of N288.6-22</p>	Yes  Appendix 8E, Table 8.2-9, Table 8.2-10

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					effluent to the receiving environment and aquatic receptors based on the current information provided.	quality concentrations in the receiving environment.	<p>and emissions data, concentrations measured in environmental media should be considered, as determined in the EMPs. Maximum concentrations measured in soil, receiving water, or sediment should be compared to screening criteria.” Therefore, COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment should be assessed in the ERA.</p> <p>Additionally, in Section 7.2.5.4.2 of N288.6-22 it is stated: “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit.” Therefore, if baseline exceedances occur in one media types, they should be carried forward for all media types in the ERA.</p> <p>It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided. Negative effects to biota from naturally elevated background concentrations of COPCs can be exacerbated by additional input of COPCs from Project effluent into the receiving environment. It is important to characterize and assess those potential effects and delineate potential Project effects from background conditions.</p> <p>Please:</p> <p>1. Update Table 3-1 in Appendix 10-A to include un-ionized ammonia, mercury and phosphorous. Update the risk assessment to incorporate these parameters as needed.</p> <p>2. Update the ERA to assess the risk of COPCs that had elevated baseline water quality concentrations in the receiving environment: aluminum, iron, and lead.</p>	<p>is saying that measured concentrations in environmental media should be screened in addition to effluent and emissions data. This is referring to measured concentrations in the environment since they will reflect the impact from releases from the facility. This is not referring to baseline concentrations without influence from effluent. Section 7.2.5.3.1 and 7.2.5.3.2 of N288.6-22 recommend that the most restrictive of applicable federal or provincial guidelines be used as the screening criteria, and screening criteria should not be below a reasonable upper end of background.</p> <p>Additionally, the reviewer points to Section 7.2.5.4.2 to indicate that if a COPC exceeds screening criterion in one medium it should be assessed for all media that are likely to contribute to exposure. This guidance was followed in the ERA – all COPCs identified in water were also assessed in sediment and vice versa, as well as additional food chain pathways. Again, the intent of this clause is for exposure situations and not specific to baseline conditions.</p> <p>The ERA did consider in the screening assessment constituents that had elevated baseline that were also present in the effluent. Aluminum, cadmium, iron, and lead exceeded water quality guidelines in baseline and were considered in the ERA screening; however, only cadmium was identified for further assessment since its concentration in the effluent exceeded its water quality guideline.</p> <p>Table 8.2-4 in the EIS provides a summary of baseline water quality exceedances. Note that the only iron exceedance was in SA-1 which is downstream of McGowan Lake (see Figure 8.2-4) and outside of the direct influence on the Project. Section 8.4.3.2.3 of the EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines.</p> <p>The screening followed the process identified in Figure 3-1 of the ERA (Appendix 10-A) as well as N288.6-22 guidance. No changes to the ERA or EIS are warranted to address Part 4 of this IR.</p>	



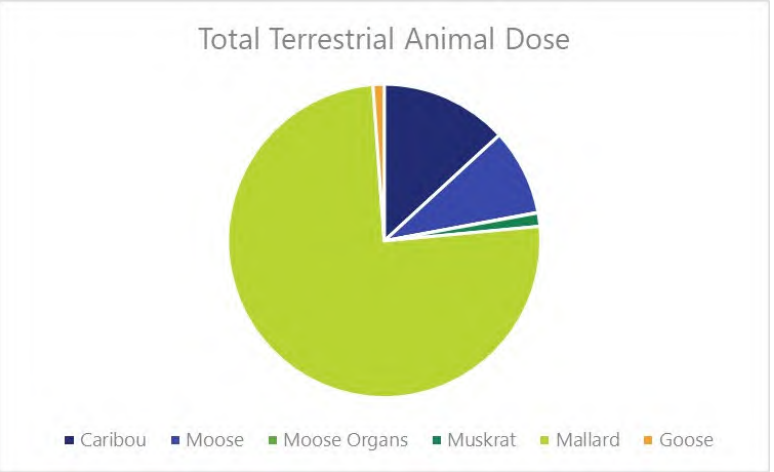
Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																										
IR-195	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>	<p>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</p> <p>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</p> <p>3. Update ERA figures and conclusions as needed.</p>	<p>This response has not been accepted. Although the Proponent addressed items 2 and 3, further information on maximum predicted concentrations of COPCs in water quality during various Project stages and how hydrological processes affect COPC concentrations from Project effluent is required based on the information provided in the Proponent’s response to validate the Proponent’s predictions.</p> <p>The Proponent has provided updated tables with modelled maximum COPC concentrations in water and sediment by individual Project phase but did not include the environmental quality guidelines for COPCs which were included in the original tables. The Proponent’s response confirmed the predicted effluent quality during the decommissioning phase. In their response the Proponent states: “Therefore, the modelled maximum COPC concentrations in water are the same for operations and decommissioning phases (which is considered conservative), the same peak concentrations appear annually due to the variation of the monthly local inflow. Since COPCs are accumulated in sediment, the modelled maximum COPC concentrations in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning in Figure 3-3.”</p> <p>The figures provided in the response support this statement, however, maximum predicted concentrations of COPCs in receiving water quality occur within a year of operations commencing. COPC concentrations in water also return to baseline within one year after decommissioning is complete. However, maximum predicted concentrations of COPCs in sediment quality do not occur until the end of the Project lifecycle due to accumulation over time, which is expected.</p> <p><b>Rationale:</b> It is unclear how maximum predicted concentrations of COPCs in water quality occur so quickly and decrease so quickly after Project operations commencement and decommissioning respectively. Further information on the</p>	<p>The maximum predicted concentrations of COPCs in water are seen over a relatively short period on the scale shown in the relevant figures as noted by the reviewer due to the short water retention time of the modelled lakes. As shown in the table below, the modelled lakes (excluding the reference lake) are small in size, with lake areas ranging from 0.10 to 1.49 km² and with average depths ranging from 1.0 to 5.5 m. Based on the area, depth and outflow of the modelled exposure lakes, the calculated retention times of the lakes ranged from 0.88 to 51.61 days. These short retention times explain the relatively rapid increase and subsequent decrease in concentrations of COPCs in the lakes during periods of effluent discharge and periods where there is no effluent discharge, respectively.</p> <table><tr><th>Waterbody</th><th>Average Depth (m)</th><th>Area (km²)</th><th>Average Outflow (L/s)</th><th>Retention Time (day)</th><th>Retention Time (month)</th></tr><tr><td>Reference Kratchkowsky Lake</td><td>2.9</td><td>0.80</td><td>331.2</td><td>80.66</td><td>2.69</td></tr><tr><td>Whitefish Lake North</td><td>1.6</td><td>0.26</td><td>1379.3</td><td>3.53</td><td>0.12</td></tr><tr><td>Whitefish Lake Middle</td><td>1.1</td><td>0.10</td><td>1398.5</td><td>0.88</td><td>0.03</td></tr><tr><td>Whitefish Lake South</td><td>1.0</td><td>0.32</td><td>1414.3</td><td>2.65</td><td>0.09</td></tr><tr><td>McGowan Lake</td><td>5.5</td><td>1.49</td><td>1832.3</td><td>51.61</td><td>1.72</td></tr><tr><td>Russell Lake Inlet</td><td>3.0</td><td>0.75</td><td>2390.3</td><td>10.92</td><td>0.36</td></tr></table> <p>Updated information has been added to Appendix 10-A, including Table 3-3, Table 3-5, Figure 3-2 and Figure 3-3, as well as Table 3-1 of Appendix A of Appendix 10-A.</p> <p>The revised text in Section 3.1.2.1 (Appendix 10-A) is as follows: “The modelled maximum COPC concentrations in water during decommissioning phase were the same as that during operations (Table 3 3). The peak concentrations of arsenic and polonium-210 appear annually in June, and the peak concentrations of all other COPCs appear annually in March due to the variation of the monthly local inflow during the effluent discharge period (Figure 3 2). It is noted that the maximum predicted concentrations of COPCs in water occurred over short periods of effluent discharge and subsequently decrease relatively quickly during periods when there is no effluent discharge. This is related to the short retention time of the modelled lakes. As shown in Table 3-1 in Appendix A, the modelled lakes (excluding the reference lake) are small, with lake areas ranging from 0.10 to 1.49 km² and with average depths ranging from 1.0 to 5.5 m. Based on the area, depth and outflow, the calculated retention times ranged from 0.88 to 51.61 days. As noted, the short retention times result in rapid increases and decreases of concentrations of COPCs in response to effluent discharge and then its cessation. Since COPCs accumulate in sediment, the peak concentrations of all COPCs in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning phase, as shown in Figure 3 3.”</p>	Waterbody	Average Depth (m)	Area (km²)	Average Outflow (L/s)	Retention Time (day)	Retention Time (month)	Reference Kratchkowsky Lake	2.9	0.80	331.2	80.66	2.69	Whitefish Lake North	1.6	0.26	1379.3	3.53	0.12	Whitefish Lake Middle	1.1	0.10	1398.5	0.88	0.03	Whitefish Lake South	1.0	0.32	1414.3	2.65	0.09	McGowan Lake	5.5	1.49	1832.3	51.61	1.72	Russell Lake Inlet	3.0	0.75	2390.3	10.92	0.36	<p>Yes</p> <p>Appendix 10-A, Section 3.1.2.1, Table 3-3, Figure 3-2, Figure 3-3</p> <p>Appendix 10-A, Section 3.1.2.2, Table 3-5</p> <p>Appendix 10-A, Section 3.1.2.3</p> <p>Appendix 10-A, Appendix A, Table 3-1</p>
Waterbody	Average Depth (m)	Area (km²)	Average Outflow (L/s)	Retention Time (day)	Retention Time (month)																																														
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							hydrological processes that facilitate this is necessary to validate predictions.  Provide further information regarding maximum predicted concentrations of COPCs in water quality during various Project stages and how hydrological processes (i.e. flows, retention time, etc.) facilitate the fast increase and decrease of COPC concentrations from Project effluent. This information should be included in Appendix 10-A, Section 3.1.2.1.	The revised text in Section 3.1.2.3 (Appendix 10-A) is as follows: “The maximum vanadium concentration in sediment is 37.2 mg/kg dw in Whitefish Lake (LA-5), which exceeds its sediment quality guideline of 35.1 mg/kg dw by approximately 6% (REF value from Burnett-Seidel and Liber, 2013). Therefore, vanadium was identified as a COPC in sediment.”	
IR-197	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.  <b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	This response has not been accepted, as the Proponent has not provided a valid explanation for not incorporating atmospheric deposition from Project-related air emissions into water quality modelling and assessing Project-related effects to aquatic receptors from this pathway.  In the Proponent’s response it is stated: “Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019).” However, both of these documents explicitly apply to human dose rate calculations and models for human end-points from radiation effects of radionuclides; they do not cover non- human biota nor non-radionuclide COPCs or chemical toxicity of radionuclides. Atmospheric deposition rates to large water bodies may be negligible for dose rates to human biota as they are not likely to be directly impacted or in the near-field vicinity. However, this may not be the case for aquatic receptors directly within the receiving environment.  A sufficient explanation for exclusion of atmospheric deposition of COPCs to surface water from Project activities has not been provided from an ecological perspective. This Project effect pathway may have effects on the aquatic receiving environment through accumulation of COPCs over	Atmospheric deposition to large waterbodies is explicitly excluded in the CSA N288.1 model. This assumption is valid for both human and ecological assessments. The N288.1 standard indicates in Section 1.5 of the Scope that the models can be used to support dose calculations for non-human biota.  The N288.1 rationale is that atmospheric input to water is very small relative to direct input to water. This conclusion applies to assessment for both human and ecological assessments, as well as radionuclides and non-radionuclides. The rationale in the IR response applies. However, calculations have been done for the Project to confirm the expectation that atmospheric input to water will be negligible.  The following calculation shows for the Project that the atmospheric input of uranium to Whitefish Lake (LA-5) is very small relative to the direct input to water via effluent.	Yes  Appendix 10-A, Appendix A, Section 2.2

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							<p>time or deposition of contaminants that are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions. ECCC requires atmospheric deposition from Project-related emissions to be incorporated into water quality modelling and that the Proponent assess any Project-related effects to aquatic receptors from this pathway in order to assess potential effects on the aquatic receiving environment.</p> <p>Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project-related effects to aquatic receptors from this pathway. Review CSA N288.6, otherwise, provide valid rationale from an ecological perspective for the elimination of this potential Project effects pathway.</p>	<table><tr><td colspan="4">P01=X1/X0(a)</td></tr><tr><td>X1</td><td>Air Concentration (LA-5) U</td><td>3.45E-05 mg/m<sup>3</sup></td><td>EIS Appendix 6</td></tr><tr><td>X0(a)</td><td>Atmospheric Release Rate</td><td>6.83E+01 mg/s</td><td>EIS Appendix 6</td></tr><tr><td>P01</td><td>Transfer source to air</td><td>5.05E-07 s/m<sup>3</sup></td><td></td></tr><tr><td colspan="4">P02=X2/X0(w)</td></tr><tr><td>X2</td><td>Water Concentration (LA-5) U</td><td>5.74E-04 mg/L</td><td>From IMPACT Model</td></tr><tr><td>X0(w)</td><td>Effluent Release Rate (U)</td><td>5.78E-01 mg/s</td><td>U Effluent Concentration x Effluent Flowrate</td></tr><tr><td>P02</td><td>Transfer source to water</td><td>9.93E-04 s/L</td><td></td></tr><tr><td colspan="4">P12 = Vg (A/V)10<sup>-3</sup>/(λs+λw)</td></tr><tr><td>Vg</td><td>Atmospheric deposition velocity</td><td>0.003 m/s</td><td>N288.1</td></tr><tr><td>Area</td><td>LA-5</td><td>96940 m<sup>2</sup></td><td>site-specific (Appendix A)</td></tr><tr><td>Volume</td><td>LA-5</td><td>106634 m</td><td>site-specific (Appendix A) (Area*Depth)</td></tr><tr><td colspan="4">λs = DR • ρ • Kd • (A/V)</td></tr><tr><td>DR</td><td>Sediment deposition rate</td><td>6.34E-08 mm/s</td><td>Assumption (2mm/yr)</td></tr><tr><td>ρ</td><td>sediment dry bulk density</td><td>0.11 kg/L</td><td>N288.1</td></tr><tr><td>Kd</td><td>partition coefficient</td><td>20000 L/kg</td><td>N288.1</td></tr><tr><td>λs</td><td>sedimentation loss rate constant</td><td>1.27E-07 s<sup>-1</sup></td><td></td></tr><tr><td colspan="4">λw = U • CA/V = Q/V</td></tr><tr><td>Q</td><td>Inflow into LA-5</td><td>1.379 m<sup>3</sup>/s</td><td>site-specific (Appendix A)</td></tr><tr><td>V</td><td>Volume of LA-5</td><td>106634 m<sup>3</sup></td><td>Area*Depth</td></tr><tr><td>λw</td><td>loss via water flow rate constant</td><td>1.29E-05 s<sup>-1</sup></td><td></td></tr><tr><td colspan="4">P12 = Vg (A/V)10<sup>-3</sup>/(λs+λw)</td></tr><tr><td colspan="2">Water conc'n from air = X0(a)*P01*P12</td><td>7.20E-06 mg/L</td><td></td></tr><tr><td colspan="2">Water conc'n from effluent = X0(w)*P02</td><td>5.74E-04 mg/L</td><td></td></tr><tr><td colspan="2">% Contribution to Water from Air</td><td>1%</td><td></td></tr></table> <p>The following statement has been added to Section 2.2 in Appendix A to Appendix 10-A</p> <p>"Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."</p> <p>The calculation has also been added to Section 2.2 of Appendix A for reference.</p> <p><b>References:</b></p> <p>Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I</p>	P01=X1/X0(a)				X1	Air Concentration (LA-5) U	3.45E-05 mg/m <sup>3</sup>	EIS Appendix 6	X0(a)	Atmospheric Release Rate	6.83E+01 mg/s	EIS Appendix 6	P01	Transfer source to air	5.05E-07 s/m <sup>3</sup>		P02=X2/X0(w)				X2	Water Concentration (LA-5) U	5.74E-04 mg/L	From IMPACT Model	X0(w)	Effluent Release Rate (U)	5.78E-01 mg/s	U Effluent Concentration x Effluent Flowrate	P02	Transfer source to water	9.93E-04 s/L		P12 = Vg (A/V)10 <sup>-3</sup> /(λs+λw)				Vg	Atmospheric deposition velocity	0.003 m/s	N288.1	Area	LA-5	96940 m <sup>2</sup>	site-specific (Appendix A)	Volume	LA-5	106634 m	site-specific (Appendix A) (Area*Depth)	λs = DR • ρ • Kd • (A/V)				DR	Sediment deposition rate	6.34E-08 mm/s	Assumption (2mm/yr)	ρ	sediment dry bulk density	0.11 kg/L	N288.1	Kd	partition coefficient	20000 L/kg	N288.1	λs	sedimentation loss rate constant	1.27E-07 s <sup>-1</sup>		λw = U • CA/V = Q/V				Q	Inflow into LA-5	1.379 m <sup>3</sup> /s	site-specific (Appendix A)	V	Volume of LA-5	106634 m <sup>3</sup>	Area*Depth	λw	loss via water flow rate constant	1.29E-05 s <sup>-1</sup>		P12 = Vg (A/V)10 <sup>-3</sup> /(λs+λw)				Water conc'n from air = X0(a)*P01*P12		7.20E-06 mg/L		Water conc'n from effluent = X0(w)*P02		5.74E-04 mg/L		% Contribution to Water from Air		1%		
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IR-198	-	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.  Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the Project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of	This response has not been accepted, as the assessment should consider organ meats from different animals if these are consumed by local population, and estimated consumption rates should be confirmed.  The response to IR-198 presents the estimated radionuclide concentrations in moose and caribou organ meats (as mass concentrations), where the	Consistent with the requirements in CSA N288.6:22, the ERA undergoes a periodic review process every 5 years to ensure the assumptions are still valid and to improve modelling and reduce uncertainty. Based on current understanding of the ERFN diet, there is no need to include caribou organs as a separate organ. As indicated in the original IR Response in Attachment IR-198 (See Annex 1), approximately 80% of the organs consumed by ERFN is moose organs, and 20% is caribou organs. Note, that there was a units error in IR-198 Table 3: Estimated Tissue Concentrations of Moose Organs and	No																																																																																																				

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					<p>as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.</p> <p><b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.</p>	<p>animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.</p>	<p>concentrations of certain radionuclides (U-238, U-234, Pb-210 and Po-210) in caribou organ meat are indeed estimated to be higher than in moose organ meat. However, the response also indicates that moose organ meat consumption represents the large majority of organ meat consumption (~80%), roughly offsetting the higher concentrations in caribou organs. When calculating tissue concentrations of radionuclides, the higher consumption rate of moose organ meat in comparison to caribou organ meat appears insufficient to compensate for the higher estimated concentrations of U-238, U-234, Pb-210 and Po-210 in caribou meat and as a result, exposures to these radionuclides from organ meat consumption may be underestimated. Health Canada recommends assessing moose and caribou organ meat separately (rather than using moose as a proxy) to confirm that COPCs including radionuclides from organ meat consumption have not been underestimated.</p> <p>IR-198 also includes additional information on organ meat consumption rates for the La Plonge and Patuanak communities to estimate dietary exposure via organ consumption, but it is unclear how these relate to the values used in the Draft EIS and ERA (Appendix 10-A). Specifically, Page 4.16 of Appendix 10-A: <i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) states:</p> <p><i>“As a conservative approach for this assessment, the Patuanak diet was selected to represent the average traditional foods consumer in the HHRA”</i></p> <p>However, Table 4-4 (p. 4.19) reports an annual organ meat consumption rate of 4.49 kg for the adult average traditional food consumer while the reported daily Patuanak consumption rate for organ meat is 16.2 g (Table 4-3; p.4.17), which equates to an annual rate of 5.91 kg. Health Canada recommends a rationale be provided for this discrepancy, and if necessary, the correct estimated rate and associated assessment calculations.</p> <p>See also follow-up IR-198-R1.</p>	<p>Woodland Caribou Organs at McGowan Lake. The unit is Bq/kg fw, not mg/kg fw as shown in the table. The numbers in IR-198 Table 3 are correct for Bq/kg fw.</p> <p>The reviewer is asking for clarification on the discrepancy between the annual organ meat consumption rate of 4.49 kg for the adult average traditional food consumer (Table 4-4) versus the reported Patuanak consumption rate for organ meat of 5.91 kg/yr (16.2 g/d) (Table 4-3; p.4.17). The ingestion rates that represent the Patuanak consumption rates from the ERFN study were modified as follows:</p> <ul style="list-style-type: none"><li>- Based on the ERFN study, the total Patuanak organ meat consumption rate was 5.91 kg/year which includes <u>all</u> organs. The ingestion rate was modified to remove organs that were not moose resulting in a moose organ ingestion rate of 4.49 kg/year.</li><li>- The total large mammal meat consumption rate was 12.95 kg/year (35.5 g/d). The ingestion rate for large mammals was increased to 14.38 kg/year to account for caribou organs in the caribou meat ingestion rate (caribou meat = 1.2 kg/year, caribou organ = 1.4 kg/year).</li><li>- The total ingestion rate for all country foods is 72.5 kg/year (199 g/d as per Table 4-3 in Appendix 10-A) which is consistent with the total Patuanak ingestion rate from the ERFN study.</li><li>- Based on the rationale in the above bullets no changes are needed to the diet.</li></ul> <p>As illustrated in the bullets above, caribou organ ingestion was not ignored, but was assessed as part of caribou meat ingestion.</p> <p>To illustrate that the current assumptions used in the HHRA of ingestion of moose organs and caribou as meat only, a comparison is provided in the table below of human dose from moose organs, caribou assessed as meat, and caribou assessed as organs. The total dose to a person eating moose organs is the same order of magnitude as the total dose to a person eating caribou organs (note that this represents total dose, not incremental dose as shown in the ERA and is used for illustrative purposes only). Additionally, there is limited difference in the results whether caribou organ intake is assessed as meat or as organs. For some radionuclides (Ra-226, Po-210) the dose for caribou assessed as meat is higher and for other radionuclides (U-238, U-234, Th-230, Pb-210) the dose for caribou assessed as organs is higher.</p> <table><tr><th>Parameter</th><th>Unit</th><th>U-238</th><th>U-234</th><th>Th-230</th><th>Ra-226</th><th>Pb-210</th><th>Po-210</th></tr><tr><td>Moose organs Concentration</td><td>Bq/kg</td><td>6.13E-02</td><td>6.13E-02</td><td>3.04E+00</td><td>8.77E-02</td><td>7.15E+00</td><td>1.30E-02</td></tr><tr><td>Caribou meat Concentration</td><td>Bq/kg</td><td>1.41E-01</td><td>1.41E-01</td><td>1.11E-02</td><td>1.13E-01</td><td>1.80E+00</td><td>8.58E+00</td></tr><tr><td>Caribou organs Concentration (scaled from meat based on TF)</td><td>Bq/kg</td><td>2.49E-01</td><td>2.49E-01</td><td>3.04E+00</td><td>6.31E-02</td><td>5.66E+01</td><td>8.58E-02</td></tr><tr><td>Dose Coefficient (DCF)</td><td>Sv/Bq</td><td>4.90E-08</td><td>4.90E-08</td><td>2.10E-07</td><td>2.80E-07</td><td>6.70E-07</td><td>1.20E-06</td></tr><tr><td>Human Dose - Moose Organs (a)</td><td>mSv/a</td><td>1.35E-05</td><td>1.35E-05</td><td>2.87E-03</td><td>1.10E-04</td><td>2.16E-02</td><td>7.04E-05</td></tr><tr><td>Human Dose - Caribou Organs as Meat (b)</td><td>mSv/a</td><td>9.84E-06</td><td>9.84E-06</td><td>3.32E-06</td><td>4.50E-05</td><td>1.72E-03</td><td>1.47E-02</td></tr><tr><td>Human Dose - Caribou Organs (b)</td><td>mSv/a</td><td>1.74E-05</td><td>1.74E-05</td><td>9.10E-04</td><td>2.51E-05</td><td>5.40E-02</td><td>1.47E-04</td></tr><tr><td colspan="2">a) based on moose organ ingestion rate of 4.5 kg/a</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="2">b) based on caribou organ ingestion rate of 1.4 kg/a</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Parameter	Unit	U-238	U-234	Th-230	Ra-226	Pb-210	Po-210	Moose organs Concentration	Bq/kg	6.13E-02	6.13E-02	3.04E+00	8.77E-02	7.15E+00	1.30E-02	Caribou meat Concentration	Bq/kg	1.41E-01	1.41E-01	1.11E-02	1.13E-01	1.80E+00	8.58E+00	Caribou organs Concentration (scaled from meat based on TF)	Bq/kg	2.49E-01	2.49E-01	3.04E+00	6.31E-02	5.66E+01	8.58E-02	Dose Coefficient (DCF)	Sv/Bq	4.90E-08	4.90E-08	2.10E-07	2.80E-07	6.70E-07	1.20E-06	Human Dose - Moose Organs (a)	mSv/a	1.35E-05	1.35E-05	2.87E-03	1.10E-04	2.16E-02	7.04E-05	Human Dose - Caribou Organs as Meat (b)	mSv/a	9.84E-06	9.84E-06	3.32E-06	4.50E-05	1.72E-03	1.47E-02	Human Dose - Caribou Organs (b)	mSv/a	1.74E-05	1.74E-05	9.10E-04	2.51E-05	5.40E-02	1.47E-04	a) based on moose organ ingestion rate of 4.5 kg/a								b) based on caribou organ ingestion rate of 1.4 kg/a								
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								<p>Overall, caribou ingestion is not ignored in the HHRA, and whether or not they are assessed as meat or as organs makes little difference to the total dose from terrestrial animal ingestion, as the dose is dominated by ingestion of mallard as shown in the pie chart below. The caribou contribution to total dose is minimal since the total dose is well below the dose limit of 1 mSv/year; therefore, no changes are made to the ERA at this time.</p> 	
IR-198	IR-198-R1	HC	Change to an environmental component due to radiological contaminants	<p><a href="#">Annex 1 Response to Information Requests (Denison Mining) – August 18, 2023</a></p> <p>IR-198 Response from Denison – COPC Concentrations in Organs (<i>Pages 74, and 354-357 of 419</i>)</p> <p>Appendix 10-A (ERA)</p>	<p><i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of radionuclides based on their mass concentrations in country foods (the assessment is only based on radionuclide concentrations).</p> <p><b>Context:</b> As part of the response to IR-198 estimated Pb-210 concentrations in moose organ and caribou organ of 7.15 and 49.4 mg/kg (ww) are reported, respectively. However, Appendix 10-A: <i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of lead among the non-radionuclide COPCs.</p> <p>Using the organ meat consumption figure from the Patuanak community (16.2 g/day), exposure to Pb-210 from caribou organ meat is estimated at over 11 ug/kg bw per day (based on the response to IR-198) which would be close to 10 times greater than the 95<sup>th</sup> percentile dietary lead exposure estimates for the general Canadian population consuming retail foods.</p> <p><b>Rationale:</b> While the abundance of radionuclides may pose a health risk with respect to radioactivity, their presence as chemical contaminants may also have an impact on health. This is demonstrated by the case of Pb-210 described above.</p>	<p>1. Provide a rationale on why radionuclide mass concentrations were not assessed for their impact to human health.</p> <p>2. Provide an assessment of Lead (Pb) as a chemical contaminant (non-radionuclide) COPC to better understand potential health risks and inform management, mitigation, monitoring and/or follow-up planning.</p>		<p>1. Uranium was assessed as both a chemical constituent and a radionuclide constituent. The other radionuclides in the U-238 decay chain were assessed for their radiotoxicity and not their chemical toxicity. This is consistent with the PSL2 Assessment Report which indicates that because of uranium’s relatively low specific activity, uranium is the only radionuclide (in the uranium and thorium decay chains) with greater potential to be more chemotoxic than radiotoxic; therefore, it is important to assess its chemical toxicity (GC &amp; EC, 2006). To illustrate, the effluent quality of Pb-210 (as per Table 3-1 in Appendix 10-A) is 4.19E-01 mg/L. Using a specific activity of 2.86E+12 Bq/g for Pb-210 (<a href="http://www.wise-uranium.org/nucv.html">www.wise-uranium.org/nucv.html</a>), the mass concentration is 1.48E-10 mg/L. This is significantly lower than the lead concentration in the effluent of 3.00E-04 mg/L (as per Table 3-1 in Appendix 10-A) which is based on pilot tests with a safety factor added. As such, consideration of the mass concentration of Pb-210 is not needed.</p> <p>2. The response to IR-198 (Attachment IR-198) erroneously provided the concentrations of Pb-210 in moose organ and caribou organ in units of mg/kg (ww). The corrected units that should have been provided for Pb-210 in moose organ and caribou organ tissues are in Becquerel per kilogram wet weight (<b>Bq/kg ww</b>); that is, the concentrations of Pb-210 in moose and caribou organs are 7.15 Bq/kg ww and 49.4 Bq/kg ww, respectively.</p> <p>The following illustrates that chemical lead (from Pb-210) in organs is not a health concern. The concentrations of Pb-210 in moose organs is 7.15 Bq/kg ww. Using a specific activity of 2.86E+12 Bq/g for Pb-210 (<a href="http://www.wise-uranium.org/nucv.html">www.wise-uranium.org/nucv.html</a>), the lead concentration in moose organs would be 2.5E-09 mg/kg ww. The daily dose for moose organ consumption would be 4.4E-10 µg/kg bw/day.</p>	No

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					Due to their potential toxicological significance to human health, Health Canada recommends assessing arsenic, cadmium, lead and mercury as part of country food assessment, regardless of the method employed to determine COPCs.			<p>Dose = 4.5kg/yr*yr/365d*2.5E-09mg/kg/70.7kg*1000ug/mg. The estimated lead exposure dose from Pb-210 in moose organs is far below the 95<sup>th</sup> percentile dietary lead exposure estimate for the general Canadian population consuming retail foods, and also well below the provisional lead TRV recommended by Health Canada of 0.5 µg/kg bw/day.</p> <p>Therefore, Pb-210 is expected to contribute a negligible amount of lead metal to total lead exposure. Lead as a non-radiological contaminant was considered in Table 3-1 in the ERA (Appendix 10-A) did not screen into the assessment and therefore it is concluded that the potential risks to consumers of country foods due to lead (and Pb-210) are negligible. The project includes an environmental monitoring program which will include analysis of country foods for trace metals, including lead.</p> <p><b>References:</b></p> <p>Government of Canada, Environment Canada. 2006. Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (Impact on Non-human Biota). September.</p>	
IR-199	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<p><b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.</p> <p><b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.</p>	<p>1. Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.</p> <p>2. Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).</p>	<p>This response has not been accepted, as the explanation and rationale provided by the Proponent is not sufficient to validate the model performance.</p> <p>Beyond the figures demonstrating modelled versus measured concentrations of COPCs in water and sediment provided in Appendix A, no quantitative statistical metrics validating model performance have been provided by the Proponent. It is also unclear if the geometric mean for each COPC at each monitoring station was calculated as individual inputs per station or if a single geometric mean for each COPC was calculated using all sampling data. Using a single geometric mean of all samples would result in not capturing the variation in concentrations of COPCs between sampling stations such as variation between different lakes. The Proponent’s response provided no additional information that was not already in the EIS to the information request for specific details on how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality.</p> <p>Without statistical metrics validating model performance, there is no quantitative evidence to</p>	<p>To clarify, the geomean shown for each COPC in Figure 3-2 (water) of the IMPACT Model report is for all the data in a series of lakes downstream of the future mine discharge. The measured data do not suggest any pattern of difference among lakes, nor would any such pattern be expected under baseline conditions. We want a baseline model that predicts a value for the downstream lakes in the range of measured data, as long as the measured data are reliable and not dominated by detection limit values. As discussed in Section 3.2.1 of the IMPACT Model report, the model meets this test. The geomean was considered appropriate as it is more representative of the central value of the data distribution. However, considering the data represents baseline conditions with many values below the detection limit, there is limited difference between the geomean and the arithmetic mean for the majority of constituents (see table below for summary statistics for baseline water concentration). Section 3.2.1 of the IMPACT Model Report (Appendix A to Appendix 10-A) was modified to provide more discussion on the selection of the geomean.</p>	<p>Yes</p> <p>Appendix 10-A, Appendix A, Section 3.2.1</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																																																																																																																																																																				
							<p>support conclusions of model performance regarding the use of model calibrated concentration inputs of COPCs and conclusions on under- and over-predicted COPC concentration inputs influence on risk assessment conclusions. It is also unclear if the methodology for using the geometric mean of all samples for each COPC has eliminated variation between sample sites for modelling, and how this affects the conclusions of risk.</p> <p>ECCC requires further information on how using geometric mean values of the measured baseline data influences variation between sites and model outputs, as well as quantitative statistical metrics validating model performance to verify the Proponent’s conclusions.</p> <p>Please provide:</p> <p>1. Further information on how using geometric mean values of the measured baseline data influences variation between sites and model outputs.</p> <p>2. Quantitative statistical metrics validating model performance to support conclusions on model calibrated concentration inputs of COPCs and risk assessment conclusions, with particular focus on influence of over- and under-predicted COPC concentration inputs. Include model performance benchmarks for comparison.</p>	<table><tr><th rowspan="2">Category</th><th rowspan="2">Parameter</th><th rowspan="2">Units</th><th>Total</th><th>Count</th><th rowspan="2">Minimum</th><th rowspan="2">Percentile_95th</th><th rowspan="2">Maximum</th><th rowspan="2">Arithmetic_Mean(a)</th><th rowspan="2">Geo</th></tr><tr><th>Count</th><th>(&lt;RDL)</th></tr><tr><td rowspan="2">Major Ions</td><td>Chloride</td><td>mg/L</td><td>142</td><td>7</td><td>&lt;0.1</td><td>0.7</td><td>0.9</td><td>3.69E-01</td><td></td></tr><tr><td>Sulphate</td><td>mg/L</td><td>142</td><td>1</td><td>&lt;0.2</td><td>1.1</td><td>8.3</td><td>8.46E-01</td><td></td></tr><tr><td rowspan="12">Metals</td><td>Arsenic</td><td>mg/L</td><td>142</td><td>53</td><td>&lt;0.0001</td><td>0.0001</td><td>0.0003</td><td>1.05E-04</td><td></td></tr><tr><td>Cadmium</td><td>mg/L</td><td>142</td><td>90</td><td>&lt;1.00E-08</td><td>0.00003</td><td>0.00007</td><td>1.34E-05</td><td></td></tr><tr><td>Chromium</td><td>mg/L</td><td>142</td><td>142</td><td>&lt;0.0005</td><td>&lt;0.0005</td><td>&lt;0.0005</td><td>5.00E-04</td><td></td></tr><tr><td>Cobalt</td><td>mg/L</td><td>142</td><td>138</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Copper</td><td>mg/L</td><td>142</td><td>139</td><td>&lt;0.0002</td><td>&lt;0.0002</td><td>0.0008</td><td>2.07E-04</td><td></td></tr><tr><td>Lead</td><td>mg/L</td><td>142</td><td>135</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0012</td><td>1.16E-04</td><td></td></tr><tr><td>Molybdenum</td><td>mg/L</td><td>142</td><td>138</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0013</td><td>1.23E-04</td><td></td></tr><tr><td>Nickel</td><td>mg/L</td><td>142</td><td>101</td><td>&lt;0.0001</td><td>0.0003</td><td>0.0006</td><td>1.24E-04</td><td></td></tr><tr><td>Selenium</td><td>mg/L</td><td>142</td><td>140</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Uranium</td><td>mg/L</td><td>142</td><td>141</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Vanadium</td><td>mg/L</td><td>142</td><td>110</td><td>&lt;0.0001</td><td>0.0002</td><td>0.0005</td><td>1.12E-04</td><td></td></tr><tr><td>Zinc</td><td>mg/L</td><td>142</td><td>95</td><td>&lt;0.0005</td><td>0.00278</td><td>0.02</td><td>9.62E-04</td><td></td></tr><tr><td rowspan="2">Nutrients</td><td>Ammonia as N</td><td>mg/L</td><td>142</td><td>104</td><td>&lt;0.01</td><td>0.0596</td><td>1.2</td><td>3.26E-02</td><td></td></tr><tr><td>Nitrate</td><td>mg/L</td><td>103</td><td>70</td><td>&lt;0.04</td><td>0.438</td><td>0.66</td><td>1.15E-01</td><td></td></tr><tr><td rowspan="4">Radionuclides</td><td>Lead-210</td><td>Bq/L</td><td>142</td><td>136</td><td>&lt;0.02</td><td>&lt;0.02</td><td>0.05</td><td>2.06E-02</td><td></td></tr><tr><td>Polonium-210</td><td>Bq/L</td><td>142</td><td>112</td><td>&lt;0.005</td><td>0.008</td><td>0.02</td><td>5.50E-03</td><td></td></tr><tr><td>Radium-226</td><td>Bq/L</td><td>142</td><td>98</td><td>&lt;0.005</td><td>0.00995</td><td>0.01</td><td>5.70E-03</td><td></td></tr><tr><td>Thorium-230</td><td>Bq/L</td><td>142</td><td>138</td><td>&lt;0.01</td><td>&lt;0.01</td><td>0.02</td><td>1.01E-02</td><td></td></tr></table> <p>(a) The majority of the results are less than the detection limit</p> <p>Statistical measures of how individual baseline measurements deviate from the baseline prediction would not be indicative of model performance, since the model is not trying to predict this noise. What matters is how well the model predicts the downstream condition as reflected in the geomean of the data. This can be seen in Figure 3-2.</p> <p>The “underpredictions” seen in Figure 3-2 (Se, U, Pb-210) are to be expected when the measured data are dominated by non-detects. The predicted value is consistent with measured data. There is no implication of any model error that would influence model predictions for the operational phase of the mine. The overpredictions seen in Figure 3-2 (Cd, Cu, V) would imply a conservatism of similar magnitude in the baseline + project predictions for water in the operational phase. As an example, the root mean square error (RMSE) for cadmium of the measured water quality data against the modelled prediction shown in Figure 3-2 is +/-1.31E-05 mg/L which indicates that the modelled concentration is within the range of the geomean of the measured data.</p> <p>Similarly, the geomean shown for each COPC in Figure 3-3 (sediment) of the IMPACT Model report is for all the data in a series of lakes downstream of the future mine discharge. The overpredictions seen in Figure 3-3 (for As and Ra-226) would imply a conservatism of similar magnitude in the baseline + project predictions for sediment in the operational phase.</p> <p>The relationship in the Wheeler River IMPACT model between water and sediment is based on existing operating uranium mines in northern Saskatchewan as described in the IMPACT Model Report (Appendix A to Appendix 10-A). Baseline conditions do not represent impacted conditions; therefore, it is not appropriate to calibrate the model to baseline conditions as we are most interested in impacted conditions. The test of model performance will be as the facility moves into operation and operational data is compared against modelled data.</p>	Category	Parameter	Units	Total	Count	Minimum	Percentile_95th	Maximum	Arithmetic_Mean(a)	Geo	Count	(<RDL)	Major Ions	Chloride	mg/L	142	7	<0.1	0.7	0.9	3.69E-01		Sulphate	mg/L	142	1	<0.2	1.1	8.3	8.46E-01		Metals	Arsenic	mg/L	142	53	<0.0001	0.0001	0.0003	1.05E-04		Cadmium	mg/L	142	90	<1.00E-08	0.00003	0.00007	1.34E-05		Chromium	mg/L	142	142	<0.0005	<0.0005	<0.0005	5.00E-04		Cobalt	mg/L	142	138	<0.0001	<0.0001	0.0002	1.01E-04		Copper	mg/L	142	139	<0.0002	<0.0002	0.0008	2.07E-04		Lead	mg/L	142	135	<0.0001	<0.0001	0.0012	1.16E-04		Molybdenum	mg/L	142	138	<0.0001	<0.0001	0.0013	1.23E-04		Nickel	mg/L	142	101	<0.0001	0.0003	0.0006	1.24E-04		Selenium	mg/L	142	140	<0.0001	<0.0001	0.0002	1.01E-04		Uranium	mg/L	142	141	<0.0001	<0.0001	0.0002	1.01E-04		Vanadium	mg/L	142	110	<0.0001	0.0002	0.0005	1.12E-04		Zinc	mg/L	142	95	<0.0005	0.00278	0.02	9.62E-04		Nutrients	Ammonia as N	mg/L	142	104	<0.01	0.0596	1.2	3.26E-02		Nitrate	mg/L	103	70	<0.04	0.438	0.66	1.15E-01		Radionuclides	Lead-210	Bq/L	142	136	<0.02	<0.02	0.05	2.06E-02		Polonium-210	Bq/L	142	112	<0.005	0.008	0.02	5.50E-03		Radium-226	Bq/L	142	98	<0.005	0.00995	0.01	5.70E-03		Thorium-230	Bq/L	142	138	<0.01	<0.01	0.02	1.01E-02		
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IR-200	-	HC	Indigenous Peoples' health /	Section 10 (p. 4.10)	Indigenous consultation should be included in the Country Foods analysis.	1. Evaluate the suitability of using the 2017 EFRN survey results and	This response has not been accepted, as it did not provide the requested information to support the	IR-01 was provided by the EFRN as a member of the FIRT. Denison subsequently met with EFRN to better understand the specific concern raised. The comment was centered	No																																																																																																																																																																																																				



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			Socio- economic conditions	Appendix 10-A (ERA), Table 4-4 (p. 4.19)	<p><b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following:</i> “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p>consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.</p> <p>2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>	<p>assumption used in the traditional foods risk assessment.</p> <p>The response did state:</p> <p><i>The 2017 report was authored by ERFN and as such there is no need for Denison to ask ERFN to validate their own report.</i></p> <p>The dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017 was an important resource that contributed to the risk assessment; however, the ERFN’s Information Request (IR-1) raised similar questions about the EIS’s assumptions on Indigenous land use and diet, and the perception that feedback from the local ERFN trapper was not representative of the community’s current and future land use. The response to IR-1 referenced meetings/discussions that were held with the ERFN to better understand how their community uses the area and their diet.</p> <p>The following contradictory clarification was provided in the response to IR-1: [The] <i>ERFN considers the ERFN Trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use.</i></p> <p>See follow up IR-200-R1.</p>	<p>around the fact that the local land and resource harvester, referred to throughout the EIS as the ERFN Trapper, passed away before the draft EIS filing. The nation was concerned that the land use and occupancy of the ERFN Trapper may be lost or somehow downplayed since he has passed away and no longer resides near the Project site. In response to this, Denison updated text in the revised draft EIS to better reflect the totality of ERFN TK and land use information. The ERFN Trapper’s land and resource use patterns and activities are considered by ERFN as representative of future ERFN uses in the area.</p> <p>We note that in IR-01 ERFN was not suggesting that the ERFN Trapper’s diet was <b>representative</b> of all ERFN land users. The HC reviewer has erroneously connected parts of the response to IR-01 and IR-200 to suggest there is a gap in the EIS; Denison notes there is no contradictory information provided and outline clarifications here and in response to IR-200-R1.</p> <p>ERFN wrote and provided the 2017 dietary study (CanNorth 2017) and requested Denison use this information in the EIS. The CanNorth report is considered as a source of Indigenous Knowledge by the community. Denison has included both an ERFN diet as described in the 2017 report, and the ERFN Trapper’s diet throughout the HHRA. There were five receptors in the human health risk assessment (HHRA): camp worker, seasonal resident, recreational fisher/hunter, fisher/trapper, and future permanent resident. The ERFN 2017 diet was included for a portion of the camp worker, seasonal resident, recreational fisher/hunter, and future permanent resident diets. The fisher/trapper diet was unique and provided by the ERFN Trapper whose trap lines and commercial fishing operations are located in the Project area. Importantly, the ERFN Trapper’s diet was not a scaling up of the ERFN 2017 ingestion rates; rather, it was based on different dietary assumptions. For example, the ERFN Trapper rarely eats any country plants but eats a considerably larger amount of caribou and fish, whereas the ERFN 2017 diet has a wider representation of all food pathways.</p> <p>Other sensitive or vulnerable human health groups are addressed through the use of toxicity reference values (TRVs) that incorporate uncertainty factors to account for sensitive individuals. This is standard practice in development of TRVs for human health risk assessment. As such, differences in health status or subgroups were not considered separately.</p> <p>Denison will work with regulators and Indigenous nations and communities to refine future permanent resident characteristics through regular updates to the ERA as the Project advances as per the review cycle in N288.6.</p> <p>Denison encourages the CNSC to reach out to the ERFN FIRT representative to confirm Denison’s understanding on the scope of IR-01 (Annex 1, IR-01 on page 1/419) and ERFN’s acceptance of Denison’s response to IR-01 and related discussions.</p> <p><b>References:</b></p> <p>CanNorth. 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p>	

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IR-200	IR-200-R1	HC	Indigenous People’’ health / Socio- economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)  IR-200 Response from Denison	<p>The traditional foods risk assessment should be updated to include an “Intense Land User” scenario and consider all relevant sub-groups. <b>Context:</b> See ‘Rationale for Status’ in IR-200 <b>Rationale:</b> Health Canada notes that the response to IR-1 confirms that the use, diet and consumption rates used to assess the “Trapper” receptor are representative of “intensive land users” from the ERFN and possibly others. This change in the assumption is significant and should be integrated into the traditional foods risk assessment. Suggestions and follow-up measures have been provided to assist in responding to this information request, which benefits from the clarity provided in response to IR-1.</p> <p>Health Canada also notes that the response to IR-200 did not consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p>	<p>1. Update assumptions used in the risk assessment to reflect the new information provided in response to IR-1. (e.g., the <i>ERFN Trapper’s use of the area as <b>representative</b> of current and future land users</i>).</p> <p>2. Update the risk assessment in the EIS and ERA for the “Trapper” receptor (i.e., Intensive Land Users) to account for the <b>representative</b> nature of their described diet (i.e., consumption rates and composition).</p> <p>3. Update the rationale and decisions related to management, mitigation, monitoring and follow-up. Include a specific discussion for those COPCs that contribute to elevated health risks among “intensive land users” and those raised by Indigenous communities (i.e., selenium, mercury &amp; cadmium).</p> <p>4. Revise receptor’s descriptor/title from “Trapper” to “Intensive land users” throughout the EIS and ERA to be consistent with proposed revisions made in response to IR-1.</p> <p>Consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately. Alternatively, provide a fulsome rationale to justify their exclusion.</p>		<p>1. Denison would like to clarify to the reviewer that the response to IR-01 does not in fact introduce new information to the EIS. As noted in the above response to IR-200, the intent of IR-01 was to provide updates to the EIS to better reflect the totality of ERFN TK and land use information. Both the ERFN 2017 (CanNorth 2017) and the ERFN Trapper’s traditional food intakes have been included in the HHRA.</p> <p>2. Denison has clearly outlined in the EIS, Section 10 and Appendix 10-A how each HHRA’s receptor diet was derived, including that for the fisher/trapper. We reiterate that the ERFN provided the 2017 dietary study to Denison and requested Denison include this in the EIS.</p> <p>3. The details of the Project’s environmental management system are being developed to support Project permitting and licensing. This will include monitoring for various metals and radionuclides in a variety of media (e.g., fish, water, etc.). No updates to management, mitigation, monitoring and follow-up outlined in the revised draft EIS are required. Based on the criteria set out in Section 4 Table 4.3-1, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e., moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring program.</p> <p>4. Denison has clearly outlined in the EIS, Section 10 and Appendix 10-A how each HHRA’s receptor diet was derived, including that for the fisher/trapper.</p> <p>As indicated in the response to IR-200 above, other sensitive or vulnerable human health groups are addressed through the use of toxicity reference values (TRVs) that incorporate uncertainty factors to account for sensitive individuals. This is standard practice in development of TRVs for human health risk assessment. As such, differences in health status or subgroups were not considered separately.</p> <p><b>References:</b></p> <p>CanNorth. 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p>	No
IR-203	-	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<b>Context:</b> This section of the ERA states “If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the	This response has not been accepted.  Although these potential sediment quality exceedances if treated effluent were to be released	After running the model to include the effluent released during the decommissioning period, the additional constituents that exceed sediment quality guidelines include vanadium for the expected case and cadmium for the upper bound case. Table 3-6 of the ERA (Appendix 10-A) has been updated to include the updated sediment quality	Yes

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					<p>Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p> <p><b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.</p>	maximum upper bound discharge rate scenario.	at the maximum upper bound discharge rate are to be documented in the ERA, the response does not address the potential risk to receptors nor propose any mitigation measures. Please provide additional assessment/justification/mitigation measures for these predicted sediment quality exceedances.	<p>predictions and the comparison against sediment quality guidelines. Vanadium was added as a COPC for the ERA since it exceeds a sediment quality guideline in LA-5 (Whitefish Lake). Section 6.2.2 of the ERA, figures and text were updated as well.</p> <p>For cadmium, the sediment quality exceeds the REF value but is below the NE2 value which is also a no-effect value. The predicted concentration of vanadium in sediment in LA-5 at the end of decommissioning is 37.2 mg/kg dw for the expected case and 68.5 mg/kg dw for the upper bound. This is a conservative prediction as it assumes effluent is released during decommissioning at the same flow and quality as during operations. The predicted sediment concentration for vanadium is higher than the REF value from Burnett-Seidel and Liber (2013) of 35.1 mg/kg dw and the LEL from Thompson et al (2005) of 35.2 mg/kg dw. Exceedances of a REF or LEL value are not indicative of adverse effects to aquatic organisms but do suggest that further investigation may be warranted. Exceedance of a REF value indicates that sediment downstream of the proposed discharge is elevated compared to natural background. The LEL represents a concentration in sediment that the majority of benthic organism can tolerate, whereas the SEL represents a concentration in sediment that the majority of benthic organisms cannot tolerate (Persaud et al., 1993). The predicted sediment concentration for vanadium in LA-5 is well below the SEL of 160 mg/kg dw; therefore, adverse effects to benthic organisms are not anticipated. Nevertheless, vanadium was carried forward as a COPC in the ERA and hazard quotients are provided in the updated Draft ERA (Appendix 10-A) for the expected case. No hazard quotients above 1 were identified.</p> <p><b>References:</b></p> <p>Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494. Persaud, D., Jaagumagi, R., Hayton, A., 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality of Ontario. Ministry of Environment and Energy. Ontario.</p> <p>Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.</p>	Appendix 10-A, Table 3-6, Section 6.2.2.
IR-206	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 11 Section 12 Section 15 Section 16	<p><b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.</p> <p><b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the Project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEAA 2012.</p>	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find solutions or continue discussions with the potentially impacted Indigenous Nations and communities.	<p>This response has not been accepted.</p> <p>The IR response directs the FIRT to refer to the response for IR-28. However, this IR response does not directly respond to this IR in question. In IR-28, Denison does discuss how they plan to address the concerns raised by Indigenous Nations and communities, but Denison does not demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects.</p>	<p>In engagement activities in May of 2022 and October of 2023, the conclusions of the EIS inclusive of residual effects, cumulative effects, and significance determination were shared and engaged upon with Indigenous Nations and communities. This includes ERFN and KML.</p> <p>The Indigenous COIs ERFN and KML did not identify any outstanding concerns with these conclusions, or the potential of the Project to adversely affect Indigenous and/or treaty rights that could not be mitigated or accommodated by the Project.</p> <p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the EIS process since filing its draft EIS. This has included engagement specific to the conclusions of the draft EIS</p>	Yes  Revised Draft EIS, Section 4

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							CNSC requires Denison to provide this information before the response can be accepted.	<p>in May of 2022 and October of 2023. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward.</p> <p>A list of commitments and/ or mitigation measures arising from these processes, with specific details to each Indigenous Nation (or representative thereof), will be included in the revised EIS. For clarity, this will not include any private, confidential accommodations made under contractual agreements. Where not contained in confidential contractual agreements, any new mitigation or enhancement measures will be updated in the revised EIS. Further to this, Section 4 of the EIS will be updated to include a summary of engagement and associated outcomes, with additional details offered in the Indigenous Engagement Report. Denison has engaged with various Nations (or representatives thereof) in response to the public comment review process and will continue to do so throughout the assessment process.</p>	
IR-209	-	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<p><b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).</p> <p><b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)</p>	Please provide detailed proposed mitigation measure for KML’s concerns related to loss of cultural knowledge and language should they work for Denison.	<p>This response has not been accepted.</p> <p>Please provide validation that this proposed mitigation measure is considered suitable and has been accepted by KML.</p>	<p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the Project process since filing its draft EIS. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward. Denison and KML are in agreement that all items identified in the FIRT and public comment process are considered as resolved. During the public comments process, KML raised concern for the loss of language, culture, and knowledge related to working at an industrial operation (KML and NVP Public Comment #94).</p> <p>KML has validated the process in which Denison and KML will communicate concerns and agree on appropriate mitigation measures. Specifically, the following response was provided to KML on November 22, 2023, and validated by KML on December 5, 2023. Also see comment No 37 in the Issues and Concerns Table in Appendix 4b.</p> <p>Denison respects the concern raised by KML regarding language and culture related to working at an industrial operation. Denison and KML will be working on specific items of interest to mitigate these types of concerns through private contractual arrangements, which may include specific mitigation and accommodation measures in this respect. Mitigation measures associated with potential effects to cultural continuity (including knowledge transfer and language) are described in Section 12.1.5 of the revised draft EIS and include:</p> <ul style="list-style-type: none"><li>• Working with Indigenous COIs to understand culturally important periods relative to harvest times and cultural camps to facilitate Indigenous employees taking time off to participate in such activities;</li><li>• Implementation of Denison's Indigenous Peoples Policy and advancement of reconciliation</li><li>• Using a commuter rotation system has also shown to be effective in allowing Indigenous employees continued opportunities to spend time on the land, and important factor in</li></ul>	<p>Yes</p> <p>Revised Draft EIS, Section 12.1.5</p>



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								<p>the transmission of knowledge and language (see Section 11 of the Draft for a description of potential effects to land use).</p> <p>In discussions with Indigenous Communities of Interest since the filing of the draft EIS, it has become apparent that Denison should add additional commitment / mitigation measure in relation to this area of interest, as follows:</p> <ul style="list-style-type: none"><li>• Encouragement to speak languages of choice while at site, except during safety sensitive situations.</li></ul> <p>Section 12.1.5 of the revised draft EIS was updated to include the additional commitment / mitigation measure in relation to culture and language, as follows:</p> <ul style="list-style-type: none"><li>• Encouragement to speak languages of choice while at site, except during safety sensitive situations.</li></ul>	
IR-212	-	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	<p>The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.</p> <p><b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).</p> <p>The commitment regarding monitoring and follow-up activities appears limited to “<i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i>” (p. 14).</p> <p><b>Rationale:</b> Country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the prediction</p>	<p>1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.</p> <p>2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the Proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and the direct involvement of communities in monitoring, surveillance, and risk communication activities.</p>	<p>This response has not been accepted as it does not provide sufficient detail on engagement and adaptive management.</p> <p>The response to IR-212 expresses interest and intent to working with local and Indigenous communities to develop follow-up and monitoring programs, supported by an overview of the intended approach. It also articulates that the detail of follow-up and monitoring plans will be developed as part of the licensing and regulatory phases of the Project’s approval process.</p> <p>As previously indicated, country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. As such, it is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program for country foods.</p> <p>Additionally, the preliminary monitoring plan should include decision criteria/thresholds/benchmarks for initiating action and what those actions might entail (e.g., inspection of treatment processes, additional sampling, communication with local land users &amp; residents, engagement with interested communities, etc.).</p> <p>HC reiterates its previous IR, with added clarification:</p>	<p>Given the stage of the Project, Denison believes the information provided in response to the original IR comment provided an appropriate level of feedback with respect to modes of engagement with local, provincial and federal authorities, and Indigenous Nations and communities around the sampling / monitoring (including important country foods harvested for food and cultural purposes). Based on the criteria set out in revised Draft EIS Section 4, Table 4.3-1, Denison has committed to collaborating with the Indigenous Communities of Interest English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. Within the context of the IR Denison does not feel it is entirely appropriate to provide definitive information with respect to how engagement activities will occur given that a commitment to engage in a manner that best suits the individual communities has been made and that process continues to unfold. Nevertheless, additional information is provided below that Denison believes provides further clarity regarding ongoing and planned engagement. Additionally, concepts concerning decision making related to criteria/thresholds/benchmarks that may be used to trigger follow up actions are also discussed.</p> <p>1. Denison understands the importance of engaging Indigenous Nations and communities with respect to items that matter to them. As recent as October 2023, Denison has engaged with Indigenous Communities of Interest about how the outcomes of the environmental assessment process become key areas of focus by the licensing and approvals regime – including in relation to environmental monitoring. All discussion and materials related to these engagement sessions can be found in Section 4. Further to this, Denison has planned a comprehensive and technical workshop with ERFN in March 2024, and expects to undertake the same for KML soon thereafter, focused very specifically on the aspects of items licensed or approved post-environmental assessment. This will include environmental monitoring and the relationship to country foods, including potential country foods to be monitored as part of monitoring programs. As the lifecycle regulator for the Project, Denison is required to provide information related to the outcome of these discussions into forthcoming updates in the IER to the CNSC.</p> <p>2. Re decision criteria/thresholds/benchmarks – As with any aspect of routine monitoring that would be implemented at the Project site that provides information on operational performance, feedback mechanisms will be developed as part of the monitoring process so that appropriate actions can be taken in response to data as it becomes available (i.e.,</p>	No

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							<p>1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, for substances in country foods that may represent a potential health risk and/or are of concern to community members and land users (e.g., Mercury/Methylmercury, Selenium, Cadmium and Lead).</p> <p>2. Describe the decision criteria/thresholds/benchmarks for these substances in country foods and steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.</p>	<p>routine monitoring will be developed in consideration of the adaptive management concept). Details regarding such feedback mechanisms, the basis of how subsequent actions would be triggered, and those actions would be defined as part of the development of monitoring programs as part of the Environmental Management Program during licensing, and in conjunction with engagement activities. With that in mind, a conceptual trigger-response mechanism framework related to sampling / monitoring of country foods is described for consideration that would be the basis of detailed plans developed in the next phase of Project approvals.</p> <ul style="list-style-type: none"><li>Conceptually, screening criteria would be defined in consideration of increasing trends measured in environmental media relative to background.</li><li>Where a screening criteria/threshold/benchmark was triggered, an investigation would be initiated to verify the result and to determine if the change in concentration is significant relative to background. This could include lab re-analysis, review of QA/QC data and field notes, reconnaissance, re-sampling or additional sampling and/or additional analyses. Potential causes of the increasing trend would be investigated to establish whether the trend was Project related, and the investigation may be informed by mine operations data (e.g., water treatment performance), climatic data, local and Indigenous knowledge, and background data from reference locations in the region.</li><li>If the investigation confirms that the criteria/threshold/benchmark criteria was triggered by the Project, additional analyses such as modelling, toxicity testing, increased sampling may be initiated (as appropriate) or assessment of human health risks may be warranted.</li><li>If, based on the additional investigation, modified or additional mitigation measure(s) are identified, such measures may need to be developed, implemented and monitored to address the specific issue identified as being of concern. Monitoring would be adapted to ensure it was capable of monitoring the performance of any mitigations implemented and to demonstrate the risk identified had been mitigated.</li></ul> <p>It is envisioned that Denison would engage its Indigenous Communities of Interest in all aspects of the process. Members of the public and the provincial and federal governments would be engaged through with the formalized public information program, required by the CNSC.</p>	
IR-216	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the proponent specify in the EIS that worker health, as it relates to accidents and malfunctions, will be addressed independently and part of the licensing process as required. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As indicated in the initial response to IR-216 it is Denison's intent to assess radiological dose to workers as part of the licensing process (see also Section 14.2 of the revised Draft EIS). As such Denison confirms that this will include the assessment of radiological dose to workers that may be associated with Bounding Scenarios 1 (Vehicle Accident and Aquatic Release of Radioactivity) and 7 (Vehicle Accident and Terrestrial Release of Radioactivity) of the Accident and Malfunctions Assessment (Section 14 of the revised Draft EIS). For clarity, the last paragraph of Section 14.2 of the revised Draft EIS has been revised as follows, noting that the bolded text is the addition that states the specific commitment requested in the IR.</p>	Yes  EIS Section 14.2

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					the expected doses meet the dose limits set out in the Radiation Protection Regulations.			<p>"It is noted that some hazards related to worker safety were identified; however, worker safety (i.e., risks and consequences) is beyond the scope of this assessment. Consistent with Canadian Standards Association (CSA) N288.6-12 (CSA Group 2012), potential risks to nuclear energy workers will be addressed as part of the license application and will include the results of occupational hazard and exposure assessments and the Radiation Protection Program and Health and Safety Program. <b>Specifically, as it pertains to the consideration of accidents and malfunctions as presented herein, Denison will assess radiological dose to workers that may result from Bounding Scenarios (see definition in Section 14.5.6) involving vehicular accidents resulting in releases of radioactivity to the aquatic (see Section 14.6.1) and terrestrial (see Section 14.6.7) environments."</b></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment in the revised draft EIS and as indicated the additional work to characterize radiological dose to workers will be completed during licensing.</p>	
IR-217	-	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.	<p>This response has not been accepted.</p> <p>The Proponent has provided information on all water crossings along the transportation corridor. However, it is insufficient for the justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.</p>	<p>The review comment is acknowledged, but there seems to be some confusion as to the context for the “bounding scenario” terminology used in the accident malfunction analysis. It is the release of the radioactivity (Scenario 1) and chemicals (Scenario 2) that form the basis of these bounding scenarios, and not the specific locations of their occurrence.</p> <p>It would not be possible (nor appropriate) to select a scenario that would necessarily bound all other scenarios in this regard, given the variability of conditions on the transportation route along Hwy 914 south from the project site to its junction with Hwy 165 and then Hwy 165 both east to Hwy 2 and west to Hwy 155. The alternative, that is selecting a host of locations in an attempt to capture such variability in conditions, would not be practical, nor is it necessary in Denison’s and their SME’s view. As noted in the original response, the location selected for the material releases evaluated in accident malfunction Scenarios 1 and 2 was chosen because it represents an important location to Indigenous, local resource users. The analyses of these scenarios provide examples of such releases to local receptors at the crossing identified in the report and contribute to the characterization of overall risk, the key endpoint in the accident and malfunction assessment. From that perspective the analyses would be expected to be generally representative of crossings along the transport route. As noted in the original response to IR 217, the approach in the accident and malfunction assessment is consistent with past practice for comparable assessments for uranium projects in the province.</p> <p>For clarity, the text in the attached revised Draft EIS has been revised as follows:</p> <p><b>For Appendix 14-A:</b></p> <p><b>Section 5.1</b> – to be added to the end of the 4<sup>th</sup> paragraph, “<i>This location was the focus the evaluation as it represents an important location to resource users in the study area. The scenario provides an example of the consequences of such releases to local receptors – that is, the results of the assessment of the releases at this location would be expected to be generally representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability</i></p>	<p>Yes</p> <p>Draft EIS Sections 14.6.1.1 and 14.6.4.2.1</p> <p>Appendix 14-A Sections 5.1 and 5.2</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p><i>multiplied by consequence. Appendix C to this report describes water crossings along the Project-related transportation route on Highway 914 south from the Project site to its junction with Highway 165 and Highway 165 east to Hwy 2 and west to Hwy 155. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.”</i></p> <p><b>Section 5.2</b> – to be added to the end of first paragraph, “<i>As with Scenario 1, this location was also the focus the evaluation as it represents an important location to resource users in the study area but the results of the analysis presented can generally be applied more broadly to water crossings along the transport route from an overall risk perspective.”</i></p> <p><b>Section 14:</b></p> <p><b>Section 14.6.1.1</b> – to be added to the end of the 4<sup>th</sup> paragraph, “<i>This location was the focus the evaluation as it represents an important location to resource users in the study area. The scenario provides an example of the consequences of such releases to local receptors – that is, the results of the assessment of the releases at this location would be expected to be generally representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. Appendix C to this report describes water crossings along the Project-related transportation route on Highway 914 south from the Project site to its junction with Highway 165 and Highway 165 east to Hwy 2 and west to Hwy 155. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.”</i></p> <p><b>Section 14.6.2.1</b> – to be added to the end of the 1<sup>st</sup> paragraph, “<i>As with Scenario 1, this location was also the focus the evaluation as it represents an important location to resource users in the study area but the results of the analysis presented can generally be applied more broadly to water crossings along the transport route from an overall risk perspective.”</i></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity to the reporting.</p>	

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-218	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m3/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m3/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.	<p>This IR has not been accepted as there are two typos in Denison’s response.</p> <p>In the column: Final EIS Update, the wording “Section 14.6.4.1” appears to be “Section 14.6.1.4”; for the <u>Revisions to Appendix 14-A</u>, the wording “average annual low of 24.3m<sup>3</sup>/s (average flow)” should be “average annual low of 17.3m<sup>3</sup>/s (average flow)”. Please update this text.</p>	<p>Acknowledged. Based on the further comment, confirmation of the editorial revisions for Section 14 of the Draft EIS and Appendix 14-A are highlighted below.</p> <p><b>Revisions to Section 14 of the EIS:</b></p> <p>- The last two rows of Table 14.6-3 will be removed.</p> <p>- From Section 14.6.1.4 (not Section 14.6.4.1 as previously indicated), the second to last sentence in first paragraph to be revised as follows, “<i>The flow rates considered for this assessment were 5th percentile annual flows of 10.9 m3/s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m3/s (average flow), and the 95th percentile annual flow of 24.67 m3/s (maximum flow).</i>”</p> <p>- Table 14.6-5 to be revised as shown in Attachment IR-218 (Annex 1, Attachment IR-218, pages 392/419).</p> <p><b>Revisions to Appendix 14-A:</b></p> <p>- From Section 8.1, second to last sentence in first paragraph to be revised as follows, “<i>The river flows considered for this assessment are the 5th percentile annual flow of 10.9 m3/s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m3/s (average flow), and the 95th percentile annual flow of 24.67 m3/s (maximum flow).</i>”</p> <p>- Table 8-5 to be revised shown in Attachment IR-218 (Annex 1, Attachment IR-218, pages 392/419).</p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is for editorial purposes.</p>	Yes  Draft EIS Section 14.6.1.4  Appendix 14-A, Section 8.1  Appendix 14-A, Table 8-5
IR-219	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the Proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.	<p>This response has not been accepted as the Proponent’s response does not include rationale for using different water column depths for uranium concentrate release characterization.</p>	<p>Acknowledged.</p> <p>With respect to water column depth, Denison confirms that only one water column depth was considered with respect to uranium concentrate recovery. The assumption of a 10 cm water column depth (Draft EIS Section 14.6.1.1.1, Appendix 14-A Section 5.1) is in reference to the bottom 10 cm of the water column where uranium concentrate that would be deposited on the river bottom is assumed to interact with the receiving environment (i.e., where uranium concentrate, dissolution is assumed to occur in the Wheeler River). The average depth of 1.2 m (Draft EIS Section 14.6.1.1.1, Appendix 14-A Section 5.1) is in reference to the assumed average depth of the river where the release is postulated to occur. Denison notes that the final sentence of Draft EIS Section 14.6.1.1.1 and Appendix 14-A Section 5.1 state “. . . <i>and a water column depth of 5 cm.</i>”; this statement is erroneous and has been amended in both locations in the revised Draft EIS to state “. . . <i>and a water column depth of 10 cm.</i>”</p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is for editorial purposes.</p>	Yes  Draft EIS Section 14.6.1.1.1  Appendix 14-A, Section 5.1

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-222	-	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<p><b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.</p> <p><b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.</p>	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.	<p>This response has not been accepted as the Proponent states that: <i>“Through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as “moderate” and “ALARP” and as such consistent with the A&amp;M assessment methodology was not carried forward further evaluation.”</i></p> <p>This is not the case. In Appendix A, Table 3, item 3.3 identifies that aquatic release of fuel, hazardous chemicals and reagents as having a high risk and further assessment is needed. If the Proponent believes the above statement is true, Appendix A in Appendix 14-A should be revised to reflect such a case.</p>	<p>Acknowledged.</p> <p>Table 3, Item 3.3 in Appendix A of Appendix 14-A has been revised to reflect the content of the original response (Annex 1, IR-222, page 82/419) whereby the release of acids and bases (chemicals and reagents) has a lower overall risk screening ranking than the release of diesel fuel. Complementary text has been added to Section 14 of the revised Draft EIS for consistency and clarity.</p> <p>The following revisions have been made in the revised Draft EIS:</p> <p><b>Revisions to Appendix A of Appendix 14-A</b></p> <ul style="list-style-type: none"><li>- Table 3, Item 3.3, the consequence and overall risk ratings for this scenario have been modified to reflect the distinction between the release of acids and bases (chemicals and reagents) and the release of diesel fuel and the following note has been added to the “Screening Decision / Rationale” column in Table, “ As seen in the “S” column two consequence screening rankings were provided and consequently, two overall risk screening ranking are also provided. Acids and bases (chemicals and reagents) released to the aquatic environment are likely to dissolve relatively quickly and effects to local biota can be expected to be experienced on a local basis and over a shorter timeframe resulting in the screening consequence score of “major” (4) and an overall risk screening ranking of “moderate”. There is little likely that mitigation can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP (thus the overall ranking of “ALAPRP, moderate”). The release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in liquid phase distinct from that of the water and in this sense, this release produces a greater challenge of potential contamination over a relatively large spatial extent and timespan. For this reason, a screening consequence score of “catastrophic” (5) and an overall risk ranking of “high” was given. Per the rationale provided above, the “high” overall risk release of diesel fuel case was chosen as the representative case for Scenario 3.3 and carried forward for further assessment.”</li></ul> <p><b>Revisions to Section 14.6.2.4:</b></p> <p>The following has been added as the first paragraph of Section 14.6.4.2 of the draft EIS for clarity, <i>“For the purpose of assessing the potential effects on the aquatic environment from a release of fuels and hazardous chemicals the release of diesel fuel was chosen as a representative scenario, rather than other chemicals, such as acids and bases. The release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in liquid phase distinct from that of the water in the receiving environment with potential contamination occurring over a relatively large spatial extent and timespan. In contrast, the release of acids and bases would dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe.”</i></p> <p>For reference, similar text has been added to Section 8.2 of Appendix 14-A.</p>	<p>Yes</p> <p>Appendix 14A, Appendix A, Section 3.0, Table 3, Item 3.3</p> <p>EIS Section 14.6.4.2</p> <p>Appendix 14-A, Section 8.2</p>

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								It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity to the reporting.	
IR-225	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the Proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the proponent specify in the EIS that any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As noted in the original response to IR-225 (Annex 1, IR-225, page 83/419), any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Per this additional FIRT request, this commitment has been included in the text of Section 14.6.5.2 of the revised Draft EIS. It is also noted that additional mitigations have been added to those listed in Section 14.6.5.2 so that the list is consistent with those measures highlighted in Appendix 14-A - that is, these are not new measures; rather the list has been modified for consistency. Section 14.6.5.2 of the Draft EIS is presented below in its entirety for reference, with revised text highlighted in bolded font.</p> <p>"The following principal mitigating measures would be in place to reduce the probability of a release from the process piping and vessels:</p> <ul style="list-style-type: none"><li>• visual inspections;</li><li>• regular and preventive inspection, testing, and maintenance programs;</li><li>• <b>personnel training and orientation;</b></li><li>• <b>development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE;</b></li><li>• emergency response planning;</li><li>• <b>building ventilation;</b> and</li><li>• full containment of the processing plant; and</li><li>• <b>ambient monitoring.</b></li></ul> <p><b>For reference, the engineering design controls identified as mitigating measures above will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing."</b></p>	Yes  EIS Section 14.6.5.2
IR-229	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the Proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the Proponent must specify in the EIS that any engineering design control measures identified in Bounding Scenario 6 such as ventilation will be included in the detailed design and will be provided to the CNSC during Project licensing. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As noted in the original response to IR-229 (Annex 1, IR-229, page 85/419), any engineering design control measures identified in Bounding Scenario 6 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Per this additional FIRT request, this commitment has been included in the text of Section 14.6.6.2 of the revised Draft EIS. It is also noted that additional mitigations have been added to those described in Section 14.6.6.2 so that there is consistency between the Draft EIS and Appendix 14-A - that is, these are not new measures; rather the text has been modified for consistency. Section 14.6.6.2 of the Draft EIS is presented below in its entirety for reference, with revised text highlighted in bolded font.</p> <p>"Denison would make sure that the design of the plant includes control measures to reduce exposure levels to workers and members of the public to levels that are as low as achievable. The control measures would work to make sure that the processing plant is adequately ventilated. Emergency response and spill response plans would include procedures for worker protection, details about personnel protection equipment (particularly respiratory equipment), and procedures to evaluate exposures during a release of uranium powder. <b>In addition, the following is noted with respect to mitigation:</b></p>	Yes  EIS Section 14.6.6.2

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								<ul style="list-style-type: none"><li>• implementation of regular and preventive inspection, testing, and maintenance programs;</li><li>• ventilation design considerations for upset conditions; implementation of personnel training and orientation;</li><li>• development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE;</li><li>• implementation of fire safety plan and firefighting systems; and</li><li>• ambient monitoring.</li></ul> <p><b>For reference, the engineering design controls identified as mitigating measures above will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing."</b></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity and consistency to the reporting.</p>	
IR-235	-	ECCC ERAD	Fish and fish habitat Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”</p> <p>RCP4.5 represents predicted climate conditions of a moderate carbon future.</p> <p>RCP8.5 represents predicted climate conditions under a high carbon future.</p> <p>The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.</p> <p><b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.</p> <p>ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a></p> <p>ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a></p>	<p>1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.</p> <p>2. Provide detailed calculations for the following average values:</p> <ul style="list-style-type: none"><li>• 25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li><li>• 25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li></ul> <p>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</p> <p>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</p> <p>5. Compare model derived data against:</p>	<p>Although responses 1 to 4 have been accepted, this response has not been accepted for the following reasons:</p> <p>5. although PMP is used for design purposes as indicated in Section 8, presenting the variability of observed versus climate model predicted historical precipitation values would provide understanding on the uncertainties associated with climate model projected or historical precipitation (Max 1-day, seasonal or annual) values. Thus, the proponent is recommended to include more clarification in the revised EIS.</p>	<p>The PMP is similar to annual precipitation and ~6 to 10x higher than measured and predicted future maximum 24-hour precipitation and 1:100 24 hour return events.</p> <p>In terms of Project effects on water quantity, the conservative estimate of water withdrawal would result in a reduction of flow of about 3% at times of low flow and the water level in Whitefish Lake could change by 1cm; this minor change is beyond the ability of monitoring techniques to practically measure and the assessment concluded that the Project would not result in a significant effect on surface water quantity (hydrology). Monitoring, including of water withdrawal rates and of potential effects (e.g., change in water flow, change in lake levels) will be implemented as the Project moves forward.</p> <p>The reviewer has requested information would not change the EA conclusions. However, for the purposes of demonstrating the uncertainties of climate model predicted values vs. observed data, the Max 1-day precipitation annual average historical data for Tomblin Lake, high carbon (RCP8.5) was compared to the predictive model results from the period of 1950 to 2013 (i.e., ensemble high carbon dataset). The predicted model data were hindcast for periods prior to 2006 and these value are then based on the historical data set with the ensemble values derived from 24 CMIP5 global climate models (the complete list of models can be found at <a href="https://climateatlas.ca/data-sources-and-methods">https://climateatlas.ca/data-sources-and-methods</a>) (Climate Atlas of Canada, 2023).</p> <p>A correlation coefficient (R2) value was calculated for these two datasets and the result was a coefficient of 0.36 which indicates the level of uncertainty that can be expected in the forward casting of precipitation data into the future. This information is further included in the EIS to indicate that current climate models are variable in nature and their uncertainty requires continued monitoring.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 15.5.2 (text added to discuss uncertainty in the climate predictions)</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.</p> <p>These values do not match the averages shown in Tables 15.5-1 and 15.5-2.</p>	<p>1. Natural variability of the observed data.</p> <p>2. Variability in the statistics generated via observation based time series.</p> <p><b>Technical Discussion Required:</b> Yes</p>			
IR 236	-	ECCC ERAD	Fish and fish habitat Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p><b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>This response has not been accepted.</p> <p>The Proponent made a correlation between precipitation and the Probable Maximum Precipitation (PMP). However, annual maximum and PMP cannot be correlated as they are two separate concepts that require different statistical methods to verify.</p> <p>The Proponent provided two tables which displayed precipitation data under current, existing, and future climate scenarios for two nearby lakes. These were provided to support the Proponent’s response, however, the calculations used to achieve the table figures within the response or Attachment: IR-236 were not provided. As one value cannot be used to infer the other, reviewing the calculations is required to support the Proponent’s conclusions.</p> <p>Please see the following requests: 1. In Table 3 of Attachment: IR-236, the historical mean value (1976 to 2005) for the Maximum 1-Day Precipitation is 24.1 mm and is indicated as measured. However, this estimate appears to be derived from ensembles of climate modeled historical precipitation. Thus, proponent to insert a footnote at Table 3 that indicate the total annual as well as maximum 1-day are estimates based on ensembles of climate modeled historical precipitation. The Proponent needs to provide the calculations that were used to reach the conclusions found within Tables 2 and 3 of Attachment: IR-236. Reviewing the calculation will allow for verification of the Proponent’s conclusions. If the currently used data sources do not allow for accurate representation of their conclusions, the Proponent should use complete</p>	<p>Please see Attachment IR-236.</p>	<p>Yes</p> <p>IR-236 added as Appendix D of Appendix 6-C</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>regional observational data sources to support the conclusions in Tables 2 and 3.</p> <p>2. The analysis of mean maximum one day and mean annual total precipitation [1976-2005] based on weather station (Climate ID 4063755) at Key Lake is roughly 32mm and 470mm respectively. Thus, include both modeled and observed historical precipitation statistics in the EIS for context.</p> <p>Measured data should take precedence over modeled data. The Proponent is taking an ensemble of modeled data to "predict" historical data when measured data is available and can validate the models. Without strong justification, it is not appropriate to replace measured data with "predicted" modeled data.</p>		
IR-237		CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the Proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>	<p>This response has not been accepted.</p> <p>Denison has indicated they will update the follow-up program in Appendix 16-C, but this information has not been provided. CNSC reminds Denison that there should be no new information in the final EIS, and that we must review this information before accepting the response to this IR.</p> <p>Please provide an updated version of Table 1-5.1 with detailed information proposed by Denison in the IR response for the next iteration of the FIRT technical review, for SME review and acceptance.</p>	<p>See Attachment IR-237. Also see an updated version of Appendix 16-C that has been included in an updated version of Appendix 16-C that is provided with this IR response submission package.</p>	<p>Yes</p> <p>Appendix 16-C (updated)</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>The follow-up program plan should be sufficiently described in <u>the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.</u>” (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>				
IR-238	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the Proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	<p>This response has not been accepted.</p> <p>Please provide additional information and updates on engagement activities to the EIS and IER (to date) that demonstrate whether Indigenous Nations and communities have been engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights. See also AD-62 in the Advice to Proponent table.</p>	<p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the Project since filing its Draft EIS. This has included engagement specific to the conclusions of the draft EIS in May of 2022 and October of 2023. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward.</p> <p>A list of commitments and/ or mitigation measures arising from these processes, with specific details to each Indigenous Nation (or representative thereof), will be included in the final EIS. For clarity, this will not include any private, confidential accommodations made under contractual agreements. Where not contained in confidential contractual agreements, any new mitigation or enhancement measures will be updated in the final EIS. Further to this, Chapter 4 of the revised Draft EIS has been updated to include a summary of engagement and associated outcomes, with additional details offered in the Indigenous Engagement Report. Denison has engaged with various Nations (or representatives thereof) in response to the public comment review process and will continue to do so throughout the assessment process.</p> <p>More specifically to the Indigenous COIs, Denison has worked with ERFN and KML to determine their desired involvement in mitigation and monitoring processes. This has included identifying and agreeing to measures that need to be in place as part of the EIS,</p>	<p>Yes</p> <p>Revised Draft EIS, Section 4 (including appendices)</p>

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>which topics needs to be carried through the licensing process, and each community's desired role in the process as the Project progresses. Denison and ERFN, and similarly Denison and KML, are in agreement that all items identified in the FIRT and public comment process are considered as resolved. For details, please see the Issues and Concerns table in Appendix 4B in the revised draft EIS</p> <p>Denison is committed to keeping the Indigenous communities who have expressed interest in the Project informed of monitoring and mitigation plans. Any commitments stemming from these processes, so long as they are not contained in confidential contractual arrangements, have been included in the revised Draft EIS.</p>	

## ATTACHMENT IR-12

Original IR Number	IR-12
Follow Up IR Number	-
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.2.3, Project Description
Context and Rationale (original IR)	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m<sup>3</sup> for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p> <p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>

<p>Information Requirement (original IR)</p>	<ol style="list-style-type: none"> <li>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li> <li>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li> <li>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</li> <li>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</li> </ol>
<p>Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)</p>	<p>This response has not been accepted, for the following reasons (numbers correspond with original IR):</p> <p>1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed.</p> <p>3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999 study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value.</p> <p>CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.</p> <p>Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment.</p> <p>Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR.</p>

	<p>Reference:</p> <p>[A.1] Atmospheric &amp; Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie &amp; Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>
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Response:

Supporting figures to the response provided in IR table are provided on the following pages.



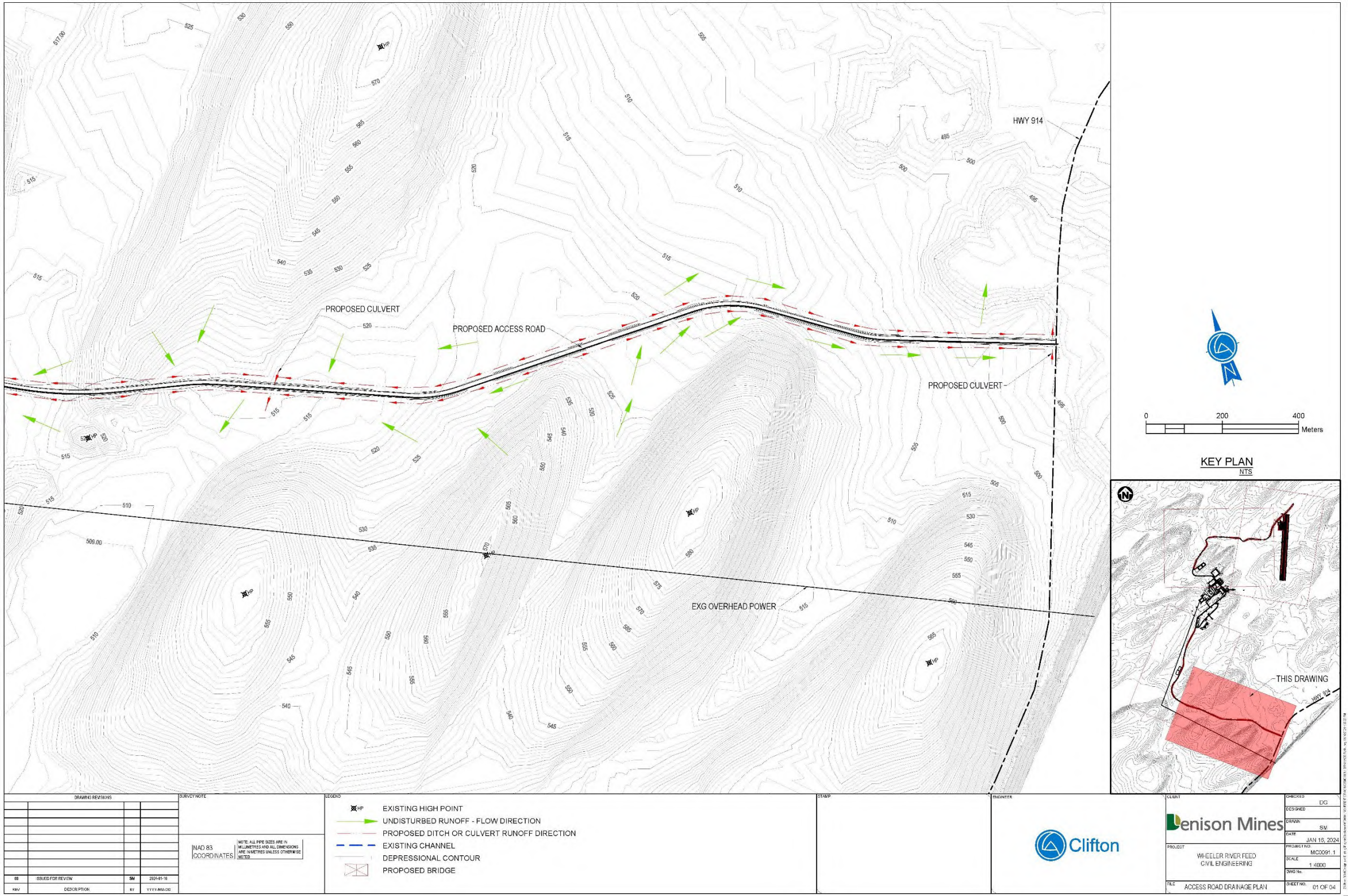


Figure IR-12- 1: Conceptual Site Drainage – Access Road (segment 1 of 2)



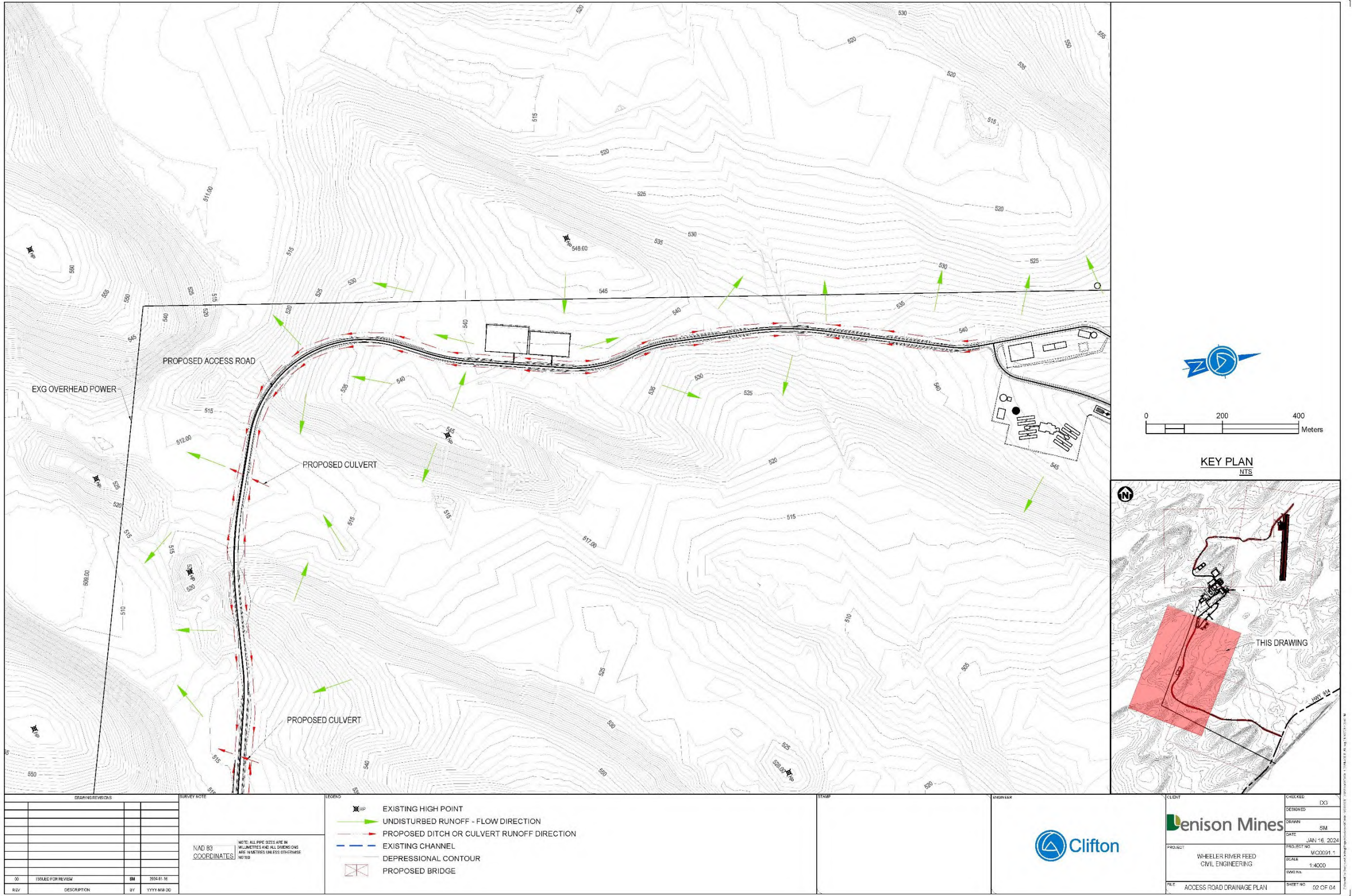


Figure IR-12- 2: Conceptual Site Drainage – Access Road (segment 2 of 2)



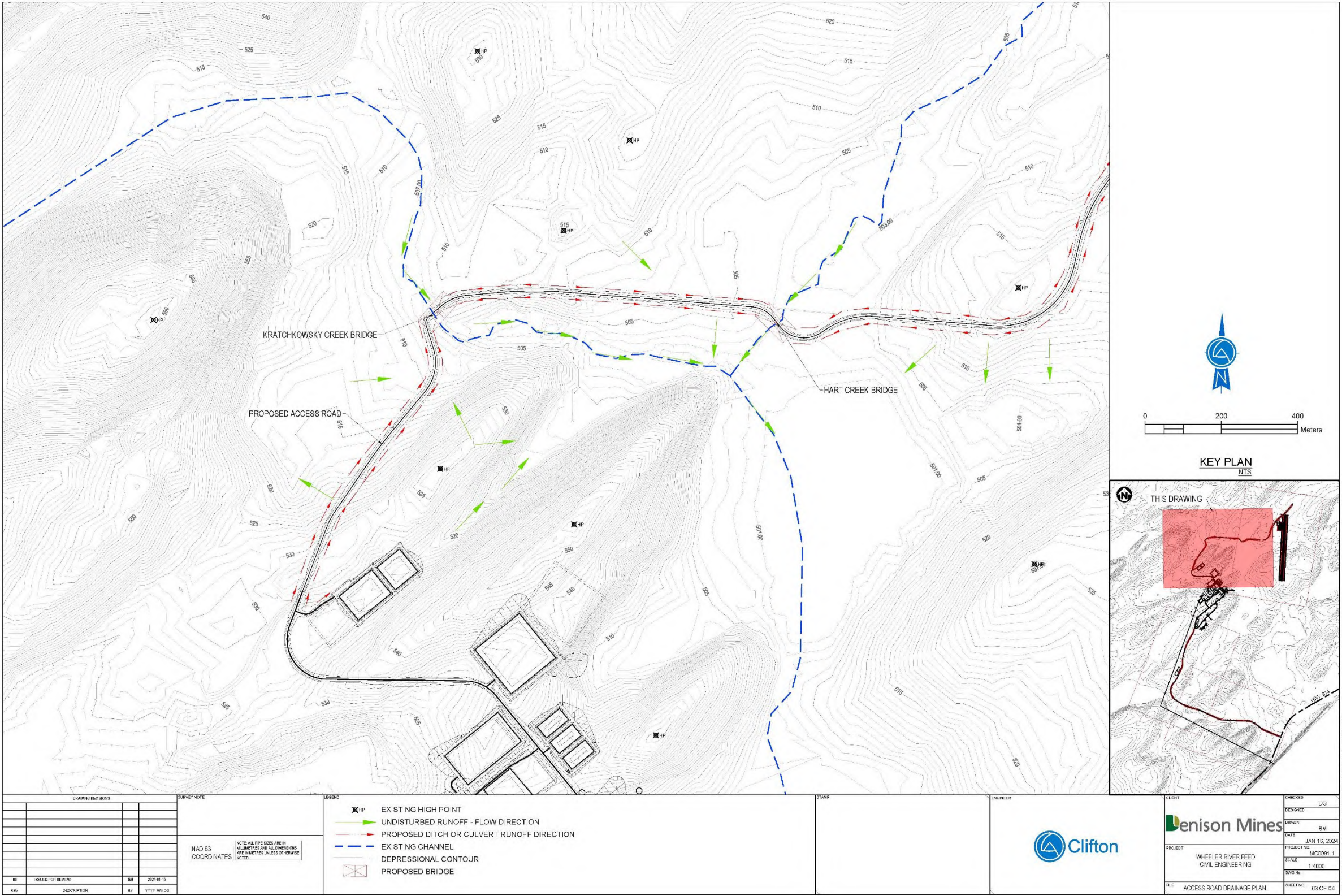


Figure IR-12- 3: Conceptual Site Drainage – Road to Airstrip



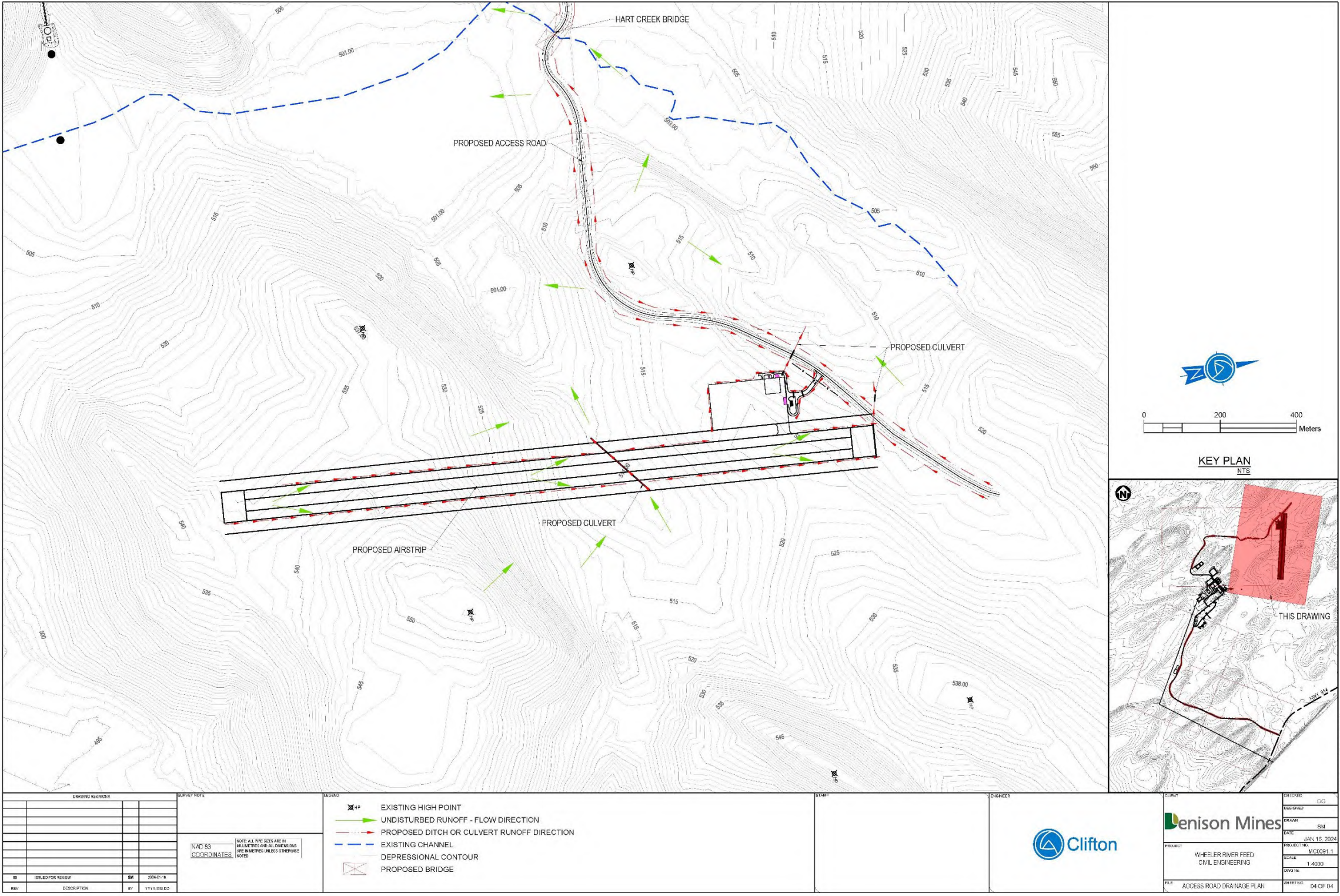


Figure IR-12- 4: Conceptual Site Drainage – Near Airstrip



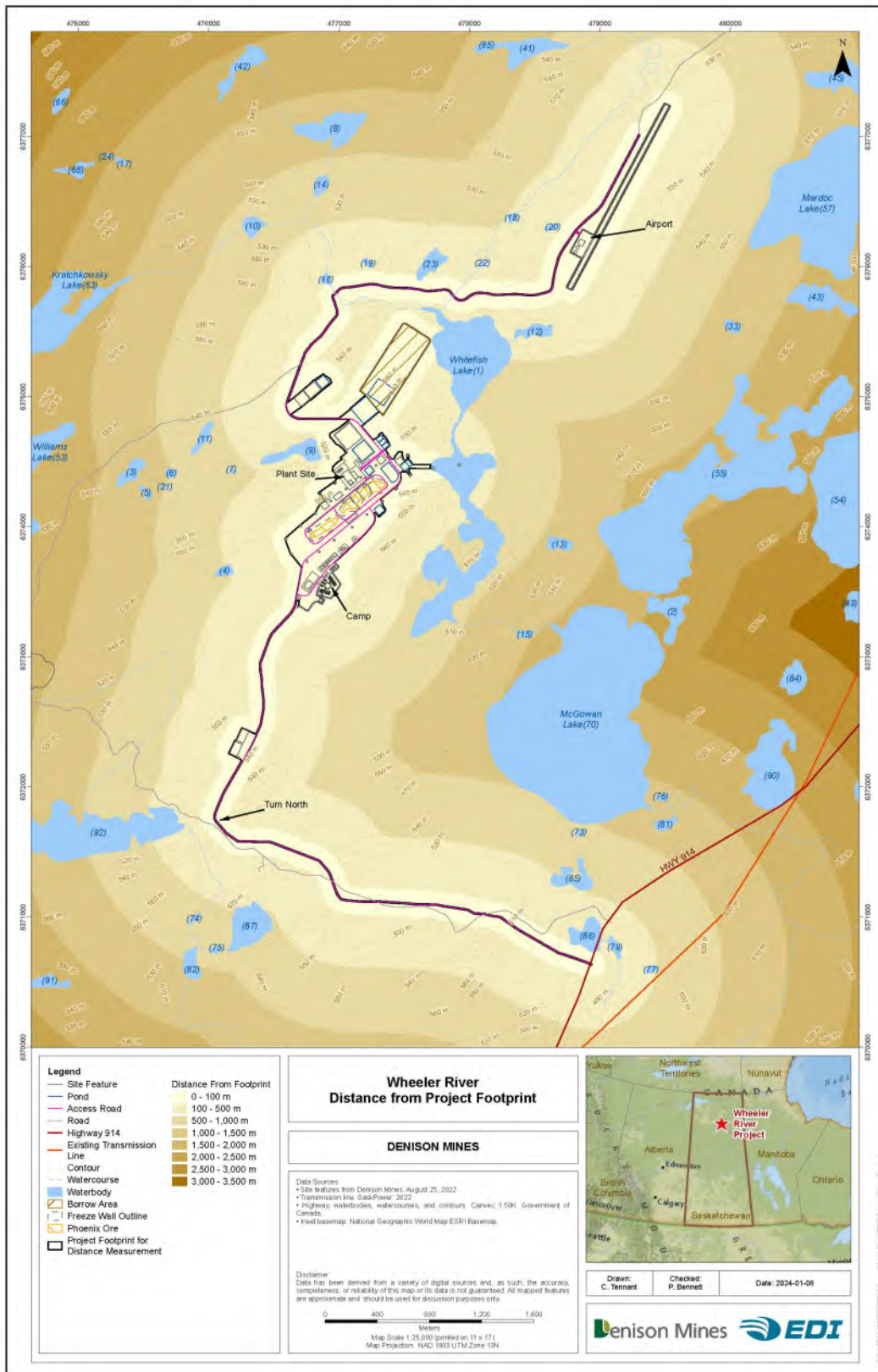


Figure IR-12-5: Distance from Project Footprint to Waterbodies

## ATTACHMENT IR-13

Original IR Number	IR-13
Follow Up IR Number	-
Dept.	ECCC CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	<p>Section 2.2.4, Waste Management</p> <p>Section 2.2.7.7, Borrow Area</p> <p>Section 2.3.1.3 Site Preparation and Earthworks</p>
Context and Rationale (original IR)	<p>Context: The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).</p> <p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p>Rationale: ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>
Information Requirement (original IR)	<p>Please provide:</p> <ol style="list-style-type: none"> <li>1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching; <ol style="list-style-type: none"> <li>a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML.</li> <li>b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.</li> </ol> </li> </ol>

	<p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>
Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)	<p>This response has not been accepted.</p> <p>In the response, Denison expected that portion of basement rock will be potentially acid generating and stated that all basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. However, criteria for segregating the potential acid generating waste rock from the clean waste rock are not provided.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings by either recovering uranium or placing the materials underground into the mining area at the end of a well's production. However, it is not clear how the potentially acid generating waste rock will be disposed of in the long term.</p>

Supporting figure and table to the response provided in the IR table:

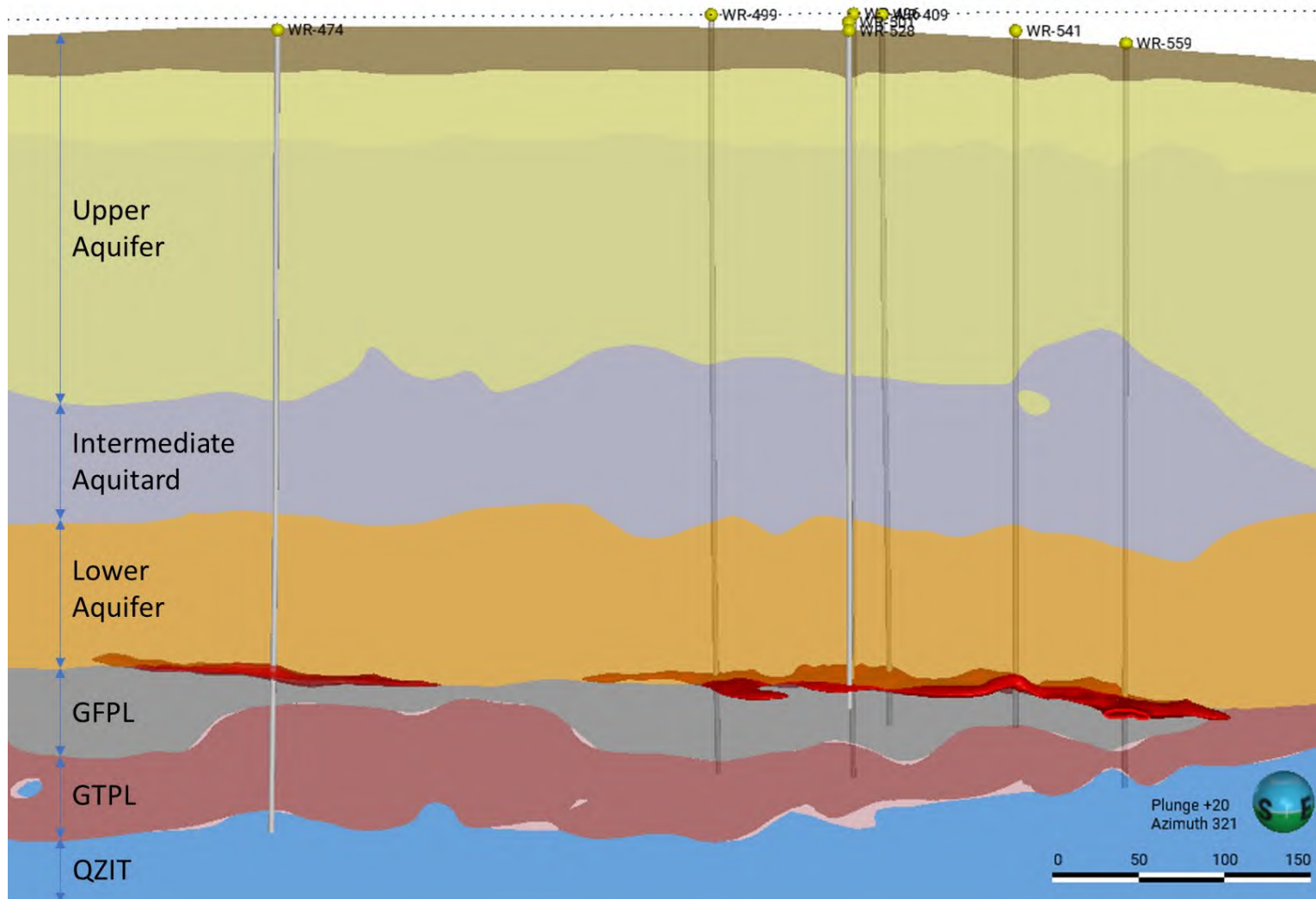


Figure IR-13-1: Major horizons of the sandstone (Upper Aquifer, Intermediate Aquitard, Lower Aquifer) and the different basement lithologies (Graphitic Pelite [GFPL], Garnetiferous Pelite [GTPL], Quartzite [QZIT]) associated with December 2023 ABA testing



Table IR-13-1: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other proposed mines

	Denison's Wheeler River Project (proposed uranium mine in Saskatchewan)	NexGen's Rook I Project (proposed underground uranium mine in Saskatchewan)	Foran's McIlvenna Bay Project (proposed underground copper-zinc mine in Saskatchewan)	Generation PGM's Marathon Palladium Project (proposed open pit platinum group metals and copper mine in Ontario)
Clean waste rock/NPAG	7,800 m <sup>3</sup>	8,000,000 m <sup>3</sup>	787,392 m <sup>3</sup>	183,146,067 m <sup>3</sup>
Mineralized or special waste (for U mines only)	150 m <sup>3</sup>	60,000 m <sup>3</sup>	n/a	n/a
PAG	1,850 m <sup>3</sup>	5,800,000 m <sup>3</sup>	1,823,164 m <sup>3</sup>	20,786,517 m <sup>3</sup>

Note: Volumes are a combination of pad storage capacities and life of mine volumes from publicly available documents including feasibility studies and EIS documentation. Any waste rock volumes presented as tonnes were converted to m3 by dividing by 1.78

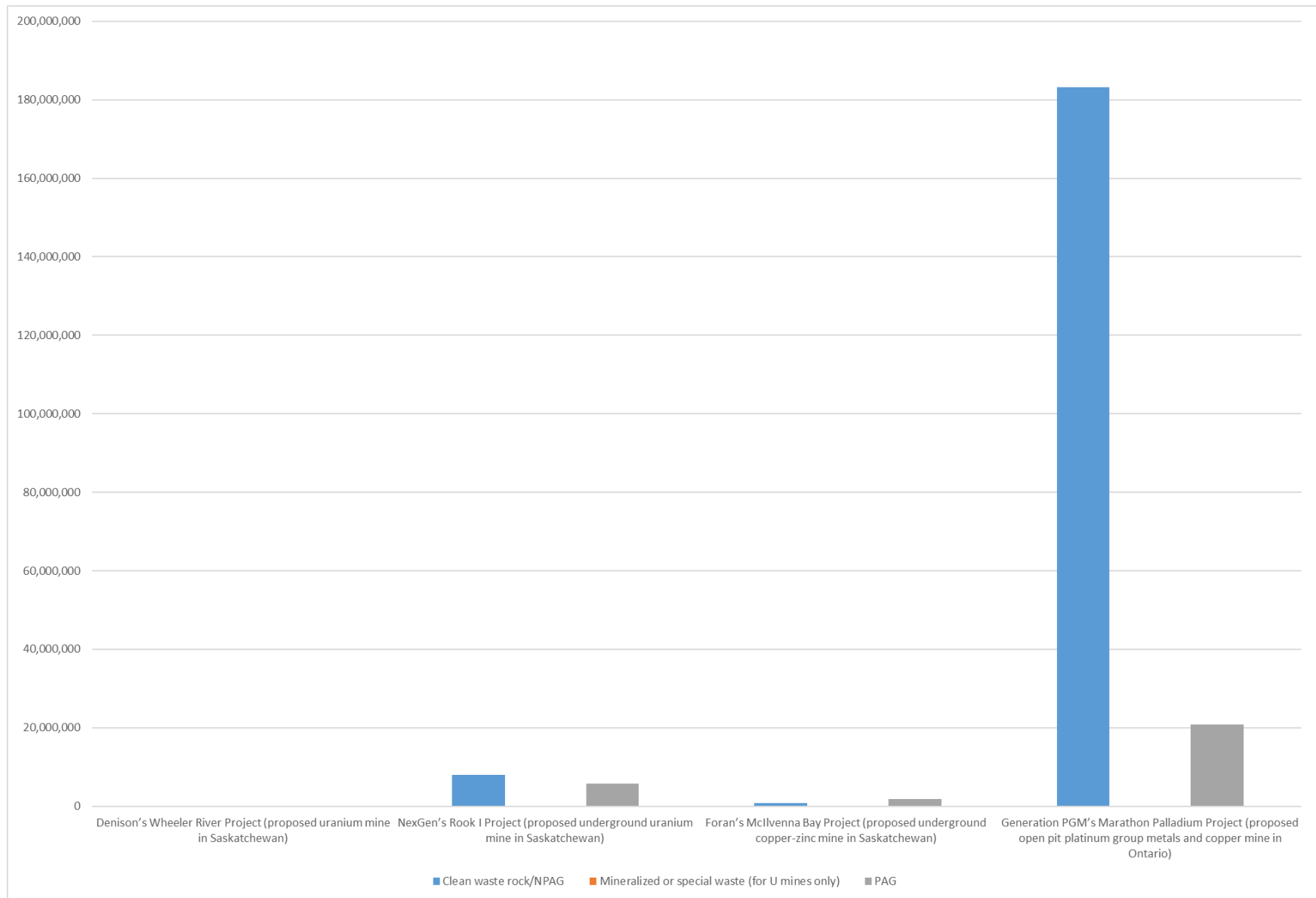
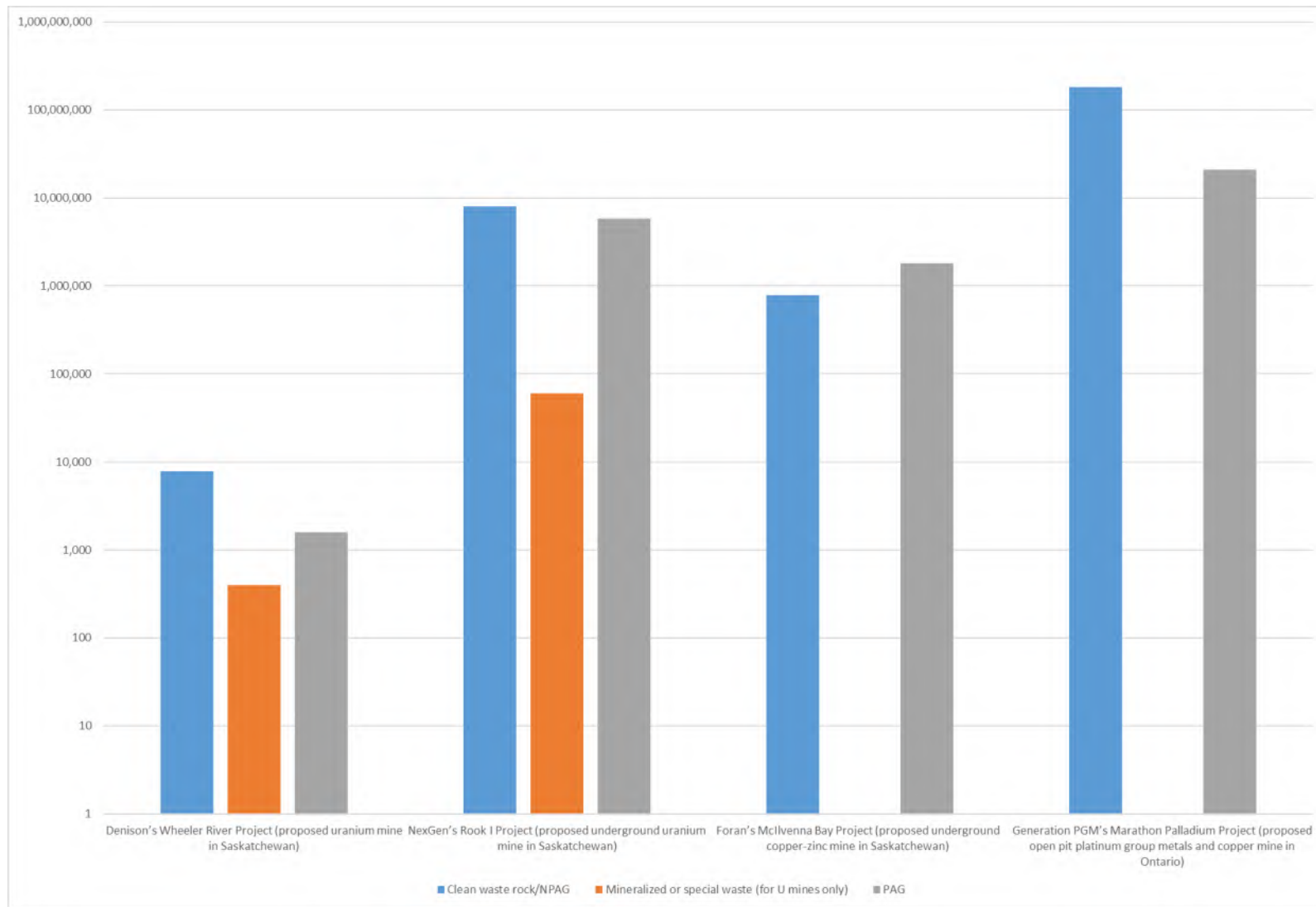


Figure IR-13-2: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other mines



Note: this is the data from Table IR-13-1 and shown in Figure IR-13-1, but this figure has a logarithmic scale on the y-axis.

Figure IR-13-3: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other mines (note: logarithmic scale on y-axis)

## ATTACHMENT IR-55

Original IR Number	IR-55
Follow Up IR Number	IR-55
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.3.3.1; Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2; Appendix 7-C, section 2.8
Context and Rationale (Original IR)	<p><b>Context:</b> According to the Proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is <math>8.4 \text{ E-}09 \text{ m/s}</math> based on field measurements. The Proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is <math>8.4 \text{ E-}10 \text{ m/s}</math>. Based on this information, structural geology and groundwater quality data, the Proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the Proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately <math>1.5 \text{ E-}07 \text{ m/s}</math>, or two orders of magnitude higher; b) The Proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The Proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the Proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p>

	<b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated in the Proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).
Information Requirement (Original IR)	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the Proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.
Rational for Status (unaccepted IR)	<p>This response has not been accepted.</p> <p>In response to IR-55, the Proponent states "The viewpoint from the third party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed."</p> <p>If the alternative model requested in IR-55 has been developed by the Proponent, NRCan requests that full details of this model be provided in an attachment.</p>

### **Denison's Response:**

#### **1.0 Introduction**

At request of the third-party reviewers, an alternative calibrated groundwater flow model was developed with a target hydraulic conductivity of  $1 \times 10^{-7}$  m/s within the competent portions of the Intermediate Sandstone Aquitard (ISA). This value was higher than the base case model value of  $1 \times 10^{-8}$  m/s, presented in Appendix 7-C of the revised Draft EIS.

The numerical groundwater flow model presented in Appendix 7-C was developed using the FEFLOW modelling software, and for this exercise, PEST was applied to find an alternative set of hydrogeologic parameters that would satisfy the calibration criteria (i.e., calibration constrained) with this higher hydraulic conductivity within the intermediate sandstone aquitard. The model structure (i.e., domain, mesh, layering, boundary conditions and hydrogeologic zonation) was left unchanged in this re-calibration; only the hydraulic conductivity values were changed. Vertical hydraulic conductivity values were tied to horizontal hydraulic conductivity values, resulting in consistent anisotropy ratios as those within the base case model.

The calibrated hydraulic conductivity values applied in the model, under both the base case and the alternative conceptualization, are presented in Table IR-55-1 alongside the range of field-based hydraulic conductivity values.

The hydraulic conductivity values simulated within the alternative calibrated scenario are considered to be on the high end of potential values for zones along the flow path toward Whitefish Lake, and thus provide a conservative estimate of potential hydrogeologic conditions. However, the model calibration was able to be maintained by combining these higher hydraulic conductivity values with offsetting lower hydraulic conductivity values in other areas.

**Table IR-55-1: Calibrated Hydraulic Conductivity**

Hydrostratigraphic Unit	Field Based Range of Hydraulic Conductivity (m/s)	Base Case Calibrated Horizontal Hydraulic Conductivity Value (m/s)	Alternative Calibrated Horizontal Hydraulic Conductivity Value (m/s)
Overburden Aquifer/Aquitard	$3 \times 10^{-6}$ to $2 \times 10^{-4}$	$5 \times 10^{-7}$ (till) to $8 \times 10^{-5}$ (sand)	$8.2 \times 10^{-8}$ (till) to $1.6 \times 10^{-5}$ (sand)
Upper Sandstone Aquifer	$4 \times 10^{-7}$ to $1 \times 10^{-4}$ (Geomean: $3.7 \times 10^{-6}$ )	$5 \times 10^{-6}$ (competent rock) to $5 \times 10^{-5}$ (desilicified rock)	$1 \times 10^{-5}$ (competent rock) to $1.6 \times 10^{-5}$ (desilicified rock)
Intermediate Sandstone Aquitard	$1 \times 10^{-10}$ to $3.8 \times 10^{-6}$ (Geomean: $8.4 \times 10^{-9}$ )	$1 \times 10^{-8}$ (competent rock) to $5 \times 10^{-6}$ (desilicified rock)	$1.0 \times 10^{-7}$ (competent rock) to $1.4 \times 10^{-4}$ (desilicified rock)
Lower Sandstone Aquifer	$7.8 \times 10^{-8}$ to $3 \times 10^{-5}$ (Geomean: $2.2 \times 10^{-6}$ )	$2 \times 10^{-7}$ to $1 \times 10^{-5}$	$8.5 \times 10^{-9}$ to $4.1 \times 10^{-5}$
Desilicified Zone Aquifer	$1 \times 10^{-6}$ to $2 \times 10^{-5}$ (Geomean: $4.8 \times 10^{-6}$ )	$5 \times 10^{-6}$	$1.4 \times 10^{-4}$
Ore Zone	$7.4 \times 10^{-10}$ to $2.7 \times 10^{-6}$ (5-spot Pumping Test Geomean: $1.0 \times 10^{-7}$ ) (Petrotek, January 2022)	$7 \times 10^{-10}$ to $2 \times 10^{-5}$	$6.2 \times 10^{-7}$
Lower Barrier Zone (underlying Ore Zone)		$1 \times 10^{-9}$	$5.3 \times 10^{-9}$
Basement Aquitards	$1 \times 10^{-11}$ to $1 \times 10^{-5}$ (Geomean : $4.8 \times 10^{-9}$ )	$1 \times 10^{-9}$ to $5 \times 10^{-9}$	$1.6 \times 10^{-9}$ to $4.9 \times 10^{-7}$

Key differences in the hydraulic conductivity values between the base case and alternative calibrated models include:

- 1) The Intermediate Sandstone Aquitard unit is simulated to have a higher hydraulic conductivity value of  $1 \times 10^{-7}$  m/s in the alternative model. It is noted that only 2 of 16 packer tests conducted within this unit produced values above  $1 \times 10^{-7}$  m/s, with the highest potential hydraulic conductivity values recorded near the MFb/MFc interface. As such, this alternative calibrated hydraulic conductivity value is considered conservatively high.
- 2) The Desilicified Zone Aquifer hydraulic conductivity was also simulated to be higher than the base case calibration, and higher than the range of measured hydraulic conductivities. The value of  $1.4 \times 10^{-4}$  m/s is almost 1 order of magnitude higher than the highest packer test value ( $2 \times 10^{-5}$  m/s), and 2 orders of magnitude higher than the most reliable estimates, which were obtained through pumping tests ( $2.7 \times 10^{-6}$  m/s). It is noted that the hydraulic conductivity of both the Desilicified Zone Aquifer and Intermediate Sandstone Aquitard units were increased to maintain calibrated conditions (i.e., the relative difference in hydraulic conductivities is important, which maintains the aquitard / aquifer relation between the two units).



- 3) The high hydraulic conductivity portions of the Lower Sandstone Aquifer were also increased to maintain a preferential flow path within this deeper unit.
- 4) The hydraulic conductivity values of materials surrounding the ore zone (i.e., the Upper and Lower Barrier zones, as well as the underlying paleo-weathered bedrock) were also increased in this simulation.
- 5) To compensate for the increased hydraulic conductivity values of the deeper units along the flow path between the Ore Zone and Whitefish Lake, the hydraulic conductivity values representing shallower units (i.e., the altered portion of the Upper Sandstone Aquifer and the Overburden sand Aquifer) were lowered by a factor of approximately 5. This adjustment was necessary to maintain calibration to observed water levels.

In summary, the hydraulic conductivity of the deeper units along the flow path between the Ore Zone and Whitefish Lake experienced an increase in hydraulic conductivity to maintain the relative ratio of conductivity values between them and the overlying Intermediate Sandstone Aquitard unit. In contrast, the shallow materials along this flow path experienced a lower hydraulic conductivity to maintain a calibrated condition.

## 2.0 Groundwater Model Calibration

### 2.1 Statistical Measures of Calibration to Water Levels

Calibration statistics were calculated as a measure of the statistical goodness of fit between the model-simulated and observed water level elevations for both the base case and alternative calibrated models (Table IR-55-2).

**Table IR-55-2: Water Level Calibration Statistics**

Calibration Statistic	Base Case Calibration	Alternative Calibration
Number of Calibration Targets	191	191
Mean Error (m)	0.23	0.33
Mean Absolute Error (m)	0.61	0.68
Root Mean Squared Error (RMS)	0.81	0.90
Normalized RMS (%)	4.1%	4.5%
Range of Observed Water Levels (m)	20.0	20.0
Baseflow: Observed: 29.3 to 50.6 L/s	40.6	44.5

As is evident from Table IR-55-2, the model calibration under the alternative calibrated conditions with higher hydraulic conductivity values representing the Intermediate Sandstone Aquitard, and Desilicified Zone is not as good as the base case calibration, and as such the model predictions should be viewed as less likely to occur than the base case model predictions. However, the alternative calibrated conditions are within the range of plausible values, given the available calibration data.

## **2.2 3D Groundwater Flow Patterns**

Groundwater elevation contours remained very similar between the calibrated models, as the calibration data constrains the simulated conditions. Under both calibrated conditions, groundwater from the vicinity of the Ore Zone is simulated to flow upward through the Desilicified Zone and discharge to Whitefish Lake.

The advective travel time to Whitefish Lake under the alternative calibration is approximately 250 years, which is similar to the predictions obtained with the base case model.

The alternative calibrated groundwater flow model, results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth through the ore zone/mining area.

## **3.0 Summary of Alternative Calibrated Model with Higher Conductivity within the Intermediate Sandstone Aquitard**

An alternative, calibrated groundwater flow model was developed with a hydraulic conductivity value representing the Intermediate Sandstone Aquitard of  $1 \times 10^{-7}$  m/s. While this hydraulic conductivity within the Intermediate Sandstone Aquitard is higher than expected given the geochemistry data and normative clay content observed in monitoring wells and mineralogical analysis of core logs, it is within the range of hydraulic conductivity values reported from packer tests completed within this unit. The alternative calibrated model was developed using PEST, wherein the hydraulic conductivity within other parameter zones were adjusted so that the alternative model was also consistent with the groundwater level and baseflow discharge field observations (i.e., calibration constrained).

The alternative model contains higher hydraulic conductivity values within the deeper portions of the groundwater flow system, including the Intermediate Sandstone Aquitard, the Lower Sandstone Aquifer and the Desilicified Zone. To compensate and maintain calibrated conditions, hydraulic conductivity values within the Upper Sandstone Aquifer and overlying sand (i.e., overburden) were reduced. The alternative model does not fit the field observations as well as the base case calibrated model presented within the EIS, however it is within the acceptable range for calibration metrics.

The resulting hydraulic conductivity distribution produces similar groundwater flow patterns, although with higher groundwater flow rates through the Lower and Intermediate Sandstone units, which are expected to produce greater dilution of COPCs along the flow paths toward Whitefish Lake. Advective groundwater transport timing to Whitefish Lake from the Ore Zone remained relatively consistent with the base case model.

In general, the alternative calibrated model does not fit the observation data as well as the simulations presented within the EIS. As such, it is considered a less-conservative modelled scenario than those already presented within the EIS. The alternative calibrated groundwater flow model results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth through the ore zone/mining area.

Analysis of transport of COPCs under this alternative calibrated scenario are presented as part of the response to IR-89.

## References

Petrotek. 2022. *Hydrologic Report, Summary of Findings, 2019-2021, Wheeler River Project*. Unpublished report prepared for Denison Mines. January 2022.

## ATTACHMENT IR-89-R1

Original IR Number	IR-89
Follow Up IR Number	IR-89-R1
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Numerical Modelling: Post- Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone  IR-89 Response from Denison
Context and Rationale (Original IR)	<p><b>Context:</b> The Proponent states that the range of hydraulic conductivities considered in sensitivity analysis was limited to values that fit within a calibration constrained uncertainty analysis of the model.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on the aquatic environment.</p> <p>The Proponent clarified the details of the calibration-constrained uncertainty analysis that was used for parameter bounding within the model, with hydraulic conductivity sensitivity bounds determined based on model calibration values that were supported by the available physical data.</p> <p><b>Rationale:</b> ECCC agrees that calibration constrained uncertainty analysis using hydraulic head field data is useful to determine probable upper limits of K values. However, there is always some degree of uncertainty in groundwater data and models. Sources of such uncertainty may include errors, lack of complete and representative field data to determine key parameters, or any number of heterogeneities associated with groundwater systems over large scales. Such uncertainties will always exist and can be accounted for by conducting a sensitivity analysis that accounts for the lack of physical data in the Desilicified Zone by running modelling scenarios using parameters that are outside of the calibration constrained values.</p>
Information Requirement (Original IR)	Expand the sensitivity analysis of hydraulic conductivity outside of calibration constrained parameters to account for the lack of physical data in the Desilicified Zone

## **Denison's Response:**

### **1.0 Introduction**

Simulations of conditions that extend beyond the range of conditions supported by the monitoring data (i.e., calibration-constrained conditions) is inappropriate for an EIS as it suggests that unrepresentative, potentially misleading scenarios should be tested, documented, and presented as potential outcomes. In the SME's view this would confuse the groundwater transport and associated risk discussions.

While we do not support development of un-calibrated scenarios for inclusion within the EIS, additional scenarios that did not violate field observation data were evaluated as part of this response. These scenarios further demonstrate the robust nature of the hydrogeologic setting, which has been shown to have a high assimilative capacity.

Additional groundwater flow and geochemical reactive transport modelling scenarios were performed in response to:

1. IR-55, wherein the hydraulic conductivity of the Intermediate Sandstone Aquitard was increased to a maximum value of  $1.0\text{E-}7$  m/s, and other parameter values, including the hydraulic conductivity of the Desilicified Zone, were increased to maintain a calibrated condition.
2. IR-70, wherein a higher hydraulic conductivity within the Ore Zone post-decommissioning was tested. This is an uncertain parameter which is unconstrained by calibration data.
3. IR-71, wherein uncertainty in future groundwater recharge rates were evaluated by varying rates by +/- 20%. Future groundwater recharge is an uncertain parameter which is unconstrained by calibration data.
4. IRs 78 & 88, wherein the effective porosity of the Paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate toward receptors 10-times faster. Effective porosity of the Paleoweathered zone is an uncertain parameter which is unconstrained by calibration data.
5. IR-96, wherein the transverse dispersivity was reduced to 1m to be consistent with ratios of longitudinal-to-transverse dispersivity published in the literature (e.g., Gelhar et al.; 1992) based on anisotropic settings. Transverse dispersivity is an uncertain parameter which is unconstrained by calibration data.

### **2.0 Post-Decommissioning Scenarios: Simulation Approach**

Post-decommissioning reactive transport was evaluated using the same sub-domain model as was used for all other scenarios presented within the EIS. The sub-domain model area and mesh were unchanged from previous simulations.

Where applicable (i.e., for IR-55), groundwater flow boundary condition values were updated to reflect the revised groundwater flow solution, and the hydrogeologic property values were updated to match those within the alternatively calibrated groundwater flow model. For all other simulations, only individual parameter values (e.g., hydraulic conductivity, recharge, porosity or dispersivity) were altered.

Transport boundary conditions and parameters were left unchanged from the Base Case condition. The 3D geochemical reactive transport simulation was completed using FEFLOW coupled with PiChem (i.e.,

the same approach followed for earlier simulations). The PHREEQC database, boundary and initial conditions, and simulation approach were the same as described within the EIS for the Base Case scenario. The full suite of 31 constituents was applied for selected scenarios, however as those simulations can take 3 to 4 weeks to complete, not all scenarios were able to be run with the full suite of constituents.

### **1. IR-55 Scenario: Higher Hydraulic Conductivity - Intermediate Sandstone Aquitard**

The IR-55 scenario documents an alternative calibrated groundwater flow model which was developed with a hydraulic conductivity of  $1.0\text{E-}07$  m/s within the Intermediate Sandstone Aquitard. This scenario also contained higher hydraulic conductivity values within the Desilicified Zone ( $1.4\text{E-}04$  m/s) and Lower Sandstone Aquifer ( $4.1\text{E-}05$  m/s); as such, the deeper units along the flow path between the Ore Zone and Whitefish Lake were all simulated as having increased hydraulic conductivity values. To maintain calibration, shallow materials along the flow path between the Ore Zone and Whitefish Lake were simulated to have a lower hydraulic conductivity than the Base Case (e.g., Overburden and Upper Sandstone Aquifer). For a full list of parameter values see the IR-55 groundwater flow response.

In general, the alternative calibrated model does not fit the observation data as well as the Base Case simulation presented within the EIS; however, the calibration statistics are acceptable. The alternative calibrated groundwater flow model results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth, through the Ore Zone/mining area. As such, it is considered a less-conservative modelled scenario than those already presented within the EIS.

### **2. IR-70 Scenario: Higher Hydraulic Conductivity – Ore Zone**

The hydraulic conductivity of the material remaining post mining within the Ore Zone, and the surrounding clay-rich or sulphide cemented units (i.e., natural barriers), is uncertain. Review comments have suggested that the impact of a higher value for hydraulic conductivity within the Ore Zone needs to be evaluated. While the hydraulic conductivity of the Ore Zone is not considered critical to predictions as it is only a small portion of the source area (i.e., 6% of the assumed Post-Decommissioning source mass), an additional scenario was performed to reflect the uncertainty in the post-mining hydraulic conductivity within the Ore Zone and the surrounding barrier zones; for this scenario the Ore Zone and natural barriers were treated as one uniform zone. As this is a future condition after the uranium ore and associated minerals have been removed, this parameter cannot be calibrated with current data. It is expected that the hydraulic conductivity of the Ore Zone and barriers will be enhanced due to mining, and thus a conservatively high hydraulic conductivity value of  $5.0\text{E-}05$  m/s was assigned for this scenario. This value reflects the understanding that the voids created through mining will be infilled with the overlying desilicified sandstone (i.e., the altered sandstone within the Lower Sandstone Aquifer), and may have a higher hydraulic conductivity than currently within the Lower Sandstone Aquifer (i.e.,  $5.0\text{E-}06$  m/s).



### **3. a), b) IR-71 Scenario: Lower / Higher Groundwater Recharge**

Recognizing that future climate conditions are uncertain, and that the predicted timespan of migration of chemical constituents from within the mining area to Whitefish Lake requires centuries to millennia, the future climate is uncertain. A reduction in groundwater recharge is considered most likely due to enhanced evapotranspiration and surface water runoff; such a reduction would reduce groundwater flow rates which is considered to be less conservative than scenarios presented within the EIS. While current groundwater recharge can be calibrated based on field observations (e.g., stream baseflow, water level fluctuations, etc.), groundwater recharge in future centuries cannot be calibrated.

Review of future climate predictions presented by Environment Canada (climatedata.ca – Key Lake) indicates precipitation will increase by 11 to 15%, and temperature will increase by 2.5 to 4.6°C. The future change in groundwater recharge is not specified but based on the range of variability that others (e.g., Erler et. al., 2019) have found for the foreseeable future (i.e., end of century), a range of +/- 20% was selected for future recharge simulations.

### **4. IR-78 & 88 Scenario: Lower Effective Porosity within the Paleoweathered Zone**

Effective porosity within the units where constituents of potential concern (COPCs) will remain post-mining will affect the persistence of COPCs within the source area, and the residence time within deeper units. Simulations within the EIS illustrate that the most persistent portion of the source area is within the Paleoweathered bedrock, and so the uncertainty of the effective porosity within this unit is considered to be most relevant. As noted in Appendix 7-C of the revised Draft EIS (Table 4-2), the effective porosity within the Paleoweathered zone was enhanced to account for potential matrix diffusion effects. The scenario herein presents the change in predicted conditions if the effective porosity of the Paleoweathered zone is reduced by an order of magnitude, as would be consistent with lesser matrix diffusion effects. This value is not constrained by model calibration.

### **5. IR-96 Scenario: Lower Transverse Dispersivity**

Dispersivity values incorporated within geochemical reactive transport calculations impact the degree of mass spreading as hydrogeologic heterogeneities are experienced. A wealth of literature is available to document that longer plumes experience greater dispersion as they flow through larger volumes of heterogeneous subsurface materials. While reviewers agree with the magnitude of dispersivity values applied within the EIS scenarios, the ratio of dispersivity along the flow paths (i.e., longitudinal) to perpendicular from the flow paths (i.e., transverse) was questioned. In settings with high degrees of anisotropy created by depositional variations (e.g., horizontally stratified sediments such as fluvial sands with silt interbeds), the ratio between longitudinal and transverse dispersivity has been shown to be 100:1 (Gelhar et al.; 1992), particularly for the transverse dispersion component across lower conductivity features such as silt interbeds within sand aquifers (i.e., vertical transverse dispersion in a horizontally dominated flow field). For the Denison Mines setting, where the hydrogeologic material of interest is within hydrothermally altered (i.e., desilicified) sandstone, transverse dispersion is expected to be relatively high and isotropic to be consistent with the isotropic hydraulic conductivity of desilicified sediments. Further, as flow is not horizontally dominated (e.g., vertically upward flow through the Desilicified Zone) differentiating transverse components of dispersivity is not appropriate for this setting.

Since this parameter cannot practically be field verified, nor is it constrained through groundwater flow model calibration, an additional scenario with a lower transverse dispersion rate, such that a 10:1 ratio of longitudinal to transverse dispersion was evaluated.

### **3.0 Reactive Transport Predictions at Whitefish Lake**

Table IR-89-R1-1 presents the transport results simulated for the above scenarios; the Base Case conditions are also provided for comparison. In general, the peak concentrations reaching Whitefish Lake were similar to the Base Case simulation and are within the range of simulation results presented within the EIS. As such these simulation results do not further expand the range of potential outcomes already presented. Further, the simulations indicate that groundwater quality screening criteria (GQSC) are only exceeded for dissolved manganese and iron, as was presented within the EIS.

#### **1. IR-55 Scenario: Higher Hydraulic Conductivity - Intermediate Sandstone Aquitard**

For the IR-55 scenario, which had a hydraulic conductivity of  $1.0\text{E-}07$  m/s within the Intermediate Sandstone Aquitard, concentrations were simulated to be lower (i.e., less conservative) than the Base Case scenario. This is expected to be due to enhanced mixing with fresh water as a result of higher volumes of groundwater flow through those zones with higher hydraulic conductivity values. Under the IR-55 alternative calibrated case, the hydraulic gradient remained relatively unchanged to be consistent with the observed water levels, and thus the groundwater flow rates converging on Whitefish Lake were increased (see simulated baseflow: IR-55), resulting in a decreased contribution of flow from the deep aquifers relative to the total volumetric groundwater flow into Whitefish lake. This results in an overall reduction in the peak concentrations of COPCs in groundwater beneath Whitefish Lake.

#### **2. IR-70 Scenario: Higher Hydraulic Conductivity – Ore Zone**

Simulating a higher hydraulic conductivity for the Ore Zone post mining produced similar peak concentrations reaching Whitefish Lake as the Base Case scenario. As an increase of the hydraulic conductivity by more than one order of magnitude did not make an appreciable difference in the simulated peak concentrations reaching Whitefish Lake, we re-affirm that the hydraulic conductivity of the Ore Zone is not a controlling parameter for mass discharge reaching Whitefish Lake. This is consistent with the mass within the Ore Zone being a relatively small percentage (e.g., 6% uranium by mass) of the total dissolved-phase mass in the mining area Post-Decommissioning, as conceptualized in the model.

#### **3. a), b) IR-71 Scenario: Lower / Higher Groundwater Recharge**

The scenarios where future groundwater recharge was varied by +/- 20% due to future climate change did not appreciably change peak concentrations reaching Whitefish Lake. The findings of these simulations also support the IR-71 response wherein climate change was not simulated because it was expected to produce lower peak COPC concentrations at Whitefish Lake than the Base Case. The simulation with lower groundwater recharge is interpreted to produce a lower hydraulic gradient, and thus a lower rate of groundwater flow from the mining area, than the Base Case. Conversely the higher groundwater recharge case provides more a greater volume of water moving through the sub-surface, resulting in a smaller relative contribution from the mining area. Both cases result in similar, but lower peak concentrations reaching Whitefish Lake.

#### 4. **IR-78 & 88 Scenario: Lower Effective Porosity within the Paleoweathered Zone**

Reduction of the effective porosity within the Paleoweathered bedrock was shown to have the largest impact on simulated peak COPC concentrations reaching Whitefish Lake. Slightly higher peak concentrations than the Base Case were simulated for a suite of COPCs (i.e., As, Cd, Co, P, Ra, Se, Sr, U, Zn). This simulation reflects a reduced ability for matrix diffusion to contain mass within the Paleoweathered zone and slowly release it over time. With the exception of dissolved iron (Fe) and manganese (Mn) concentrations, none of the other (relatively) elevated COPC concentrations reached levels above GQSC within the simulated timeframe. Based on simulated trends, showing decreasing concentrations at depth, additional COPC concentrations are not expected to exceed GQSC even further into the future.

#### 5. **IR-96 Scenario: Lower Transverse Dispersivity**

Reduction of the transverse dispersivity to maintain a ratio of 10:1 for the longitudinal to transverse dispersivity values resulted in higher COPC concentrations reaching Whitefish Lake than for the Base Case. For this scenario, the longitudinal dispersivity remained at the Base Case level (i.e., 10 m), while the transverse dispersivity value was reduced to 1m (5m in the Base Case). As in the other simulated cases, with the exception of dissolved iron (Fe) and manganese (Mn) concentrations, none of the other COPC concentrations reached levels above GQSC within the simulated timeframe.

**Table IR-89-R1-1: Peak Groundwater Concentrations Reaching Whitefish Lake: Alternative Scenarios Consistent with Observed Conditions (all concentrations in mg/L)**

COPC	Groundwater Quality Screening Criteria	EIS Base Case	1. IR-55 Alternative Calibration (K <sub>ISA</sub> = 1.0E-7 m/s; K <sub>DSZ</sub> = 4.0E-5 m/s)	2. IR-70 High Ore Zone Hydraulic Conductivity Post Decommissioning (K <sub>OZ</sub> = 5.0E-5 m/s)	3a. IR-71 20% Lower Groundwater Recharge	3b. IR-71 20% Higher Groundwater Recharge	4. IR 78 & 88 Lower Effective Porosity Paleoweathered Zone (1%)	5. IR-96 Lower Transverse Dispersivity (α <sub>TV</sub> = α <sub>TH</sub> = 1.0m)	Comment
Al	0.05	3.0E-02	3.0E-02	3.0E-02	4.1E-02	3.9E-02	3.7E-02	4.3E-02	Naturally near GQSC, Peak @ 750 yrs.
As	0.005	3.2E-04	3.1E-04	3.2E-04	3.2E-04	3.2E-04	3.4E-04	3.3E-04	Naturally near GQSC, Peak @ 2000-3000 yrs.
Ba	--	3.9E-02	3.5E-02	3.9E-02			3.9E-02		Background
Ca	--	7.0	4.5	7.8	7.2	6.9	6.6	12	Peak @ 400 yrs.
Cd	4.0x10 <sup>-5</sup>	1.1E-05	1.0E-05	1.1E-05	1.1E-05	1.1E-05	1.2E-05	1.1E-05	Peak @ 500-3000 yrs.
Cl	120	9.9	7.1	10.9	10.1	9.8	9.5	14.6	Peak @ 400 yrs.
Co	7.8x10 <sup>-4</sup>	4.2E-04	4.2E-04	4.3E-04	4.2E-04	4.2E-04	4.5E-04	4.5E-04	Late time peak
Cr	8.9x10 <sup>-3</sup>	5.3E-04	5.2E-04	5.3E-04			5.3E-04		Peak @ 500 yrs.
Cu	2.0x10 <sup>-3</sup>	7.0E-04	7.0E-04	6.9E-04			7.8E-04		Late time peak
F	--	6.1E-02	6.0E-02	6.1E-02			6.2E-02		Late time peak
Fe	0.3	<b>1.9</b>	<b>0.66</b>	<b>2.4</b>	<b>2.0</b>	<b>1.9</b>	<b>2.0</b>	<b>4.4</b>	Peak @ 400 yrs.
K	--	3.1	3.2	3.1	3.1	3.0	2.9	3.4	Background
Mg	--	2.8	2.8	2.8	2.8	2.7	2.7	3.9	Background
Mn	0.23	<b>0.28</b>	<b>0.22</b>	<b>0.28</b>			<b>0.28</b>		Peak @ 400 yrs.
Mo	31	3.1E-03	7.3E-04	9.2E-04			8.6E-04		Peak @ 400 yrs.
Na	--	5.1	4.5	5.4	5.2	5.0	6.4	7.6	Peak @ 400 yrs.
Ni	2.5x10 <sup>-2</sup>	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	2.0E-03	Background
P	--	7.4E-02	5.8E-02	7.4E-02	1.2E-04	1.2E-04	9.4E-02	1.3E-04	Peak @ 500 yrs.
Pb	1.0x10 <sup>-3</sup>	1.2E-04	1.2E-04	1.2E-04			1.2E-04		Background
Ra	3.0x10 <sup>-9</sup>	2.3E-09	1.8E-09	2.1E-09			2.6E-09		Peak @ 400 years and at late time
SO <sub>4</sub>	128	13	3.5	16	13	12	13	30	Peak @ 400 yrs.
Se	2.0x10 <sup>-3</sup>	8.4E-04	8.2E-04	8.4E-04	8.4E-04	8.3E-04	8.4E-04	8.7E-04	Peak @ 400-800 yrs.
Sr	2.5	1.2E-01	7.7E-02	1.4E-01			1.2E-01		Peak @ 400 yrs.
Th	1.24x10 <sup>-4</sup>	3.2E-08	3.0E-08	3.1E-08			3.7E-08		Background
U	0.015	5.4E-04	5.3E-04	5.4E-04	5.5E-04	5.5E-04	1.3E-03	6.0E-04	Late time peak
V	0.12	6.6E-03	1.0E-04	1.3E-04			1.3E-04		Peak @ 400 yrs.
Zn	0.011	4.7E-03	4.6E-03	4.8E-03			5.1E-03		Late time peak
Simulated Time (years)		8720	7600	6400	5600	10000	10000	10000	

## Summary of Additional Simulation Results

Additional long-term predictive simulations of COPC transport were undertaken to evaluate the areas of uncertainty highlighted within the second round IRs. Scenarios tested were limited to those that were consistent with, or did not contradict, available observations. The areas of uncertainty included:

- 1) Hydraulic conductivity of the Intermediate Sandstone Aquitard ( $1.0\text{E-}07$  m/s), Desilicified Zone ( $1.4\text{E-}04$  m/s), and Lower Sandstone Aquifer ( $4.1\text{E-}05$  m/s). The alternative calibrated scenario presented contained higher hydraulic conductivities than the Base Case model for each of these hydrogeologic units with increases of 10, 28, and 4, respectively.
- 2) Hydraulic conductivity of the Ore Zone post-decommissioning was increased to  $5.0\text{E-}05$  m/s, which is a factor of 10 higher than the overlying Lower Sandstone Aquifer. It is considered to reflect a very high value that could result due to the dissolution mining process.
- 3) Groundwater recharge was varied by +/- 20% to evaluate potential future climate change impacts on groundwater flow and subsequent COPC transport.
- 4) The effective porosity of the Paleoweathered zone was lowered by a factor of 10 to evaluate a case where the mass was less persistent within this unit, which is the deepest portion of the source zone.
- 5) The transverse dispersivity value was lowered by a factor of 5 to achieve the requested 10:1 ratio between longitudinal and transverse dispersivity values.

All additional scenarios produced similar predicted peak COPC concentrations reaching Whitefish Lake. All scenarios produced concentrations of primary COPCs at Whitefish Lake that are below the groundwater quality screening criteria established, with the exception of iron and manganese due to naturally high background levels, as reported within the EIS.

The key understanding gained, or further supported, through these simulations is that the natural groundwater system has a high assimilative capacity such that reasonable changes to parameters do not produce concentrations of COPCs at Whitefish Lake that exceed the groundwater quality screening criteria (with the exceptions of dissolved manganese and iron, which naturally occur at elevated concentrations). As the peak concentrations reaching Whitefish Lake do not exceed groundwater quality screening criteria within these additional scenarios, no additional or enhanced risk to the natural environment is expected.

## References

- Erler, A. R., Frey, S. K., Khader, O., d'Orgeville, M., Park, Y.J., Hwang, H. T., et al. (2019). Evaluating climate change impacts on soil moisture and groundwater resources within a Lake affected region. *Water Resources Research*, 55, 8142–8163. <https://doi.org/10.1029/2018WR023822>
- Gelhar, L.W., Welty, C., & Rehfeldt, K.R. (1992). A critical review of data on field-scale dispersion in aquifers. *Water Resources Research* 28, no. 7, 1955-1974.

**Attachment IR-102**

Number	IR-102
Comment From	ECCC
Category	Fish and Fish Habitat
Page # in EIS	
Section # in EIS	8.1.3.1 Appendix 8-C, including Appendix II, Table 1 (p. 2)
Comment	<p>In response to IR-102 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>1. Given the limitation of data availability extension of flow records based on the nearest active WSC hydrometric station (Wheeler River (06DA005)) is acceptable although other methods are not shown to be explored by the proponent including rainfall-runoff modelling techniques (such model can be calibrated at 06DA005 thus computed flow at subbasins or sub watershed can be estimated with good degree of confidence), drainage area ratio method, etc. CNSC staff recommends proponent to consider aforementioned methods or similar or provide justification why other methods were not considered.</p> <p>2. In Attachment IR-102 Figure 1 to 7 show the plots of measured versus the estimated daily flows using the relationship developed for extension of daily flows at SA-1, SA-2, SA-3, SA- 4, SA-5, SA-6, SB-3, LA-1 and LA-5. CNSC staff however finds it difficult to determine the predictive accuracy of the relationships based on visual comparisons. Therefore, CNSC staff requests that the proponent provide quantitative measures of prediction accuracy, for example in the form of Root Mean Square Error, correlation coefficient, etc., for the Equations presented in Table 1 of Attachment IR-102.</p> <p>In addition, CNSC staff requests that the proponent provide clarification on whether the current relationships are only limited to baseline characterization or will also be considered for estimation of design flows at SA-4 and SA-5 for culvert/crossing design for the access road.</p> <p>3. Response to third part of the IR to be re-assessed when proponent addresses the above two comments ([1] and [2]).</p>

**Denison Response:**

1. Though other methods exist for extension of flow rates from 06DA005 to the RSA, the Proponent believes it sufficient to rely on the transfer method used in the water quantity (hydrology) component of the EIS. The transfer method is an advanced form of unit area transfer which incorporates additional algorithms to adjust to streamflow response. In some cases, unit area runoff without additional algorithms was used to transfer the record specifically for SA-5, SB-3, LA-1 and LA-5. The transfer method was used for all other nodes in an effort to be most accurate with respect to representing localized flows when using the 06DA005 station as the foundational dataset for extrapolation.



The transfer method employed in the technical assessment (Appendix 8-C) and summarized in the EIS relies on measured data from the LSA and is compared to other measured data within the same watershed. A rainfall-runoff model would rely upon transfer of climate data to site from the closest meteorological station (Key Lake Mine) or interpolated grid data neither of which can be confirmed to accurately reflect site conditions. The transfer method used is the most site specific possible and therefore in our view provides the best level of accuracy and use of empirical data for this time period.

2. To further confirm the viability of the chosen extension method, the Root Mean Square Error (RMSE) between the transfer method and the unit area runoff method was estimated for comparison. Baseline data reported by Ecometrix Incorporated (2019) present hydrometric monitoring data at several of the stations at the Project. These data represent the observed data set against which the synthesized data are checked. The baseline data in some cases are hydrographs from installed sensors and in other cases are point measurements of discharge. The observed and synthesized hydrographs were checked between coincident dates of available data. Two synthesized hydrographs are compared for RMSE, the first hydrographs are those developed using the transfer discussed in the EIS, technical support memo (Appendix 8-C) and previous response to this IR. The second hydrograph is developed using unit area runoff relationships.

As mentioned above, four stations were developed using the unit area runoff method, therefore nullifying the utility of a method comparison for these locations. The remaining five stations include SA-1, SA-2, SA-3, SA-4 and SA-6. RMSE is a comparison of the differences between observed and synthesized data. The squared error is estimated between coincident data points and the RMSE for a dataset is the sum of that error. A perfectly matching data set would have an RMSE of 0 and a negative RMSE is not possible. The following table presents the estimated RMSE values for the two synthesized hydrographs at the relevant stations. For all stations, the reported transfer equation yields a better RMSE than unit area runoff.

**Table 1: Hydrology Station Correlation Coefficients for RMSE Methods as Compared to Historical Data**

Station	Reported Transfer Equation RMSE	Unit Area Runoff RMSE
SA-1	0.252	0.426
SA-2	0.317	0.381
SA-3	0.080	0.345
SA-4	0.090	0.118
SA-6	0.362	0.453

As a result, it is confirmed that the use of the reported transfer equation method is fit for use as part of the hydrology assessment and for the purposes of:

- a) Baseline water quantity characterization
- b) Estimates of change in water quantity as a result of the Operation; and,
- c) Assessment of potential impacts to the environment as part of the EIS including for water quantity and all other components of Section 8 that may be influenced by changes in water quantity.

Therefore, no additional changes to the EIS with regard to this IR are required.

## Attachment IR-103

Number	IR-103
Comment From	ECCC CNSC
Category	Fish and Fish Habitat
Page # in EIS	
Section # in EIS	Section 8.1.3.4 Climate Change Influenced Extreme Events
Comment	<p>This response has not been accepted.</p> <p>In the Context and Rationale of AD-15 in the Annex 1 – Denison Response, ECCC recommends that the Proponent consult CSA PLUS 4013:19 (2019) <i>Technical guide: Development, interpretation and use of rainfall intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners</i> regarding the consideration of future changes in short-duration precipitation extremes. In IR-103, ECCC indicated that in order to assess the accuracy of the Intensity duration frequency (IDF) curves, ECCC required that the Proponent provide the gauged stations generating the values for the modelled data. The Proponent provided the closest gauged stations; however, the future short duration precipitation values were based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes.</p> <p>Additionally, on page 15-19 of the draft EIS states that: “Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” Denison did not provide details on how climate factors will be considered within their adaptive management plans.</p> <p><b>Rationale:</b> Estimates of future short duration precipitation that are based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes, such as the approach used by the Proponent, are unlikely to provide reliable projections. This is because the amount of information regarding changes in local-scale observed extreme precipitation contained in short records is not sufficient to constrain a regression (model the statistical relationship) between local and larger scale simulations (Li et al., 2019; ECCC 2022). An alternative approach is to base future projections on a comprehensive assessment that integrates climate science understanding and model projections over a large region. The recent Canadian Standards Association (CSA 2019) guidance on IDF for Canadian Water Resources practitioners provides such an assessment.</p> <p>In terms of adaptive management, the Proponent should clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p> <p>In order to assess the Proponent’s adaptive management strategies for future extreme precipitation events, ECCC requests that the Proponent consult the CSA (2019) guidance when using future IDF projections in the Project design and provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration.</p> <p>1. Provide revised estimates of the potential future changes in short-duration precipitation</p>

	<p>extremes over the Project's duration as relevant to the Project design.</p> <p>2. Demonstrate how the CSA (2019) guidance will be incorporated in the Project design when developing and considering future IDF projections and estimates of the potential future changes in short-duration precipitation extremes.</p> <p><b>References</b></p> <p>CSA Group. (2019). Technical guide: Development, interpretation and use of rainfall intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners. <i>CSA PLUS 4013 :19</i>. <a href="https://www.csagroup.org/store/product/2703080/">https://www.csagroup.org/store/product/2703080/</a></p> <p>ECCC (2022). Draft Technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience. <a href="https://www.strategicasessmentclimatechange.ca/28896/widgets/117114/documents/77106">https://www.strategicasessmentclimatechange.ca/28896/widgets/117114/documents/77106</a></p> <p>Li, C., Zwiers, F., Zhang, X., &amp; Li, G. (2019). How much information is required to well constrain local estimates of future precipitation extremes? <i>Earth's Future</i>, 11-24.</p>
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### **Denison Response:**

A review of the CSA Group (2019) document was undertaken and an estimate of the IDF using this guidance was undertaken. The result of this estimate for the Key Lake Mine Station 4063753 using data corresponding to the period 2014 to 2023 was 69.6 mm for the 1:100-year 24 hours storm event. This estimate is greater than the estimate provided by ECCC of 67.2 mm at Key Lake Mine for the period 2011 to 2021 by approximately 4% ([https://climate.weather.gc.ca/prods\\_servs/engineering\\_e.html](https://climate.weather.gc.ca/prods_servs/engineering_e.html); [https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer\\_Climate/IDF/](https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer_Climate/IDF/)). The calculated estimate is greater than the ECCC estimate likely owing to large rain events occurring in northern Saskatchewan in 2022.

The IDF\_CC tool Version 5.0 (<https://www.idf-cc-uwo.ca/>) was used to estimate design events at the Project. The previous results reported based on generalized extreme value (GEV) distribution (79.9 mm in current scenario and 88.6 mm in a future scenario). IDF\_CC tool Version 7.0 is the new version of the website and now, using GEV, estimates a 79.9 mm current scenario and 94.7 mm future scenario (RCP8.5 for time period 2015-2100). Within IDF\_CC tool Version 7.0, the Gumbel distribution yields 80.9 mm in current scenario and 95.8 mm for future scenario (RCP8.5 and 2015-2100). These data, as well as similar estimates for the Project and Key Lake Mine are summarized in the following table where all estimates reflect a 1:100-year 24 hour precipitation event and all future scenarios assume RCP8.5 for 2015-2100. The Key Lake Mine is approximately 35 km south-southeast of the Project area for reference.

Scenario Description	Statistical Method	Estimated Period	Location	Data Source	Data period (as indicated)	Estimate (mm)
<b>Environment Canada published IDF curves</b>	Gumbel	Current	Key Lake Mine Site	Key Lake climate station (Station 4063753)	2011-2021	67.2
<b>EIS Document</b>	IDF_CC Tool 5.0 – GEV	Current	Project	Interpolated grid data	Not reported	79.9
<b>EIS Document</b>	IDF_CC Tool 5.0 – GEV	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	88.6
<b>Manual Calculation</b>	Gumbel	2014-2023	Key Lake Mine Site	Key Lake climate station (Station 4063753)	2014-2023	69.6
<b>IDF_CC Tool 7.0</b>	GEV	Current	Key Lake Mine	Key Lake climate station (Station 4063753)	2011-2021	56.4
<b>IDF_CC Tool 7.0</b>	GEV	Predicted Future	Key Lake Mine	Key Lake climate station (Station 4063753)	RCP8.5 2015-2100	68.1
<b>IDF_CC Tool 7.0</b>	Gumbel	Current	Key Lake Mine	Key Lake climate station (Station 4063753)	2011-2021	67.2
<b>IDF_CC Tool 7.0</b>	Gumbel	Predicted Future	Key Lake Mine	Key Lake climate station (Station 4063753)	RCP8.5 2015-2100	73.9
<b>IDF_CC Tool 7.0</b>	GEV	Current	Project	Interpolated grid data	2011-2021	79.9
<b>IDF_CC Tool 7.0</b>	GEV	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	94.7
<b>IDF_CC Tool 7.0</b>	Gumbel	Current	Project	Interpolated grid data	2011-2021	80.9
<b>IDF_CC Tool 7.0</b>	Gumbel	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	95.8

As seen in the table, a range of 1:100-year 24 hour rainfall events can be estimated using different methods, data sources and timeframes. The predicted future estimate originally presented using IDF\_CC Tool 5.0 (Scenario 3) is lower only than those future estimates via Gumbel and GEV estimated for the same timeframe using IDF\_CC Tool 7.0. The IDF\_CC tools follows the same methodology as that used by ECCC and recommended by the above-referenced CSA document. The IDF\_CC tool also makes use of a gridded climate data set and, though Key Lake Mine is only 35 km from the Project, the projected change in rainfall values is substantial. As such, the use of the IDF\_CC tool is conservative. Further to that point, site facilities are designed in consideration of the Probable Maximum Precipitation event of 493 mm. That event is more than 5 times higher the largest predicted scenario by any of the above presented methodologies.

Despite Denison's reiteration that the PMP is adequate for the EA level design basis, Denison is committed to revisiting the estimates of the IDF as per CNSC's recommendations, as applicable, for the licensing phase of the Project.

**Attachment IR-107**

Number	IR-107
Comment From	ECCC
Category	Aquatic Environment
Page # in EIS	
Section # in EIS	Section 8.2.3.3, Existing Surface Water Quality
Comment	<p>In response to IR-107 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions.</p> <p>CNSC and ECCC staff have the following expectations:</p> <ol style="list-style-type: none"><li>1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices.</li><li>2. Confirm which federal requirements were used when assessing potential impacts through EA.</li><li>3. Confirm which data quality objectives were used to establish the baseline, provide references if available</li><li>4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.</li></ol>

**Denison's Response:**

The water quality sampling for baseline was conducted over several years from 2011 to 2019. In years 2015 and 2017 sampling did not occur. Sampling occurred during the open water period and most consistently in May, June, August, September and October. The reviewer is correct in that sampling did not occur on a monthly basis at each of the sampling locations over all years. The table below provides a summary of the periodicity of sampling as it occurred over the described period at each station.



**Table 1: Water Quality Sampling by Year and Location**

Station ID	2011		2012			2013		2014		2016	2018		2019		Total
	May	Jun	May	Aug	Oct	Aug	Oct	Mar	Apr	Sep	Mar	Jul	Jul	Aug	
Lakes															
LA-1		1		1				1		1	1	1			6
LA-2		1						1		1					3
LA-3		1						1		1					3
LA-4								1		1					2
LA-5				1					1	1					3
LA-6				1				1		1	1	1			5
LA-7				1				1		3					5
LA-8										1					1
LA-9										1					1
LAB-1				1				1		1					3
LAB-2										1					1
LB-1										1					1
LB-2									1	1					2
LB-3				1					1	2					4
LA-1											1	1			2
Sub-Total	0	3	0	6	0	0	0	7	3	17	3	3	0	0	42
Streams															
SA-1	1	1	1	1	1	1	1	1					1	1	10
SA-2	1	1	1	1	1	1	1	1					1	1	10
SA-3	1	1	1	1	1	1	1	1					1	1	10
SA-4	1	1	1	1	1	1	1	1					1	1	10
SA-5	1	1	1	1	1	1	1	1					1	1	10
SA-6	1		1	1	1	1	1		1				1	1	9
SB-1	1	1	1	1	1	1	1	1							8
SB-2	1	1	1	1	1	1	1								7
SB-3	1	1	1	1	1	1	1	1							8
SB-4	1	1	1	1	1	1	1								7
SB-5	1		1	1	1	1	1	1							7
Sub-Total	11	9	11	11	11	11	11	8	1	0	0	0	6	6	96
Total	11	12	11	17	11	11	11	15	4	17	3	3	6	6	138

- 1.) The table above identifies that monthly sampling was not completed at each station on an annual basis.
- 2.) For the purposes of the EA, a statistical analysis was conducted to identify the correlation between the water quality data for LA-1, LA-5, LA-6, and McGowen Lake and the full dataset for the LSA. Datasets were highly correlated and therefore the full dataset for the LSA was used as background concentrations in the IMPACT model. This approach was taken to meet the criteria of REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental

Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”.

- 3.) Samples were collected following applicable field protocols and analysis was conducted by CALA accredited laboratories. The conceptualization of sampling in this remote location loosely followed the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). However, due to the remote nature during the baseline sampling, monthly sampling was not deemed feasible.
- 4.) There are no additional data to add to the analysis at this time for either the near-field or far-field water quality models. It is noted that some additional sampling occurred at Whitefish Lake offshore in the general, vicinity of the proposed discharge (diffuser) location in 2022 and continued in 2023. The concentration of constituents from samples collected in 2022 and 2023 were in the range of those measured previously and as a result no changes to the outcomes of the analyses presented in the Draft EIS and its supporting documents would be expected. Denison agrees that regular water quality data collection at a wider range of sampling stations should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). These data would be used to support the licensing process and contribute to the longer term data records for the site.

**Attachment IR-108 / IR108-R1**

Number	IR-108 / IR-108-R1
Comment From	ECCC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.3.3 Aquatic Environment
Comment	<p>In response to IR-107 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>There are incorrect guidelines remaining in the updated tables, and the supporting information on parameter values used to derive benchmarks has not been provided. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect threshold could allow for effluent to be discharged at concentrations exceeding MDMER limits.</p> <p>See also follow-up IR-108-R1.</p> <ol style="list-style-type: none"><li>1.) Update Tables 8.2-2 and 8.2-3 to include footnotes with the concentrations of environmental modifying parameters such as pH, hardness and DOC used to derive guidelines for Aluminum, Cadmium, Copper, Lead, Manganese, Nickel and Zinc.</li><li>2.) Update Tables 8.2-2 and 8.2-3 to include the correct benchmark guideline value for Aluminum, Molybdenum and Nitrate. Include the concentrations of environmental modifying parameters needed for deriving guidelines. If the most stringent guideline value is not selected for use, provide a rationale for use of the chosen guideline.</li><li>3.) Update Tables 8.2-2 and 8.2-3 to include the calculated guideline value for manganese and the environmental modifying parameter concentrations used to calculate the guideline. A benchmark environmental quality guideline has not been provided for Manganese, however a chronic CWQG guideline exists that can be derived based on environmental modifying parameter concentrations.</li></ol> <p>Update Tables 8.2-2 and 8.2-3 to specify if Total Chromium or Hexavalent Chromium was measured.</p>

**Response:**

Tables 8.2-2 and 8.2-3 have been updated as requested and are provided below and updated in the EIS in their respective sections.

Table 8.2-2: Baseline Surface Water Quality in Local Study Area Lakes and Russell Lake

Parameter	Units	Short-term Benchmark			Long-term Benchmark			McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Notes	Value	Reference	Notes	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Alkalinity	mg/L							2	10	6	3	13	7.7	3	38	15
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.001	0.0051	0.0034	0.0048	0.0078	0.0061	0.005	0.073	0.0201
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.09	0.0266	<0.01	0.07	0.043	<0.01	0.05	0.026
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.008	0.072	0.0229	0.013	0.105	0.0543	0.005	0.036	0.0164
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.000233	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L							0.0023	0.0038	0.003	0.0021	0.0032	0.0027	0.0024	0.0051	0.00328
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	12	7.8	4	16	9.3	4	46	13.4
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<0.00001	0.00003	0.000015	<0.00001	0.00002	0.000013	<0.00001	0.00004	0.000016
Calcium	mg/L							1.1	1.7	1.35	1.2	1.6	1.4	1.1	1.5	1.24
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.5	0.43	0.3	0.4	0.33	0.3	0.4	0.32
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.00024
DOC	mg/L							2	2.6	2.23	2	2.5	2.2	2	2.5	2.22
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							<0.01	0.08	0.03166	0.02	0.07	0.037	0.02	0.08	0.042
Hardness	mg/L							5	6	5.5	5	6	5.3	5	5	5
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.037	0.27	0.12	0.04	0.19	0.11	0.031	0.21	0.1064
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	0.0004	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.00032
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.3	0.5	0.42	0.4	0.4	0.4	0.2	0.4	0.36
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0039	0.029	0.016	0.0046	0.02	0.0142	0.0024	0.019	0.01232



Parameter	Units	Short-term Benchmark			Long-term Benchmark			McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Notes	Value	Reference	Notes	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.001	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	0.02	0.00474

Table 8.2-2 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L							2	14	7.7	8	8	8	7	12	9.5
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0023	0.0025	0.0024	0.0029	0.0029	0.0029	0.0067	0.0096	0.0082
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.05	0.0233	<0.01	<0.01	<0.01	<0.01	0.04	0.025
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.016	0.055	0.0303	0.033	0.033	0.033	0.011	0.028	0.0195
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium	mg/L							0.0033	0.0039	0.0036	0.0034	0.0034	0.0034	0.0033	0.0046	0.004
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	17	9	10	10	10	8	15	12
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L							2.7	3.9	3.5	3.5	3.5	3.5	1.3	1.8	1.6
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	<0.1	0.5	0.3333333	0.4	0.4	0.4	0.2	0.2	0.2
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2.1	2.5	2.3	2.2	2.2	2.2	2.6	3.5	3.1
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02
Fluoride	mg/L							0.02	0.07	0.04	0.03	0.03	0.03	<0.01	0.07	0.04
Hardness	mg/L							9	13	11	12	12	12	5	6	5.5



Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.056	0.08	0.070667	0.039	0.039	0.039	0.15	0.15	0.15
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.5	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.029	0.064	0.045	0.019	0.019	0.019	0.0094	0.037	0.0232
Mercury	mg/L				0.000026	CCME		1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-07	1.00E-07	1.00E-06	1.00E-05	5.50E-06
Molybdenum	mg/L				0.07	WHO	(16)	0.0003	0.0013	0.00077	0.0011	0.0011	0.0011	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	0.0001	0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.00015
Nitrate	mg/L	550	CCME		3.0	SEQG		0.05	0.44	0.25	0.05	0.05	0.05	<0.04	0.66	0.35
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	6.70	7.00	6.90	7.20	7.20	7.20	6.70	6.80	6.80
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	mg/L							0.3	0.6	0.5	0.8	0.8	0.8	0.2	0.4	0.3
Radium-226	Bq/L				0.11	SEQG		<0.005	0.006	0.0053333	0.007	0.007	0.007	<0.005	0.008	0.0065
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.7	2	1.8	1.7	1.7	1.7	1.4	1.6	1.5
Conductivity	µS/cm							30	47	38	42	42	42	20	22	21
Strontium	mg/L				205	FEQG	(11)	0.017	0.018	0.017	0.016	0.016	0.016	0.013	0.016	0.0145
Sulphate	mg/L				128	BC MOE	(12)	3.7	8.1	6.5	8.3	8.3	8.3	0.5	0.8	0.65
Sum of Ions								18	28	23	25	25	25	12	21	16.5
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	0.001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.00045

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L							30	35	32	35	35	35	19	30	24.5
TKN	mg/L							0.14	0.22	0.17	0.29	0.29	0.29	0.13	0.35	0.24
TOC	mg/L							2.2	2.6	2.4	2.2	2.2	2.2	2.7	3.6	3.2
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		1	1	<1	4	4	4	<1	<1	<1
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.00115

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmp.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.
- (12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)
- (13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.
- (14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)
- (15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .
- (16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) * 1000$  (SEQG via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>)

(251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Table 8.2-3: Baseline Surface Water Quality in Local Study Area Watercourses

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L							2	13	5.5	2	11	6.75	1	23
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0022	0.0056	0.0037	0.0039	0.081	0.015	0.0013	0.006
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.04	0.014	<0.01	0.04	0.01375	<0.01	0.04
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.005	0.036	0.0143	0.006	0.024	0.013	0.004	0.036
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001
Barium	mg/L							0.0022	0.0035	0.00267	0.0019	0.0041	0.0026625	0.0025	0.004
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	16	6.7	2	13	8.125	1	28
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<1.0E-05	0.00002	0.000012	<1.0E-05	0.00002	0.0000125	1.00E-05	0.00002
Calcium	mg/L							1.3	1.7	1.4	1.2	1.7	1.3375	1.5	1.9
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.6	0.45	0.2	0.4	0.3125	0.5	0.7
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.000275	<0.0002	<0.0002
DOC	mg/L							1.7	2.4	2.13	1.9	2.5	2.225	1.7	2.6
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.026	0.01	0.03	0.01625	<0.01	0.07
Hardness	mg/L							5	6	5.3	4	6	4.75	5	7
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.031	0.31	0.1215	0.041	0.11	0.073875	0.036	0.13
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.000125	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	0.05	0.02375	<0.02	0.03
Magnesium	mg/L							0.3	0.7	0.43	0.3	0.6	0.375	0.4	0.5
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0041	0.025	0.01467	0.0044	0.017	0.010325	0.0066	0.023



Parameter	Units	Short-term Benchmark			Long-term Benchmark			Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0028	0.00074	<0.0005	0.0096	0.001675	<0.0005	0.0011

Table 8.2-3 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L							2	15	7.5	2	8	5.2	3	13
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0025	0.0099	0.0053	0.004	0.014	0.0065	0.0032	0.02
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.05	0.015	<0.01	0.05	0.01444	<0.01	0.04
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.007	0.065	0.0194	0.002	0.04	0.0137	0.006	0.04
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Barium	mg/L							0.0021	0.0032	0.0025625	0.0021	0.0031	0.0025556	0.0023	0.0032
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	18	9.125	2	10	6.2222	4	16
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	1.00E-05	0.00007	0.0000175	1.00E-05	<b>0.00004</b>	1.44E-05	1.00E-05	0.00005
Calcium	mg/L							1.3	2	1.5625	1.2	1.4	1.2444	1.2	1.8
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.6	0.45	0.2	0.3	0.23333	0.3	0.5
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2	2.4	2.275	1.8	2.5	2.2667	1.9	2.5
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.02625	0.01	0.08	0.0233	<0.01	0.07
Hardness	mg/L							5	7	5.625	4	5	4.56	4	6



Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.034	0.13	0.077375	0.03	0.11	0.071222	0.036	0.16
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	0.03	0.02125	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.4	0.6	0.4375	0.2	0.4	0.33333	0.3	0.5
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0029	0.019	0.010625	0.0025	0.018	0.0083333	0.0037	0.029
Mercury	mg/L				0.000026	CCME		<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L				0.07	WHO	(16)	<0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	550	CCME		3.0	SEQG		<0.04	0.35	0.112	<0.04	0.31	0.093	<0.04	0.35
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	6.58	7.16	6.85	<b>6.17</b>	6.97	6.72	<b>6.48</b>	7.07
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	0.007	0.0052	<0.005	<0.005	<0.005	<0.005	0.006
Potassium	mg/L							0.2	0.6	0.375	0.2	0.4	0.32222	0.2	0.4
Radium-226	Bq/L				0.11	SEQG		<0.005	0.009	0.00625	<0.005	0.007	0.00544	<0.005	<0.005
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.4	2.1	1.63	1.3	1.6	1.41	1.3	1.9
Conductivity	µS/cm							17	25	19.375	14	20	16.111	14	23
Strontium	mg/L				205	FEQG	(11)	0.012	0.018	0.0141	0.011	0.013	0.0113	0.011	0.016
Sulphate	mg/L				128	BC MOE	(12)	0.4	0.7	0.525	0.4	0.8	0.63333	0.3	0.8
Sum of Ions								7	25	14.125	6	14	10.667	8	22
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	0.0002	0.0001125	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
TDS	mg/L							21	32	25	13	28	20	15	28
TKN	mg/L							0.13	0.3	0.215	0.11	0.29	0.213	0.15	0.41
TOC	mg/L							2	2.6	2.325	1.9	2.7	2.3111	1.9	2.6
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		1	3	2	<1	3	1.89	1	6
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0012	0.0006	<0.0005	0.0017	0.0007445	<0.0005	0.0006

Table 8.2-3 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L							<1	24	<6.7778	3	13	7.375
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0052	0.012	0.0089	0.0016	0.0086	0.0054
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.04	0.01333	<0.01	0.04	0.0138
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.003	0.024	0.012	0.005	0.032	0.0134
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L							0.0025	0.0041	0.0031111	0.0026	0.004	0.0030625
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							<1	29	<8.3333	4	16	9
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<1.0E-05	0.00002	1.11E-05	<1.0E-05	<b>0.00004</b>	0.000016
Calcium	mg/L							1.1	1.7	1.3778	1.2	1.7	1.3625
Carbonate	mg/L							<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.1	0.2	0.17778	<0.1	0.2	<0.175
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2.2	3.4	3.0222	2.6	3.2	2.975
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.023333	0.01	0.07	0.02375
Hardness	mg/L							4	6	5.11	4	6	4.88
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.042	0.22	0.095111	0.036	0.16	0.098375
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.3	0.5	0.38889	0.2	0.5	0.375
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0053	0.02	0.010633	0.0071	0.016	0.010325
Mercury	mg/L				0.000026	CCME		<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L				0.07	WHO	(16)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	550	CCME		3.0	SEQG		<0.04	0.4	0.115	<0.04	0.4	0.13
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	<b>6.18</b>	6.99	6.70	<b>6.47</b>	6.99	6.73
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	0.008	0.0058	<0.005	<0.005	<0.005
Potassium	mg/L							0.2	0.5	0.33333	0.2	0.5	0.3625
Radium-226	Bq/L				0.11	SEQG		<0.005	0.01	0.0059	<0.005	0.006	0.0051
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.2	1.7	1.4	1.3	1.7	1.44
Conductivity	µS/cm							15	22	16.778	15	23	17.25
Strontium	mg/L				205	FEQG	(11)	0.011	0.015	0.0124	0.011	0.015	0.0119
Sulphate	mg/L				128	BC MOE	(12)	0.3	0.9	0.68889	0.5	1	0.725

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Sum of Ions								4	34	12.667	8	22	13.375
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L							14	26	20.556	16	26	20.125
TKN	mg/L							0.16	0.34	0.256	0.18	0.33	0.27
TOC	mg/L							2.4	3.6	3.1111	2.7	3.2	3
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		<1	4	2.56	<1	3	1.875
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0012	0.00059	<0.0005	0.0016	0.00065

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmf.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) * 1000$  (SEGQ via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Attachment IR-113\_IR113-R1

Number	IR-113 / IR-113-R1
Comment From	ECCC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment
Comment	<p>In response to <u>IR-113</u> issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>Based on the information provided it is not possible to assess the resiliency of the Project to potential adverse effects from climate change and potential impacts to surface water and sediment quality. The Proponent should review the guidance documents available on the <a href="#">Strategic Assessment of Climate Change</a> (SACC) website with regards to climate change resilience and provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling.</p> <p>Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, lake levels, flow rates, etc., on COPC concentrations in surface water and sediment. The Proponent should refer to the <a href="#">SACC website</a> for guidance on conducting this quantitative analysis.</p> <p>See also follow-up IR-113-R1.</p> <p><u>IR-113-R1</u> Clarify if climate change has been considered in the PMP value provided. If it has not been considered, discuss how potential increases in PMP have been and/or need to be considered in the Project design.</p> <p>Reference Kunkel, K., Karl, T. R., Easterling, D. R., Redmond, K., Young, J., Yin, X., &amp; Hennon, P. (2020). Probable maximum precipitation and climate change. Geophysical Research Letters, 1402-1408.</p>

**Denison’s Response:**

Prairie province hydrology is dominated by cold regions processes so that snowmelt is the primary hydrological event of the year for both the major rivers that derive from the Rocky Mountains and small streams and rivers that arise in Saskatchewan. Climate change impacts on water resources are therefore focused on changes to snow accumulation, snowmelt and infiltration to frozen soils. Climate change scenarios suggest generally warmer and wetter winters for Saskatchewan. Large scale hydrological models that take these scenarios into account suggest changes in the annual streamflow of the South Saskatchewan River ranging from an 8% increase to a 22% decrease, with an 8.5% decrease being an average prediction. Small scale hydrological models for prairie streams suggest a 24% increase in spring runoff by 2050 followed by a 37% decrease by 2080 as the winter snow cover becomes discontinuous. Both model results suggest that there is not a dramatic drying of the prairies to be anticipated under climate change and that in some cases streamflow will increase for certain scenarios and under moderate degrees of climate change. While prairie runoff should increase in the near term, as climate change progresses later in the 21st C there will be dramatic drops in runoff and the flow of small streams to wetlands and depressions and to small prairie rivers (Sauchyn et al 2009).

Changes in temp (warmest max temp) for the region was referenced from the Climate Atlas of Canada ([https://climateatlas.ca/data/grid/782/maxmax\\_2030\\_45/line0](https://climateatlas.ca/data/grid/782/maxmax_2030_45/line0)) for the Tomblin Lake watershed.

The primary source of climate model data presented in their maps, charts and tables is the Pacific Climate Impacts Consortium (PCIC) . The PCIC has provided downscaled projections of daily temperature and precipitation data from 24 climate models using two carbon emission scenarios.

The Climate Atlas of Canada use PCIC’s statistically downscaled data (Bias Correction with Constructed Analogues and Quantile mapping, Version 2; BCCAQv2) derived from 24 CMIP5 global climate models for two emissions scenarios (RCP4.5 and RCP8.5). The Climate Atlas of Canada call the RCP4.5 and RCP8.5 the “Low Carbon” and “High Carbon” scenarios, respectively. We use PCIC’s statistically downscaled

data (Bias Correction with Constructed Analogues and Quantile mapping, Version 2; BCCAQv2) derived from 24 CMIP5 global climate models (the complete list of models can be found at <https://climateatlas.ca/data-sources-and-methods>) (Climate Atlas of Canada, 2023)

The climate model data presented in the Atlas has been statistically downscaled and bias corrected using a method called Bias-Correction/Constructed Analogues with Quantile mapping reordering, Version 2 (BCCAQv2); the work was done by the Pacific Climate Impacts Consortium (PCIC) . [1] This method has been extensively tested by Murdock et al. (2014) and found to outperform many other statistical downscaling methodologies.

The data indicates an ensemble increase in warmest maximum temperature under the high carbon (RCP8.5) scenario of 2.32 degrees Celsius from the background average of 2.59 (1950 to 2022) to 4.91 (2023 to 2065). Increases in temperature can then influence the rates of evapotranspiration thereby reducing water availability. However, in the case of Saskatchewan, the rate of transpiration on an annual basis is not expected to overbalance the increase in precipitation for the region.

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**Table 1: Warmest Maximum Temperature Under High Carbon Scenario Historical to Projected Statistics**

Statistic	Historical (1950 – 2022)			Projected (Ensemble Data 2023 – 2065)		
	Annual Average	10% Confidence Interval	90% Confidence Interval	Annual Average	10% Confidence Interval	90% Confidence Interval
Mean	2.59	1.07	4.17	4.91	3.48	7.14
SD	1.23	0.70	0.72	0.89	0.83	1.17
Min	0.00	-0.45	2.80	3.00	2.05	5.10
Max	5.30	3.00	6.15	7.00	5.25	9.40

The data indicate an ensemble increase in total precipitation under the high carbon (RCP8.5) scenario of 39.21 millimetres from the background average of 454.65 (1950 to 2022) to 493.86 (2023 to 2065). This increase is likely to increase mean annual flows in the Icelander River drainage area thereby increasing the assimilative capacity of the receiving environment of Whitefish Lake.

**Table 2: Total Annual Precipitation Under High Carbon Scenario Historical to Projected Statistics**

Statistic	Historical (1950 – 2022)			Projected (Ensemble Data 2023 – 2065)		
	Annual Average	10% Confidence Interval	90% Confidence Interval	Annual Average	10% Confidence Interval	90% Confidence Interval
Mean	454.65	366.97	558.69	493.86	392.34	603.23
SD	66.85	19.66	28.74	19.35	25.36	31.79
Min	264.60	325.20	506.00	459.00	344.35	555.20
Max	609.20	405.70	626.45	533.00	444.30	672.65

Several uncertainties apply:

- 1) The background water quality conditions of the Icelander River system in future decades may change appreciably as a result of increases in surface run-off, landscape changes and precipitation event intensity and duration. Such changes are not predictable at this time;
- 2) The long-term accuracy of predictive models for precipitation, temperature and evapotranspiration for the region is not such that an estimate of changes to the receiving environment water quality is reasonable at this time. Any estimates would have a large attributed uncertainty. Furthermore, as mine discharge is not expected to increase in volume or constituent concentrations over the mine life, any increase in flows within the Icelander River system would provide for an increase in assimilative capacity.

As a result, quantitative assessment of the potential change in surface water quality at Whitefish Lake under Climate Change is not needed at this time as:

- the design basis PMP is robust and inclusive of projected total annual precipitation under a high carbon scenario
- the level of variability that is likely in future background water quality is high due to changes in precipitation levels and intensity and therefore run-off contributions to the aquatic environment; and,
- predictive models for the future period (2050s) for the region are variable in accuracy.



Rather, the following mitigation measures, monitoring and adaptive management should be employed.

- 1) Changes in water quality in the receiver should be monitored on a consistent basis to understand changes in the background water quality prior to effluent mixing;
- 2) Effluent discharge will be monitored as per the MDMER Schedules 4 and 5;
- 3) Under scenarios of low flow condition, discharge can be limited seasonally or periodically and specific to the assimilative capacity of the receiver (flow proportioned or fixed dilution discharge);
- 4) Adaptive management and adjustment to discharge timing and volume as needed over time to meet criteria based on climate induced changes in flow.

**References:**

Murdock, T., Sobie, S., Hiebert, J., 2014. Statistical downscaling of future climate projections for North America: report on contract no: KM040-131148/A. Available online: [https://www.pacificclimate.org/sites/default/files/publications/PCIC\\_EC\\_downscaling\\_report\\_2014.pdf](https://www.pacificclimate.org/sites/default/files/publications/PCIC_EC_downscaling_report_2014.pdf)

Sauchyn, Dave; Barrow, Elaine; Fang, X., Henderson, Norm; Johnston, Mark; Pomeroy, John; Thorpe, Jeff; Wheaton, Elaine; and Williams, B. 2009. Saskatchewan's Natural Capital in a Changing Climate: An Assessment of Impacts and Adaptation. Report to Saskatchewan Ministry of Environment from the Prairie Adaptation Research Collaborative, 162 pp.

Number	IR-114
Comment From	ECCC CNSC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.2.4.2.4 - Tables 8.2-9, 8.2-10 and 8.2-13
Comment	<p>The response has not been accepted for IR-114.</p> <p>The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER.</p> <p>The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations.</p> <p>All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds.</p> <p>Please:</p> <ol style="list-style-type: none"><li>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</li><li>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO<sub>3</sub>) in effluent and the receiving environment.</li><li>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</li><li>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li></ol>

**Denison’s Response:**

The requested tables have been updated to include water quality thresholds derived from receiving environment parameters (background) as well as effluent induced concentrations for completeness. Please see the tables below and updated in Section 8 of the EIS.

**Table 8.2-1: Predicted Effluent Water Quality**

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
General Chemistry, Nutrients and Anions		
Alkalinity	mg/L	12.4
Ammonia (as N)	mg/L	3.9
Un-Ionized Ammonia	mg/L	4.74
Hardness	mg/L (as CaCO3)	250
Conductivity	µS/cm	21.7
Nitrate	mg/L	0.249
pH	pH Unit	7
Phosphorus	mg/L	N/A
Sulphate	mg/L	2600

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
TDS	mg/L	6420
Temperature	deg C	16.5
TSS	mg/L	6
Chloride	mg/L	600
Metals		
Aluminum	mg/L	0.051
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.0027
Copper	mg/L	0.02
Cyanide	mg/L	NA
Iron	mg/L	0.0039
Lead	mg/L	0.0003
Manganese	mg/L	0.03
Mercury	mg/L	0.00001
Molybdenum	mg/L	2.5
Nickel	mg/L	0.0138
Selenium	mg/L	0.042
Strontium	mg/L	1.68
Thallium	mg/L	0.0006
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Radiological		
Lead-210	Bq/L	0.42
Polonium-210	Bq/L	0.15
Radium-226	Bq/L	0.15
Thorium-230	Bq/L	0.9
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7

Table 8.2-2: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(4)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	6.98	6.98	SEQG/CCME	(4)	4.74	0.08	0.05	0.03
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)	0.03	0.0103	0.0102	0.0101
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	(12)	2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)	600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(5)	0.051	0.0	0.0	0.0
Arsenic	mg/L	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--	0.006	0.000	0.000	0.000
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME		0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.000295	0.00149	FEQG	(10)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--	0.02	0.001	0.000	0.000

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	0.0	0.0	0.0
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	(8)	0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	0.0138	0.00	0.00	0.00
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	205	2.5	FEQG	(11)	1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	(13)	0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmv.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.
- (12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)
- (13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.
- (14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)
- (15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .
- (16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.
- (17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L
- (18) Based on water hardness of >0 to <5.3 mg/L
- (19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) * 1000$  (SEQG via AEP 1996b)
- (20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg} \cdot \text{L}^{-1})] + 0.240[\ln(\text{DOC mg} \cdot \text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.
- (21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)
- (22) MDMER Schedule 4 - maximum authorized montly mean concentration
- (23) Bold numbers indicate exceedance of long-term criteria
- SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.
- CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl  
Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.



**Table 8.2-3: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water**

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Alkalinity <sup>(1)</sup>	mg/L	NE	NE	12.4	12.4	NE	NE	NE	--	--	
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614		MDMER Sched 5	(5)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368	5.74	SEQG/CCME	(4)
Un-ionized Ammonia	mg/L	0.01770	0.01770	0.06331	0.06310	0.04813	0.04780	0.04075	6.98	SEQG/CCME	(4)
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	0.0003	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	120	SEQG/CCME	(6)
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME	
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG	(10)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425		MDMER Sched 5	
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116	0.005	CCME	(8)
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC	
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.64	SEQG/CCME	(3)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118	0.07	WHO	(16)
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044	0.07	WHO	(16)
Nitrate <sup>(1)</sup>	mg/L	NE	NE	0.249	0.249	NE	NE	NE	3	SEQG	
Phosphorus <sup>(1)</sup>	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.02 - 0.035	CCME	(17)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE	(12)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Thallium	mg/L	9.97E-05	9.96E-05	1.04E-04	1.04E-04	1.03E-04	1.03E-04	1.02E-04	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143	0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	background + 5 mg/L	CCME	
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1	MDMER Sched 4	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME	
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG	(13)
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.007	FEQG	(9)

Notes

Notes

Estimates of mercury concentration are based on 50% of the detection limit in both background and effluent.

(1) Estimated from near-field model

NE = No estimate for this lake for this parameter

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmq.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

Attachment IR-115\_IR-115-R1

Number	IR-115 & IR-115-R1
Comment From	ECCC
Category	Fish and fish habitat
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 Aquatic Environment Appendix 10-A (ERA), Section 3.1.1.1
Comment	<p>This response has not been accepted.</p> <p>Items 1. And 3. In the Proponent’s response adequately responded to the IR. However, the water quality thresholds in item two have not been derived using baseline receiving environment concentrations and not all COPCs which require monitoring under the MDMER have been included in the updated table. Additionally, the Proponent did not account for changes in baseline hardness concentrations in the receiving environment due to the deposition of effluent. Water hardness is an environmental modifying factor which can influence the toxicity of COPCs in the aquatic environment, therefore requiring the mentioned COPCs as well as background concentrations of total hardness in the receiving environment to accurately determine potential effects of COPCs upon the receiving aquatic environment. The Proponent should also provide rationale to support that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also follow-up IR-115-R1.</p> <ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include the following COPCs: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS).</li><li>2. Update Table 8.2-8 to include background concentrations of total hardness (in mg/L CaCO<sub>3</sub>) in the receiving environment.</li><li>3. Provide rationale that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li></ol>

**Denison’s Response:**

Please see the updated Table 8.2-8 below which has also been updated in the EIS. It has been updated to include; un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS). The background hardness is included and screening criteria for both short-term and long-term criteria are added with notes identifying the rationale for their concentration level based on hardness, pH, temperature and/or other background or effluent induced constituent concentration.

Table 8.2-1: Summary of Background Water Quality Screening Criteria

Constituent	Unit	Background Concentrations (95 <sup>th</sup> Percentile)	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
General Chemistry, Nutrients and Anions										
Alkalinity	mg/L	12.4	--	--	--	--	--	--	--	
Ammonia (as N)	mg/L	0.068	--	--	--	--	5.74	5.74	SEQG/CCME	(4)
Un-Ionized Ammonia	mg/L	0.00019	--	--	--	--	6.98	6.98	SEQG/CCME	(4)
Hardness	mg/L (as CaCO3)	5.26	--	--	--	--	--	--	--	--
Conductivity	µS/cm	21.7	--	--	--	--	--	--	--	--
Nitrate	mg/L	<0.249	550	550	CCME		3	3	SEQG	--
pH	pH Unit	7	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--
Phosphorus	mg/L	<0.01	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)
Sulphate	mg/L	0.69	--	--	--	--	128	429	BC MOE	(12)
TDS	mg/L	28.3	--	--	--	--	500	500	SEQG	--
Temperature	deg C	15	--	--	--	--	ambient temp	ambient temp	--	--
TSS	mg/L	3.9	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--
Chloride	mg/L	0.39	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)
Metals										
Aluminum	mg/L	0.00758	--	--	--	--	0.1	0.1	SEQG/CCME	(5)
Arsenic	mg/L	0.0001	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--
Cadmium	mg/L	0.000019	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--
Chromium	mg/L	<0.0005	--	--	--	--	0.001	0.001	SEQG/CCME	
Cobalt	mg/L	<0.0001	--	--	--	--	0.000295	0.00149	FEQG	(10)

Constituent	Unit	Background Concentrations (95 <sup>th</sup> Percentile)	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
Copper	mg/L	<0.0002	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--
Cyanide	mg/L	N/A	--	--	--	--	--	--	--	--
Iron	mg/L	0.181	--	--	--	--	0.3	0.3	SEQG/CCME	--
Lead	mg/L	<0.0001	--	--	--	--	0.001	0.007	SEQG/CCME	(8)
Manganese	mg/L	0.0198	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)
Mercury	mg/L	<0.00001	--	--	--	--	0.000026	0.000026	CCME	--
Molybdenum	mg/L	<0.0001	--	--	--	--	0.07	0.07	WHO	(16)
Nickel	mg/L	<0.0001	--	--	--	--	0.07	0.07	WHO	(16)
Selenium	mg/L	<0.0001	--	--	--	--	0.001	0.001	CCME	--
Strontium	mg/L	0.015	--	--	--	--	205	2.5	FEQG	(11)
Thallium	mg/L	<0.0002	--	--	--	--	0.0008	0.0008	SEQG/CCME	--
Uranium	mg/L	<0.0001	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--
Vanadium	mg/L	<0.0001	--	--	--	--	0.12	0.12	FEQG	(13)
Zinc	mg/L	0.0011	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)
Radiological										
Lead-210	Bq/L	<0.02	--	--	--	--	0.2	0.2	HC	--
Polonium-210	Bq/L	<0.005	--	--	--	--	0.1	0.1	HC	--
Radium-226	Bq/L	<0.0059	--	--	--	--	0.11	0.11	SEQG	--
Thorium-230	Bq/L	<0.01	--	--	--	--	0.6	0.6	HC	--
Uranium-238	Bq/L	<0.0012	--	--	--	--	3	3	HC	--
Uranium-234	Bq/L	<0.0012	--	--	--	--	3	3	HC	--

**Notes:**

(1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmpp.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

(2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})] - 8.64497)}) * 1000$  (SEQQ via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg} \cdot \text{L}^{-1})] + 0.240[\ln(\text{DOC mg} \cdot \text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria



## ATTACHMENT IR-137

Original IR Number	IR-137
Follow Up IR Number	-
Dept.	ECCC
Project effects link	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands
Reference to EIS, appendices, or supporting documentation	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>
Context and Rationale (original IR)	<p>Context and Rationale: The CNSC's Generic Guidelines for the Preparation of an EIS Pursuant to the Canadian Environmental Assessment Act, 2012 states that: "The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations."</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project's effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p>Project Footprint: In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p>

The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: "Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA." (p. 9-168)

LSA: The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.

Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects.

For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.

RSA: The Amended Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada states:

Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:

- Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;
- Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;
- Account for planned disturbances; and
- Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.

The proposed Project's cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada.

Reference:

[1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (Environment Canada, 2011).

Information Requirement (original IR)	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"> <li>• Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li> </ul> <p>Specific to boreal caribou:</p> <p>Project Footprint:</p> <ul style="list-style-type: none"> <li>• Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li> </ul> <p>LSA:</p> <ul style="list-style-type: none"> <li>• Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li> </ul> <p>RSA:</p> <ul style="list-style-type: none"> <li>• Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; or</li> <li>• Re-do the assessment with the RSA at the scale of the range</li> </ul> <p>See also related IRs: IR-154 and IR-156.</p>
Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)	<p>This response has not been accepted.</p> <p>A biologically relevant explanation for the chosen RSA for caribou was not provided. It is not clear if the RSA is representative of the SK1 range for factors such as variability and biophysical features. Describe how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range. This clarification is necessary to ensure the RSA is representative of the entire SK1 Caribou range, including the natural variability of the landscape, and to assess any project effects that may be affected by an inaccurate RSA. It is also required to verify the Proponent's assessment of cumulative impacts to caribou.</p> <p>See also AD-56 in the Advice to Proponent table.</p>

### **Denison's Response:**

#### **Supporting, Contextual Information to Denison's Response in the IR Table**

While appropriate consideration of Project effects on the terrestrial environment is important for all projects undergoing environmental assessment, we highlight that through the selection of the ISR mining method, the Wheeler River Project has a relatively small footprint on the landscape compared to project footprints associated with other more conventional mining methods.

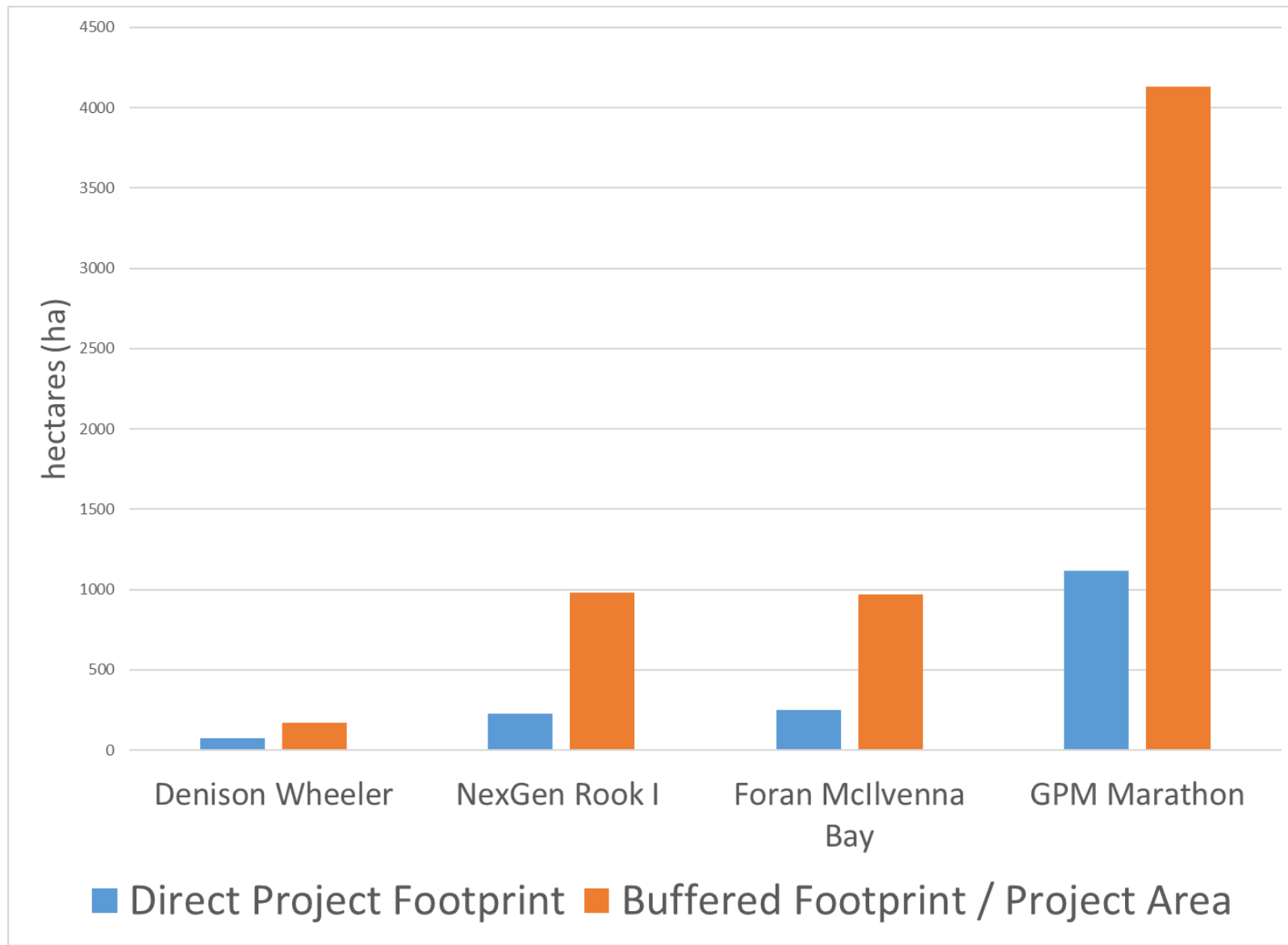
For the reviewer's context and consideration, Table IR-137-1 and Figure IR-137-1 below compare the Wheeler River Project's expected direct footprint (74.8 ha) and Project Area (area of maximum disturbance; 169.9 ha) to expected landscape disturbances associated with:

- a proposed underground uranium mining project in the Athabasca Basin undergoing a joint provincial (Saskatchewan)-federal EA (NexGen's Rook I Project),
- an underground mining project which recently completed the Saskatchewan EA process (Foran's McIlvenna Bay Project), and
- an open pit mining project in Ontario which recently completed the federal EA process (Generation PGM's Marathon Palladium Project).

**Table IR-137-1: Comparison of Wheeler River Project footprint and Project Area to landscape disturbance at other proposed mines**

	Denison's Wheeler River Project (proposed uranium mine in Saskatchewan)	NexGen's Rook I Project (proposed underground uranium mine in Saskatchewan)	Foran's McIlvenna Bay Project (proposed underground copper-zinc mine in Saskatchewan)	Generation PGM's Marathon Palladium Project (proposed open pit platinum group metals and copper mine in Ontario)
Direct Infrastructure Footprint	74.8 ha	228 ha	249.1 ha	1,116 ha
Project Area / Area of Maximum Disturbance	169.9 ha	981 ha	969.9 ha	4,131 ha

ha = hectares



**Figure IR-137-1: Comparison of Wheeler River Project footprint and Project Area to landscape disturbance at other proposed mines**

Attachment IR-236

Number	IR-236
Comment From	ECCC ERAD
Category	Fish and fish habitat
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment
Comment	<p>This response has not been accepted.</p> <p>The Proponent made a correlation between precipitation and the Probable Maximum Precipitation (PMP). However, annual maximum and PMP cannot be correlated as they are two separate concepts that require different statistical methods to verify.</p> <p>The Proponent provided two tables which displayed precipitation data under current, existing, and future climate scenarios for two nearby lakes. These were provided to support the Proponent’s response, however, the calculations used to achieve the table figures within the response or Attachment: IR-236 were not provided. As one value cannot be used to infer the other, reviewing the calculations is required to support the Proponent’s conclusions.</p> <p>Please see the following requests:</p> <p>1. In Table 3 of Attachment: IR-236, the historical mean value (1976 to 2005) for the Maximum 1-Day Precipitation is 24.1 mm and is indicated as measured. However, this estimate appears to be derived from ensembles of climate modeled historical precipitation. Thus, proponent to insert a footnote at Table 3 that indicate the total annual as well as maximum 1-day are estimates based on ensembles of climate modeled historical precipitation. The Proponent needs to provide the calculations that were used to reach the conclusions found within Tables 2 and 3 of Attachment: IR-236. Reviewing the calculation will allow for verification of the Proponent’s conclusions. If the currently used data sources do not allow for accurate representation of their conclusions, the Proponent should use complete regional observational data sources to support the conclusions in Tables 2 and 3.</p> <p>2. The analysis of mean maximum one day and mean annual total precipitation [1976-2005] based on weather station (Climate ID 4063755) at Key Lake is roughly 32mm and 470mm respectively. Thus, include both modeled and observed historical precipitation statistics in the EIS for context.</p> <p>Measured data should take precedence over modeled data. The Proponent is taking an ensemble of modeled data to "predict" historical data when measured data is available and can validate the models. Without strong justification, it is not appropriate to replace measured data with "predicted" modeled data.</p>

**Denison’s Response:**

The original response to IR-236 is provided here in its entirety as well as updates that are required for the second round of IRs from the FIRT. This is for the purposes of adding this IR Attachment as an Appendix to Appendix 6-C of Section 6 of the revised Draft EIS.

During the Draft EIS review by the FIRT, there were information requirements (IRs; mainly IR-235 and IR-236, and to a lesser extent IR-103 and IR-104) related to current and future climate precipitation, as well as the probable maximum precipitation event. The information in Attachment IR-236 will be added as *Appendix D Summary of Precipitation Values Presented in the EIS* to Appendix 6-C in the final EIS. The advancement of Project design and the site drainage plan are more closely linked to detailed design to support the licensing process and the precipitation information provided herein and in the revised Draft EIS to support an EA decision is adequate. This new appendix to Appendix 6-C serves to provide clarifications only.

The probable maximum precipitation (PMP) event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program (1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes. As an example, during a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m<sup>3</sup> (*excluding a freeboard of 1 meter*). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In EIS Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.”



Tables 1 to 4 below provide a summary of precipitation information for both current / existing climate and future climate under different emissions scenarios, in order to 1) summarize precipitation data from various sections of the EIS (Section 6 including Appendix 6-C, Section 8, and Section 15) and 2) provide context on the PMP of 493 mm in comparison to precipitation values (annual precipitation, maximum 1-day precipitation, and 1:100 year, 24 hour return).

With specific reference to the second round IR comments response the following is noted:

- 1) Table 3 has been updated to represent the Total Annual and Maximum 1-Day precipitation event for Tomblin Lake as provided from the Climate Atlas of Canada.
- 2) The information provided in Section 6, Appendix 6-C, Table 10 provides both the historical data (2011 to 2022) and the predicted values for the future periods for both Total Annual Precipitation and Maximum 1-Day Precipitation (see Table 2 below). As such, Denison has used the available measured data from the Key Lake data station for presentation in Appendix 6-C. With the update provided to Table 3 (see #1 above), the information provided for the period from 1976 to 2005 has also been updated to represent measured data.

Denison has used measured data where applicable and this IR will be included as Appendix D in Appendix 6-C of Section 6.

Table 1: Precipitation - Existing Climate – Comparisons of Observed Annual Average Precipitation and Maximum 24-hour Precipitation to PMP

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
Annual average precipitation	456 mm	Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Annual average precipitation	483 mm	Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Maximum 24-hour precipitation	45.9 mm	Occurred on August 8, 2020.  Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 10.7 x lower than PMP</i></b>
Maximum 24-hour precipitation	72 mm	Occurred July 12, 1998. Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 6.8 x lower than PMP</i></b>
1 in 100 year, 24 hour return	79.9 mm	Calculated using IDF_CC Tool for the Wheeler River Project. Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b><i>1:100 is 6.2 x lower than PMP</i></b>
1 in 100 year, 24 hour return	56.4 mm	Return Period Estimate based on data from the Key Lake Mine using the IDF_CC Tool (~32 km away from Wheeler River Project). Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b><i>1:100 is 8.7 x lower than PMP</i></b>

Table 2: Precipitation – Future Climate - Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)

Year	Total Annual (mm)				Maximum 1-day (mm)			
	Measured	RCP 2.6	RCP 4.5	RCP 8.5	Measured	RCP 2.6	RCP 4.5	RCP 8.5
2011-2020	455	518	509	508	48	29	27	27
2030		528	503	537		27	24	26
2040		487	498	514		28	29	24
2050		504	524	520		26	29	33
2060		513	515	523		26	33	26
2070		527	534	568		29	31	28
2080		539	551	547		30	33	28
2090		543	545	548		31	32	35
2100		546	535	559		23	25	28
Overall Increase:		28	26	51		-6	-2	1

Table 3: Precipitation – Future Climate - Historical and Future Precipitation Data (Total Annual and Maximum 1-day) for Tomblin Lake, Climate Atlas (provided in EIS, Section 15, Table 15.5-1 and 15.5-2)

Period	Total Annual (mm)			Maximum 1-day (mm)		
	Historical	RCP 4.5	RCP 8.5	Measured	RCP 4.5	RCP 8.5
Historical mean (1976-2005)	495.7			27.9		
Near Term (2021-2050)		484	487		25.9	25.9
Far Term (2051-2080)		500	509		26.7	27.5

Table 4: Precipitation – Future Climate - Predicted Precipitation (1:100 year, 24-hour return) for Key Lake and Wheeler River Project, 2020 to 2050 using IDF\_CC Tool (provided in EIS Section 8)

Location	1:100 year, 24-hour return
Key Lake Mine	62.0
Wheeler River Project	88.6

## Attachment: IR-237

Number	IR-237
Dept.	CNSC
Project effects link	EA follow-up and monitoring program
Reference to EIS, appendices, or supporting documentation	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)
Context and Rationale	<p><b>Context:</b> CNSC's <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: "The EIS should provide discussion on the follow-up program's requirements, and include:</p> <ul style="list-style-type: none"> <li>objectives and structure of the follow-up program and the VCs targeted by the program</li> <li>tabular summary and explanatory text of the main components of the program including: <ul style="list-style-type: none"> <li>a description of each monitoring activity under that component</li> <li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li> <li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li> <li>the specific monitoring objective for that activity</li> <li>planned schedule</li> </ul> </li> <li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li> <li><u>possible involvement of independent researchers</u></li> <li><u>program funding sources</u></li> <li>information management and reporting (reporting frequency, methods and format)</li> <li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li> </ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures."</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: "Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively" (p. 7-109) and that "At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process" (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>

Information Requirement	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>
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### **Denison's Response:**

As noted previously, Denison concurs that follow-up program documentation will evolve over the planning process and is committed to providing complete and up to date documentation as the EIS is finalized and prior to the EA Decision. Per the IR request Appendix 16-C has been updated with the most recently available information concerning follow-up programs. For reference, Table 1.5-1 in Appendix 16-C has only been updated so that references to EIS documentation is consistent with the revised submission that is part of the overall IR response package that is being submitted to CNSC for the second round of FIRT comments. Table 1.5-1 conveys appropriate information of the conceptual level and provides relevant context. An additional table (Table 1.5-2) that provides more detailed monitoring program information has been added to Appendix 16-C.

For ease of review, specific notes per the EIS Guidelines are provided below to provide context to the remainder of the response. Text in *italics* is taken from the EIS Guidelines; whereas text in **bold** is commentary provide by Denison. It is noted that this narrative was provided in the initial response to IR-237 during FIRT first round comments and has been updated accordingly.

*The EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.* **Note from Denison – Table 1.5-1 in Appendix 16-C identifies a framework or preliminary program upon which EA follow-up actions will be managed, as well as all phases of the Project in which the proposed individual follow up programs will be executed. Table 1.5-2 (a new table) provides further specific details as to locations, rationale, duration, frequency, sampling method and constituents.**

*The EIS should provide discussion on the follow-up program's requirements, and include:*

- *objectives and structure of the follow-up program and the VCs targeted by the program -* **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs, provides an overall program structure and identifies the VCs targeted by the program. Table 1.5-2 (a new table) provides further rationale for the proposed sampling specific details as to locations, rationale, duration, frequency, sampling method and constituents.**
- *tabular summary and explanatory text of the main components of the program including:*
  - o *a description of each monitoring activity under that component -* **Note from Denison - Table 1-5.1 in Appendix 16-C identifies each proposed monitoring activity for the various technical disciplines within which the environment assessment has been organized. A new Table 1-5.2 has been added to Appendix 16-C to provide more detail on the environmental monitoring activities, such as locations, rationale, duration, frequency, sampling method**

and constituents. This information is consistent with the current status of the development of the overall Environmental Monitoring Plan.

- o *which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)* - **Note from Denison** - Table 1-5.1 in Appendix 16-C generally identifies whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures (see column "Monitoring Program Objective(s)"; however, it is agreed that further clarity could be provided in this regard. To this end, in the new Table 1.5-2, there is a column named Rationale, which indicates specifically whether the proposed follow up activities are related to verifying EA predictions and/or to determine effectiveness of mitigation measures with rationale. Requirements regarding compliance with provincial / federal guidelines / standards are also noted in this column.
- o *the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)* – **Note from Denison** - Table 1-5.1 in Appendix 16-C identifies the relevant section of the EIS to which each proposed follow up activity refers. Further clarity has been provided as requested in this regard. In the updated version of Table 1-5.1 a further, more specific reference to the section / subsection has been added to the "EIS Reference" column for greater traceability between the assessment section of the EIS for each of the technical disciplines and the proposed follow activities. This is generally the Monitoring and Follow-Up subsection of each EIS chapter, where the objectives of the monitoring are listed.
- o *the specific monitoring objective for that activity*- **Note from Denison** - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs. Additionally, Table 1.5-2, there is a column named Rationale, which indicates specifically whether the proposed follow up activities are related to verifying EA predictions and/or to determine effectiveness of mitigation measures with rationale. Requirements regarding compliance with provincial / federal guidelines / standards are also noted in this column.
- o *planned schedule* - **Note from Denison** -Table 1-5.1 in Appendix 16-C identifies the phases of the Project in which the proposed individual follow up programs will be executed. It is premature in Denison's view to develop specific "schedule" associated with all follow-up activities that are proposed. As noted in draft EIS Section 1.7.5, Licensing and Permitting, as well as in other responses to FIRT IRs, the Project is proceeding through sequential EA and licensing process. Given the sequential process to which Denison has committed it is planned that further detail will be developed to align with detailed engineering design through licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Notwithstanding the above, the proposed duration of each monitoring program (i.e., applicable project phases) and frequency of monitoring are provided in Table 1.5-2.

*roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results* - **Note from Denison** – At this time and commensurate with the level of detail at which the follow up activities have been defined the proponent assumes responsibility for



execution of all proposed activities. This may change as the program details are developed, and Denison presumes this is likely as it continues to work with the key Indigenous groups. It is noted however that provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners and therefore it is inappropriate (and may remain so) that specific details regarding follow up activities be shared without the expressed consent of the agreement signatories. Regulatory agencies at the provincial and federal levels are expected to largely play a review/approval role consistent with their responsibilities under various laws/acts/licenses/permits under which the Project, and follow up activities, will be executed. At this time there are no specific plans with local and regional organizations as it pertains to the design, implementation and evaluation of the program results; but this may change in the future. Per the above, Denison has added additional detail into Section 1.5 in Appendix 16-C with respect to roles and responsibilities consistent with the information provided in this IR response. As noted, full disclosure of such information may not be possible as it would be subject to non-disclosure covenants between Denison and its key Indigenous partners; nevertheless, more specific information will be provided as is available.

- *possible involvement of independent researchers* – **Note from Denison** – Involvement of independent researchers in follow up activities has not been identified at this time. This does not preclude possible involvement of independent researchers in the future; however, need for such has not been specifically flagged. As noted above, provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners, and such follow up activities and monitoring could include independent research. The sharing of information related to this type of independent research can and would only be shared with the expressed consent of the agreement signatories. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.5 clarifying the role of independent research that is consistent with our current understanding of such.
- *program funding sources* – **Note from Denison** – As noted above, the proponent assumes responsibility for execution of all proposed follow up activities that have been identified and therefore the funding of such. Also as noted above, provisions for follow up activities and monitoring that may be included in agreements developed between Denison and its key Indigenous partners will be subject to non-disclosure covenants in those agreements. This would include information concerning any funding that may be associated with these programs. It would be inappropriate (and may remain so) that specific details regarding any funding that may be provided for follow up activities be shared without the expressed consent of the agreement signatories. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.5 clarifying funding sources that is consistent with our current understanding of such.
- *information management and reporting (reporting frequency, methods and format)* – **Note from Denison** – A framework for information management and reporting is provided in Section 1.2 of Appendix 16-C. As described in Section 1.2 of Appendix 16-C specific information management and reporting structures associated with follow up activities are proposed to be developed as part of the development of the Project Environmental Management System (EMS). The Project EMS will be developed during licensing and permitting and that this information, including more detailed information regarding information management and reporting (e.g., reporting frequency, methods and format) will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.

*possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program* – **Note from Denison** – As noted above, Denison is committed to continuing the ongoing process of identifying opportunities for the participation of the public and Indigenous groups through its engagement process. For example, as recent as October 2023, Denison has engaged with Indigenous Communities of Interest about how the outcomes of the environmental assessment process become key areas of focus by the licensing and approvals regime – including in relation to environmental monitoring. All discussion and materials related to these engagement sessions can be found in Section 4 of the revised Draft EIS. Further to this, Denison has planned a comprehensive and technical workshop with ERFN in March, 2024, and expects to undertake the same for KML soon thereafter, focused very specifically on the aspects of items licensed or approved post-environmental assessment. This will include environmental monitoring and among other things the relationship to country foods, including potential country foods to be monitored as part of monitoring programs. As the lifecycle regulator for the Project, Denison is required to provide information related to the outcome of these discussions into forthcoming updates in the IER to the CNSC. Input provided in these meetings, and others as they occur, would be integrated into monitoring program development as appropriate. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.4 where consultation and engagement is discussed.

Denison also notes that the information provided herein and in Appendix 16-C represents a snapshot in time. Since follow up activities will span the full lifecycle of the Project, identification of potential opportunities for involvement is an ongoing process that will also span the full lifecycle of the Project.

Advice Response Table – Denison’s Response, February 2024 (Summary Advice Comments where EIS and Supporting Document Revision have been indicated)

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-50	Environment and Climate Change Canada (ECCC)	Section 2.2.1.4.2, Wellfield Operation Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	Providing a report or memo by the Proponent’s consultant Newmans Geotechnique Inc. as a public record will more effectively explain the “information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting [sic] Saskatchewan mining operations”, than a summary (attachment IR-10) of the material presented by Greg Newman during the meeting with the FIRT on April 19, 2023.	The response from the Proponent in IR-10 is accepted based on the meeting between ECCC, Denison and the CNSC, as well as the Proponent’s consultant and the presentation by Greg Newman (Newmans Geotechnique Inc.) as well as the summary of the meeting noted in attachment IR-10. However, the Proponent should provide a public record of the consultant’s memo or a report that explains the details of the freeze wall containment and monitoring that were provided during the April 19, 2023, meeting instead of the summary provided by the Proponent in attachment IR-10.	The April 19, 2023, presentation from Newmans Geotechnique Inc. to the CNSC is provided here as Attachment AD-50.
AD-51	Canadian Nuclear Safety Commission (CNSC)	Section 8.3.3 and 8.5, Aquatic Environment and Fish health	Denison has committed to additional baseline data gather as part of their response to IR-107.	Also related to IR-120 and IR-125, CNSC staff recommend Russell Lake be included in this baseline collection to increase the robustness of the established baseline in the final EIS.	Acknowledged. Denison will consider this request as it develops the plans for additional baseline collections, as well as the monitoring program design documentation for aquatic environment monitoring that is planned to be part of the licensing submission. It is noted that no aquatic environment effects are predicted to accrue in Russell Lake in relation to any phase of the Project and the concentrations of all water quality constituents are predicted to remain below aquatic protection values.
AD-52	CNSC	Section 8.3.3.1, Methodology and Metrics	Denison has indicated that exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.	Related to IR-121, CNSC staff recommend that Denison add text to EIS to reflect that no gross abnormalities in fish were observed during field work.	The text of revised Draft EIS Section 8.3.3.2 has been revised as recommended to indicate that that no gross abnormalities in fish were observed during baseline field work.
AD-53	CNSC	Section 8.3.8, Monitoring and Follow-up	<p>Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre- development."</p> <p>Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.</p> <p>Denison has committed to inclusion of reference lakes in study designs used to assess changes in fish communities / populations over time.</p>	Related to IR-122, CNSC staff recommend that Denison strengthen discussion of reference lakes, and their use, in EIS.	<p>Additional text (see below) has added to the fifth paragraph of Section 8.3.8 of the revised Draft EIS regarding aquatic environment monitoring program sampling areas and “reference lakes” more specifically, as follows.</p> <p>“Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development conditions, as well as through contemporaneous comparison of “exposure area” versus “reference area” data. In this context an “exposure area” is an area downstream of potential mine influence and a “reference area” is an area outside of potential mine influence. Where possible, the reference area would be located in the same drainage, upstream of mine influence where conditions closely mimic those downstream as is possible and where there is no, or reduced likelihood that exposure and reference fish populations can co-mingle.”</p>
AD-54	CNSC	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use	The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting	Related to IR-128, Denison should have follow-up discussions with the Ministry of Saskatchewan Highways, Indigenous Nations and communities (including KML and ERFN) and stakeholders regarding adding additional pull-outs to the highway to ensure safety for northern residents.	Acknowledged. We note that the Ministry of Highways and Infrastructure is responsible for construction and maintenance of highways in the province and Denison has no power or authority to construct pull-outs. However, Denison is committed to ongoing engagement throughout the life of the project and can provide input to Ministry of Highways and Infrastructure as applicable.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
		Section 12 Section 14	with Indigenous Nations and communities and are presented in the EIS.		
AD-55	ECCC	Section 9.2.5.2.7, Waste and Hazardous Materials Management	Vehicles and equipment with engines adhering to Tier 4 emission standards should be employed where feasible in order to minimize emissions. Regardless of engine tier used, best management practices should be followed, including proper maintenance of engines and anti-idling measures.	Related to IR-139, the Proponent should commit to following best management practices regarding the use of vehicles and equipment, including proper maintenance of engines and anti-idling measures.	Section 2.8 of the EIS and the commitment register included with this submission outlines Denison’s plan to regularly maintain and inspect equipment and machinery to make sure they are in good working order.
AD-56  IR-137	ECCC	Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou	The EIS and the IR response did not provide sufficient information to understand how the Regional Study Area (RSA) boundaries for caribou were determined.	<p>Related to IR-137, An assessment typically involves setting a geographic area for the assessment for the direct and indirect effects of a proposed project; this area is sometimes referred to as the Local Study Area (LSA). ECCC advises that the LSA is likely to extend beyond the Project footprint and a 500m buffer. ECCC demonstrated that the application of a 500m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale (Environment Canada, 2011). However, adverse effects of projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individuals of boreal caribou can vary and extend several kilometers depending on project activities and ecological context. The LSA should at the minimum capture the above-mentioned effects.</p> <p>A Proponent will also set a geographic area for the assessment within which the cumulative effects of the proposed Project are possible; this is sometimes referred to as the RSA. Typically the range(s) is(are) the proper scale to assess cumulative effects. However, assessing cumulative effects may require a different approach for large continuous ranges than for smaller discrete ranges. The impact of disturbance that may be concentrated in part of a large continuous range may be masked given the size of the range. For large continuous range it may be relevant to assess cumulative effects at the scale of the range but also at a smaller scale.</p> <p>The Proponent should consult with experts of the relevant jurisdiction in order to determine the local and regional study area, and provide a justification of the extent of the study areas in the impact statement.</p>	<p>The reviewer is also referred to the response to IR-137 and the response to AD-56 should be read in conjunction with it. The following is provided for reference.</p> <p>As per accepted environmental assessment methodology, the spatial boundaries were established to capture the extent of the expected/likely adverse effects, both direct and indirect, on the various valued components, that were expected as a result of the Project.</p> <p>The Project Footprint was delineated as the maximum extent of physical, direct disturbance resulting from the Project.</p> <p>The LSA was delineated to capture the extent of all direct, and most indirect effects of the Project on the wildlife VCs, including woodland caribou.</p> <p>The RSA was delineated to capture the extent of all likely Project effects, in consideration of the life-requisites and behavior of the various VCs being assessed (i.e., a habitat-based assessment) including ungulates (e.g., woodland caribou) which are known to have large home ranges. The RSA was also delineated in the context of the cumulative effects assessment, as it related to the region. Further the RSA is considered representative, as it includes habitat (ecosite types) that are found throughout the SK1 range. In particular, based on the habitat and its potential to support woodland caribou (as classified by the Saskatchewan Ministry of Environment) within the RSA is relatively consistent with the remainder of the habitat in the SK1 range (see Figure 2.1 in Appendix 9-F of the revised draft EIS).</p> <p>These study areas are appropriate, in that they capture the extent of the likely adverse effects of the Project on the VCs, to provide an ecologically relevant determination as to the likely adverse effect on the regional population of all assessed VCs, including woodland caribou (i.e., no dilution of the effects over the entire SK1 range – although this has been provided for context).</p> <p>The 500 m buffer around a physical disturbance was considered in the context of the extent of sensory disturbance, to allow Denison to determine the geographical extent of an effect (i.e., limited to the LSA, limited to the RSA) to allow the appropriate characterization of the effect to inform the determination of significance.</p> <p>Cumulative effects occur when the adverse effects of the Project, overlap in time and space, with the adverse effects from other projects and activities. As such, the RSA is the appropriate scale to appropriately conduct a defensible cumulative effects assessment – i.e., the effects of projects that are beyond the RSA spatial extent would not likely result</p>

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					<p>in residual effects that could act cumulatively with the Project’s effects, and consideration of effects that do not overlap spatially or temporally, are not cumulative, by definition.</p> <p>The Project is likely to add another 0.4% of anthropogenic disturbance (considering the Project Area of 169.6 ha) resulting in up to 1.9% of total anthropogenic disturbance in the Terrestrial RSA. As such, the Project's contribution to the cumulative effect is 0.001% of additional disturbance in the SK1 range, which is below the accepted threshold level of anthropogenic disturbance based on the SK1 range plan (ECCC 2020). The Ministry of Environment has indicated that the current level of anthropogenic disturbance is 53% within the SK1 range, which is below the accepted threshold level of 55% for anthropogenic disturbance for the SK1 range.</p>
AD-57	ECCC	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p>In their response to IR-167, the Proponent states: “Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre- clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre- construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>ECCC does not recommend active nest searches in most cases and for most species, in part because there is a great degree of difficulty associated with reliably detecting nests and a high likelihood of disturbing or damaging active nests while searching.</p> <p>Exceptions to the general nesting period exist, and these include interannual variation and nest searches for certain species which may breed outside of these</p>	<p>Related to IR-167, provide details on how vegetation clearing related to site development will be conducted to avoid harm to migratory birds and species at risk (SAR).</p>	<p>The reviewer is also referred to the response to IR-167 and the response to AD-57 should be read in conjunction with it. The following is provided for reference.</p> <p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snowpack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and</p>

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			general periods. Under the MBCA it is prohibited to destroy a nest with a live bird or viable egg, even if this occurs outside of what might be considered a normal nesting period.		implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.  <b>References:</b>  B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119  Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.  Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).
AD-58	HC	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	Section 6 of the Draft EIS contains Table 6.1-1 (p. 6-7), which lists radionuclides as a key indicator for air quality. Only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.	Related to IR-177, consider rewording Table 6.1-1 to “radon” instead of “radionuclides” to avoid confusion.	Acknowledged. The revision to Table 6.1-1 has been made as suggested.
AD-59	CNSC	Section 10.1.6.1.1, Human Receptors Selection and Characterization	Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.  While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.  In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor	Denison has addressed IR-180, but has not considered the suggestion for establishment of additional treatment technologies of COPCs.  CNSC staff maintains that there may be the need to establish additional treatment for effluent should environmental monitoring during operation indicate COPC’s are accumulating in the environment beyond what is anticipated in the EIS.  This is a firm reminder that this will be evaluated as part of the licensing phase of the project, should it proceed.	Acknowledged; it is understood that consideration of treatment technologies will be part of the licensing phase of the Project.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?		
AD-60	CNSC	Section 11, Perceived Risks to Lands and Resources	<p>The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are “perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well- being” (ERFN and SVS 2022a).” (p. 11-11)</p> <p>CNSC’s Generic Guidelines for the Preparation of an EIS state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEAA 2012). For the mitigation measures intended to address the effects of changes to the environment for Indigenous peoples, the Proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.” These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.</p>	<p>Related to IR-207, as Denison continues to work with Indigenous Communities of Interest on community specific monitoring regimes, please provide additional information in the IER on any updates on engagement activities to date that have taken place with KML and ERFN and any other Indigenous Nations and communities who utilize the area, with respect to follow-up monitoring plans that are being developed to support the Project licensing and permitting.</p> <p>If Denison has made commitments with respect to this, this is information that should also be included in the commitments report.</p>	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-61	CNSC	Various sections of the EIS, including: Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<p>ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).</p> <p>Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs.</p>	Related to IR-129, Denison needs to ensure that the proposed monitoring regime with ERFN, KML and other Indigenous Nations who utilize the area are included in the commitments table for future EIS submissions.	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-62	CNSC	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	IR-238 requested that Denison provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.  As well, it requested that Denison provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.	Related to IR-238, If Denison has made commitments with respect to engagement activities with Indigenous Nations and communities on potential, this is information that should be included in the commitments report.	Please see response to IR-238 and as noted previously Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-63	ECCC	Appendix 6-C Climate Baseline and GHG Emissions Report	ECCC recommended that the identification of the sources of GHG emissions and quantification of these emissions be described for the post-decommissioning phase, as was done for the other phases. ECCC recommended that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the Strategic Assessment of Climate Change (SACC) and the Draft Technical Guide Related to the Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment.	Related to AD-18, ECCC recommends the identification of the sources of GHG emissions and quantification of these emissions be described for the post decommissioning phase. This information will be useful for future development of a net-zero plan.	The Post-Decommissioning phase consists of physical, chemical, and biological monitoring of the site that will be conducted to confirm that the site is chemically and physically stable. Post-Decommissioning extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program or direct release of the land back to the Crown. The Post-Decommissioning monitoring program will be designed and conducted in accordance with the provincial and federal regulations and licence conditions.  For the purpose of the environmental assessment and the stage at which Project development currently stands, Denison believes the information provided on GHG emissions within the EIS documentation is appropriately focused on the Project phases with greatest activity which contribute to Scope 1 and 2 emissions.  As noted previously in response to AD-18, in accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data become available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.
AD-64	ECCC	Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report	ECCC noted that more specific data, such as regional data from provinces, forest companies, or literature may be available. The use of Table 20 of the draft Technical Guide does not apply.  ECCC recommended that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands.  ECCC recommended that the Proponent provide a quantitative and qualitative description of the Project’s	Related to AD-19, ECCC recommends that the Proponent revisit the land use calculation provided in the draft Environmental Impact Statement as the use of Table 20 of the draft Technical Guide for the above ground mass of vegetation species is not appropriate. This table is for above-ground woody vegetation in cropland systems which does not apply in this instance. A simple site survey would determine above-ground biomass on site using basic information such as site class and species. More specific data, such as regional data from provinces, forest companies, or literature may be available, while generic national	It is anticipated the GHG and climate change components of the Project will be re-evaluated once more detailed, site-specific data becomes available; this will be done after the EIS process is concluded and possibly as part of sustainability reporting. This analysis is expected to include more detailed study around overall GHG emissions (including land use changes - forest/vegetative biomass, soil carbon, wetlands), carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.	<p>data is available (e.g., Biomass Estimates for Major Boreal Forest Species in West-Central Canada (publications.gc.ca), Canada’s Forest Biomass Resources: Deriving Estimates from Canada’s Forest Inventory (nrcan.gc.ca)).</p> <p>ECCC reiterates the advice that the Proponent provide information regarding the consideration of biomass that are not above ground, specifically whether soil carbon and wetlands are taken into account.</p> <p>ECCC also restates the advice that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.</p>	
AD-65	CSNC	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit  Appendix 7-C, Section 3.5	In response to IR-82, Denison highlights the importance of the S redox couple (S(2-)/S(6+)) near the ore zone.	Related to IR-82, CNSC staff recommend that Denison consider the inclusion of hydrogen sulfide test kits for in-field measurements of H2S to supplement qualitative interpretations (e.g., absence of "rotten egg" odor associated with sulfide) relating to redox conditions.	Acknowledged and Denison thanks CNSC staff for this recommendation. The recommendation will be considered within the context indicated during future planning.
AD-66	ECCC	Appendix 7-C, Numerical Modelling: Post Decommissioning Evaluation,Section 2.3.1.4, Desilicified Zone	<p>The Proponent states in both the EIS and their response that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>In their IR response, the Proponent stated that the hydraulic conductivity used as the model base case (5x10-6 m/s) is similar enough to the geometric mean value (6x10-6 m/s) that no consequential change to the model would occur if the geometric mean were to be used. The use of the value of 5x10-6 m/s as the model base case was not substantiated.</p> <p>ECCC accepts the response to Part 1 of the IR as the Proponent has stated that 5x10-6 m/s and 6x10-6 m/s are similar enough hydraulic conductivities that redoing modelling with the geometric mean is not expected to consequentially change outputs for either the PHREEQC orFEFLOW model. However, the reasoning for selecting the value of 5x10-6m/s was not clear.</p>	Related to IR-89, while repeat modelling using the geometric mean hydraulic conductivity of 6x10-6 m/s is not required, include a statement in the EIS to indicate that the geometric mean hydraulic conductivity was not used in the model and providing justification for using the value of 5x10-6 m/s instead.	<p>The revised Draft EIS text (Appendix 7-C, Section 2.3.1.4 has been updated to report the geomean of the desilicified zone will be updated to 4.8x10<sup>-6</sup> m/s. The previously reported value of 6x10<sup>-6</sup> m/s was erroneous.</p> <p>“A hydraulic conductivity value of 5x10<sup>-6</sup> m/s was uniformly assigned to the model layers representing the Desilicified Zone. This value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10<sup>-6</sup> to 2x10<sup>-5</sup> m/s, with a geomean of 4.8x10<sup>-6</sup> m/s. As within other units, the geomean value was not applied directly, but rather a rounded value slightly higher than the geomean was applied throughout the entire desilicified zone. The value applied within the desilicified zone is considered conservative as it is a factor of 1.9 higher than the most-reliable hydraulic conductivity estimates (i.e., values obtained through pumping tests measured the conductivity as 2.7x10<sup>-6</sup> m/s) and is equivalent to the geomean value.”</p>
AD-67	Health Canada (HC)	Appendix 10-A, Section 3.2.1.3.1, p.3.43-3.44	<b>Inappropriate use of an outdated standard in assessing health and environmental effect(s) from</b>	The CAAQS are recommended as the most stringent air quality standard for assessing health and	Acknowledged. The reviewer is referred to the response to IR-190 for a discussion of the use / interpretation of the CAAQs in the EIS.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			<p>short-term exposure to nitrogen dioxide (NO2).</p> <p>The Draft EIS technical supporting document (Appendix 10-A) appears to misinterpret Health Canada’s 2016 Human Health Risk Assessment for Ambient Nitrogen Dioxide (NO2) in setting its screening criteria and evaluating the health impacts from exposure to Nitrogen Dioxide. The document states:</p> <p>“Health Canada published a national one-hour maximum acceptable level of 400 µg/m3 for NO2 in ambient air using a risk assessment approach (Health Canada, 2016b). This value considers sensitive human populations.”</p> <p>This statement is inaccurate.</p> <p>As indicated in Health Canada’s 2016 publication, this value (400 µg/m3) refers to the National Ambient Air Quality Objective (NAAQO) for NO2, developed in the 1970s. The Canadian Ambient Air Quality Standards (CAAQS) were later developed in consideration of both human health and the environment to replace existing Canada-wide standards, including the NAAQOs, and in many cases are the most stringent Canadian air quality standard, guideline or objective.</p> <p>The new CAAQS for NO2 also recognizes that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). In other words, NO2 is considered to be a non-threshold substances, meaning that health effects may occur at any level of exposure. Therefore, guideline values should not be construed as limits to which polluting up to is allowed.</p>	<p>environmental effect(s) from short-term exposure to NO2 in the project.</p> <p>The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, Health Canada suggests using model results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The modelling results should be able to indicate the frequency of CAAQS exceedances, which can be used in the discussion as to whether any anticipated human health impacts are anticipated</p> <p>Modelled predictions within an air quality assessment’s study area should be compared to the most stringent air quality standards, guidelines or objectives applicable to the region that may be affected by project activities. In this case, CAAQS are the most stringent levels and CAAQS are not restricted to applications only within the context of the Air Quality Management System (AQMS). Evaluation against the CAAQS may be considered in determining the nature and severity of the project’s impact on air quality levels and the resulting mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS.</p> <p>As health effects can occur even at levels of exposure below the limits set out in the CAAQS, they should not be viewed as “pollute-up-to” levels. It should be acknowledgeable that health risks exist below the guidelines. In addition, the principles of keeping clean areas clean and continuous improvement are operative, thus proposed mitigation measures should not be confined to meeting the standards, but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>This advice is also relevant to IR-190 and may be of use in responding to that request for a comparison of the predicted maximum concentrations to the most protective applicable air quality standards available (i.e., CAAQS).</p>	

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-68	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	<p>ECCC recommended the inclusion of an assessment of potential GHG mitigation measures throughout all phases of the Project including a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the draft Technical Guide.</p> <p>ECCC also recommended the development of a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.</p>	Related to AD-49, ECCC notes the comment provided by the Proponent stating, “Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances”. ECCC continues to recommend that the Proponent align with best practices by including in the EIS a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination and a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.	The information presented in the Draft EIS meets the requirements of CEAA 2012. Per Denison’s response to AD-49 (Annex 1, page 419/419) the company will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances but is not intending to include this information in the revised Draft or Final EIS.
AD-69	CNSC	Appendix 16-C	<p>The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p> <p>The CNSC’s Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS), also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p>CNSC staff requested in the March 2023 letter to Denison (e-Doc 6991467) a Commitments Table for the Wheeler River EIS. This letter requested information of all commitments made by Denison with detailed information such as:</p> <ul style="list-style-type: none"><li>• details of the commitment</li><li>• which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>• where the commitment is referenced (which document, table, etc. and where it can be found)</li><li>• how this commitment will be tracked (project EA follow-up program, site-wide programs, etc.)</li></ul> <p>Several commitments to Indigenous Nations and communities from the August 2023 submission appear to be missing from this table and should be included in the next submission.</p>	<p>For the next draft EIS submission, the evergreen Commitments Table should be updated to include:</p> <ul style="list-style-type: none"><li>• which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>• how this commitment will be tracked (project EA follow-up program, site- wide programs, etc.) and;</li><li>• all commitments to Indigenous Nations and communities</li></ul>	Please refer to the commitments register included with Denison’s IR response package.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-70	ECCC	Appendix 16-C Summary of Monitoring & Follow-up Programs	ECCC recommended that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Related to AD-48, ECCC acknowledges that the Project will likely be required to report annually per section 46 of the Canadian Environmental Protection Act as the annual emissions are likely to be over 10,000 tonnes of CO2e. However, ECCC’s suggestion incorporates additional components to align with the goal outlined in Appendix 16-C of the draft EIS to “assess the environmental performance of the project relative to the predictive assessment that has been completed in support of the environmental assessment process”. This would involve comparing actual vs. estimated emissions following the terms of the SACC’s net GHG emissions equation and evaluating the effectiveness of GHG-related mitigation measures.	Greenhouse gas emissions (GHGs) were not included as a valued component in the EIS, and as such, Denison is not proposing to add GHG monitoring to the EA follow-up monitoring to remain consistent with the methodology and scope for an EA completed under CEAA 2012. The annual GHG reporting will provide the required and relevant information to regulators per the Canadian Environmental Protection Act. Denison’s ESG reporting framework will be developed as the Project advances and will be scoped beyond the components of the EIS.
AD-71	ECCC	Conceptual Caribou Management Plan	Section 4.2.1 of the Conceptual Caribou Management Plan states that "The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area." Calculation of home range is normally based on statistical analyses of telemetry data. Home range cannot be inferred from telemetry points and incidental observations from a map	Related to IR-149, the Conceptual Caribou Management Plan should be corrected to remove the reference to caribou home range.	Acknowledged - Version 2 of the Caribou Mitigation Plan (now titled Caribou Management Framework) has been updated to re-word the sentence highlighted by ECCC.  For reference and further information, it is noted that Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.

## Attachment: AD-50

Original IR Number	AD-50
Follow Up IR Number	n/a
Dept.	ECCC
Project effects link	n/a
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4.2, Wellfield Operation Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping
Context and Rationale	Providing a report or memo by the Proponent's consultant Newmans Geotechnique Inc. as a public record will more effectively explain the "information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting [sic] Saskatchewan mining operations", than a summary (attachment IR-10) of the material presented by Greg Newman during the meeting with the FIRT on April 19, 2023.
Advice to Proponent	The response from the Proponent in IR-10 is accepted based on the meeting between ECCC, Denison and the CNSC, as well as the Proponent's consultant and the presentation by Greg Newman (Newmans Geotechnique Inc.) as well as the summary of the meeting noted in attachment IR-10. However, the Proponent should provide a public record of the consultant's memo or a report that explains the details of the freeze wall containment and monitoring that were provided during the April 19, 2023 meeting instead of the summary provided by the Proponent in attachment IR-10.

### Denison's Response:

Below are the Newman Geotechnique PowerPoint slides from the April 19, 2023 meeting with the CNSC.





 **ISR Freeze-Wall Queries...**  
PRESENTATION TO CNSC BY NGI  
APRIL 26, 2023



 **Outline**

- NGI qualifications
- Ground freezing basics
- Phoenix deposit freeze-wall
- IR 10 Queries
  - Freeze-wall integrity for containing solution
  - Fluid pressure interaction with freeze-wall
  - Exothermic reaction of solution with freeze-wall

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## NGI qualifications

- Newmans Geotechnique Inc. (NGI)
- Freezing engineering since 1995
- Ground Freezing Consulting with focus on
  - Ground water control, ground stabilization using freezing
  - Mine planning, shaft sinking, civil works
  - Construction in natural or artificially frozen ground
- Uranium Mining Freezing Related...
  - Cameco McArthur River freeze-walls
  - Cameco Cigar Lake bulk freezing
  - NexGen Rook I shaft freezing
  - Fission Uranium bulk freezing
  - Cameco Rabbit Lake tailings thawing / consolidation
  - Areva – various studies

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## Ground freezing outcomes

- Controls water flow by reducing permeability
- Allows for short and long term strength gain and stability improvement
- Permeability
  - Water freezes over a range of temperatures below 0°C. Once mobile water in pores changes phase, water flow is so impeded it, in effect, ceases.
    - In sand, limited flow when colder than -1°C
    - In clay, limited flow at -2°C, no measureable flow when colder than -5°C
- Strength
  - Freezing strengthens porous materials by increasing cohesion
    - E.g. an unfrozen clay with cohesion of 1.7 MPa is weaker than pure ice with UCS of about 5 MPa
  - Frozen ground can experience plastic deformations (glaciers flow)
  - Mohr-Coulomb analysis shows static plastic yielding
  - Creep analysis shows time dependent elastic-plastic strains

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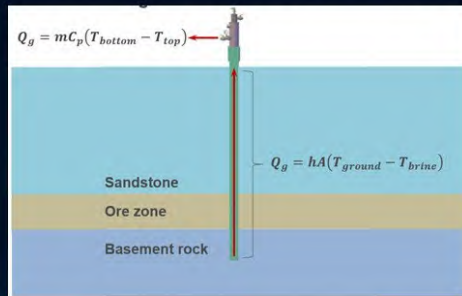
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## Ground freezing basics

- Has been used for over 120 years. First project was a 500 ft deep shaft in UK
- Inject chilled  $\text{CaCl}_2$  down poly tubes and it removes heat as it flows back in annulus between poly tube and steel casing.
- Pipes are "keyed" into basement rock to prevent bypass flows below.
- Pipes are installed from surface to create a barrier to flow over all depths.



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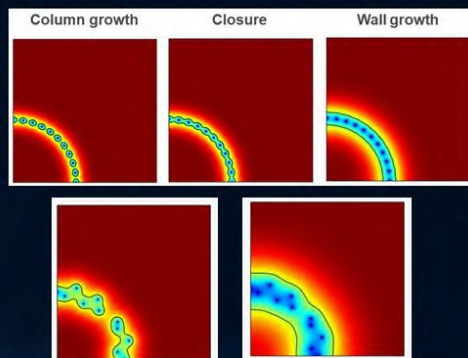
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## Ground freezing basics

- Ground heat is extracted around each pipe
- The frozen columns eventually "close" and water flows are cut off
- Over time, the freeze-wall grows much thicker.
- Deviation in drilling is forgiven over time



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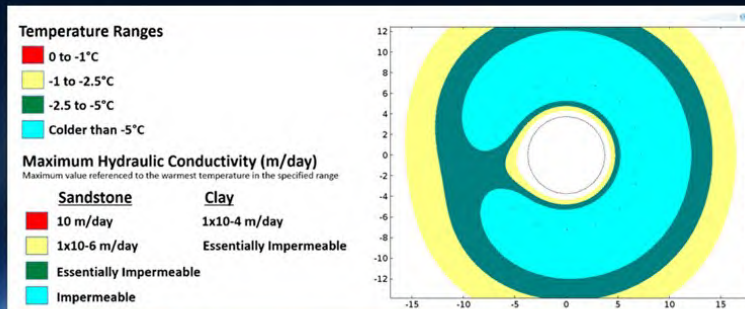
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## Freeze wall influence on hydraulic conductivity

Temperature is related to hydraulic flow rates

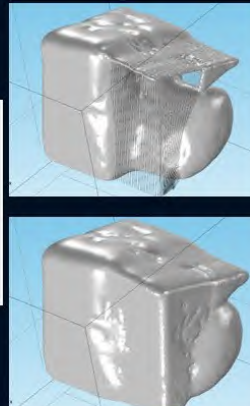
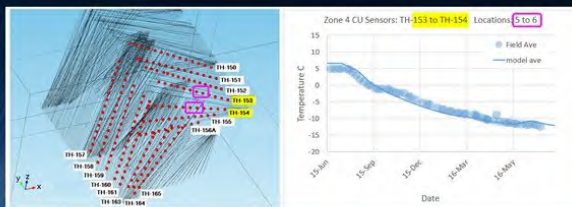
- As temperatures drop below freezing, the flow paths for liquid water to move are closed off
- The amount of reduction in  $K_{hyd}$  depends on ground type and temperature as shown here for a simulated shaft freeze where two pipes have been assumed permanently damaged and off line.



## Freeze wall creating a hydraulic barrier around a high grade ore zone (McArthur River)

Temperature strings installed offset from the wall used to:

- validate the models
- then use the model to understand the bigger picture



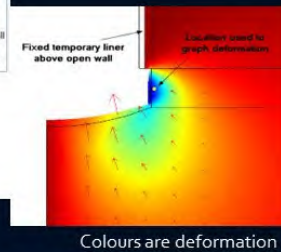
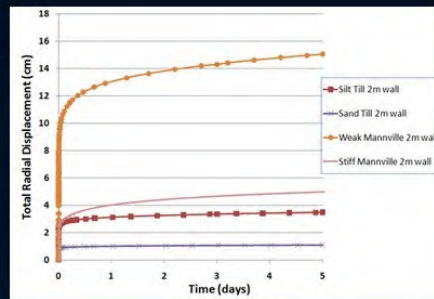
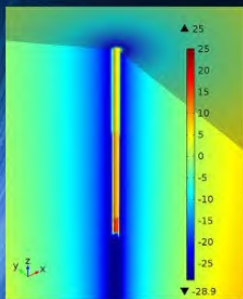




## Freeze wall stabilizing ground prior to large shaft excavation (BHP Jansen Mine)

Temperature is quite warm at base of shaft where cutting machine is working

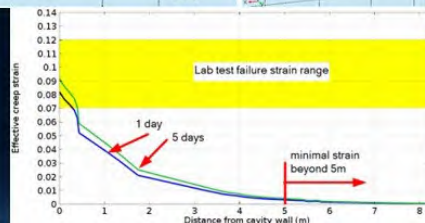
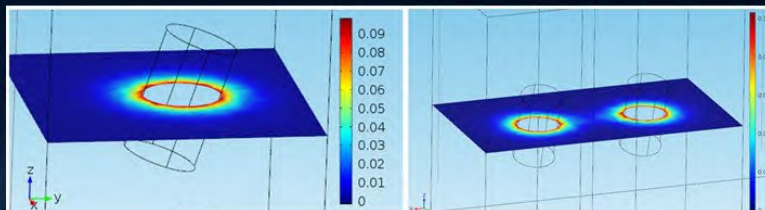
- Shaft opening is 10 m diameter in this case
- Freeze wall is blue in colour and stabilizes the ground to support the open shaft
- Deformations here are much more than anticipated at Phoenix given that freeze wall at Phoenix will be thicker than those used in this conservative model.



## Freeze wall stabilizing ground with Jet Boring mining at Cigar Lake (from CNSC presentation Aug 2013)

Jet boring cavities are 10 m high by 3.5 m diameter

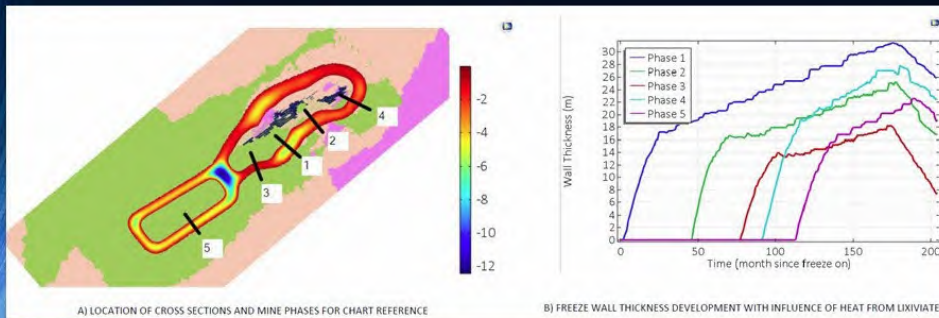
- Ground is frozen
- Creep in frozen ground results in up to 22 cm displacement but corresponding strains are well below failure range





## Phoenix freeze-wall

- Frozen and mined in phases
- Freeze-wall is offset from ISR grid patterns by 27 m
- Freeze-wall grows very thick, wall growth is controlled by cycling on/off active freezing to limit over growing in thickness



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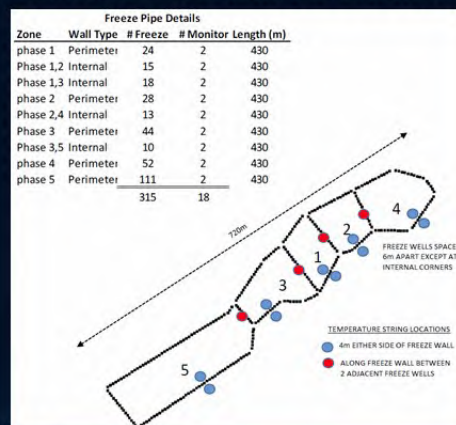
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## Phoenix freeze-wall

- Total of 315 freeze pipes and 18 dedicated thermal monitoring wells that have sensors spaced from below ore to surface
- Temperatures are monitored on both sides of the freeze-wall
- Data is used to calibrate the FEM model of the freeze over all ground types



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## CNSC IR 10 Queries

### 1 Freeze-wall integrity for containing solution

- Design meets all main criteria for a freeze-wall
- Freeze wall is keyed into basement and extends to surface so no overtopping or underflow
- Fluids are isolated – ground water cant get in, lixiviant cant get out
- Freeze wall is very thick (between 18 and 30 m) and is 27 m away from ISR injection and recovery wells
- Freeze wall temperatures are monitored and checked against thermal models

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## CNSC IR 10 Queries

### 2 Fluid pressure interaction with freeze-wall

- In deep shaft freezing or at McArthur River mine (530 to 640 m deep) there are mine openings at atmospheric pressure inside the freeze-wall with 6000 kpa fluid pressure outside the freeze wall.
- The walls at Phoenix will be much thicker than either the above and there will be fluid pressure on both sides of the wall.
- It is very very unlikely that the freeze wall will "see" pressure or stress gradients anywhere close to what it can withstand.
- Even if it did, freeze-walls are plastic and can deform without failing.

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## CNSC IR 10 Queries

### 3 Exothermic or other reactions of solution with freeze-wall

#### Freezing point of lixiviant...

- An acid/water strength of 80g/L H<sub>2</sub>SO<sub>4</sub> (~8% w/w) will freeze around -4 °C
- An acid/water strength of 55g/L H<sub>2</sub>SO<sub>4</sub> (~5% w/w) will freeze around -2 °C
- A peroxide/water strength of 15g/L H<sub>2</sub>O<sub>2</sub> (~1.5% w/w) will freeze around -1 °C
- A peroxide/water strength of 5g/L H<sub>2</sub>O<sub>2</sub> (~0.5% w/w) will freeze similar to water
- The freeze-wall will be formed with -30°C coolant. It will immobilize any lixiviant that flows near it. Potash mine shafts are frozen in saline soils with freeze points as low as those noted above.
- If lixiviant freezes off near freeze wall, it cannot bring in more solution to sustain an freeze-wall degradation

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## CNSC IR 10 Queries

### 3 Exothermic reactions of solution with freeze-wall

#### Exothermic Reactions...

- The ground at Phoenix is low sulphur content and should not generate much heat
- All design work so far assumed it DID generate heat and the freeze wall is maintained even assuming the entire ore phase region is generating heat.
- The freeze walls at McArthur River routinely withstand the heat of hydration of stope concrete backfilling where temperatures reach in the 50 °C range over the short term.
- The freeze walls in mine shafts routinely withstand ventilation heat in the range of 20 to 30 °C
- The peak temperature is not the sole issue. It is the peak T and the rate of heat generation. The freeze wall continually removes heat on both the ore and non ore sides. Even if the ore side warms due to lixiviant, most of that heat will not flow past the mid-line of the freeze wall so the wall thickness on the non ore side is not significantly impacted.
- If actual temperature monitoring shows the ground near the freeze wall warming more than anticipated, the freeze plant on/off cycling can be changed or the coolant temperature lowered.

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## CNSC IR 10 Queries

### 3 Exothermic reactions of solution with freeze-wall

#### Exothermic Reactions...

- "WHAT IF" models were solved

Ore Zone Sustained T	Freeze Plant Cycling?	Freeze wall Status
10 (base design case)	Yes	No impact
30	Yes	Thins but stable
50	Yes	Thins but too thin, possible issues
50	No	Thins but stable

There are controls that can be applied based on field observations

**ANNEX 1 TO FIRT ROUND 2 IR RESPONSE PACKAGE FEBRUARY 2024 (Complete  
Wheeler River Project FIRT IR Round 1 Response Package)**

Annex 1 Responses to Information Requirements

**Federal Indigenous Review Team (FIRT) – Denison’s Responses to Information Requirements for the Wheeler River Project Environmental Impact Statement**

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-01	English River First Nation (ERFN)	Current use of lands and resources for traditional purposes	General	<p><b>Context:</b> Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the <i>Traditional Knowledge Study and Health and Socio-Economic Study Report</i>. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN’s rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user.</p> <p><b>Rationale:</b> It is important for the proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and sociocultural and economic perspective.</p>	<p>The draft EIS should be revised to reflect the totality of ERFN TK and land use information.</p> <p>Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated.</p>	<p>Denison has met with ERFN regarding the IR and has gained a better understanding of the specific concern raised in the IR. ERFN's relationship and connection to the land is important. Denison will continue to work with ERFN to refine its understanding of this relationship and will work with ERFN to make sure this is accurately reflected in the final EIS.</p> <p>Despite the passing of the late trapper/resource harvester referred to throughout draft EIS, ERFN has communicated to Denison that ERFN considers his use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use. Changes will be made throughout the EIS to reflect that the late ERFN land user is but one of many current and future land users, and should be considered as representative of future land uses and expression of rights.</p> <p>For example, statements about the land being inactive at this time or statements that suggest that other land users are limited or have not provided documented use of the area will be removed and repositioned so as to reflect the importance of the area to ERFN. This may result in the inclusion of additional mitigation and enhancement measures. Denison will continue to work with ERFN on the list of Project elements that ERFN feels required additional refinement or that are sources of concern as the EIS review process continues.</p>	<p>As noted in the IR response, the final EIS will be updated. To support review of the response, a few examples of updates to the draft EIS are provided, with new text in <b>bold</b>, and deleted text in <del>strike</del>through:</p> <p>Example 1:</p> <p><i>10.1.6.1.4 Human Health Risk Assessment Results</i> (excerpt only) The ingestion rate for caribou, based on engagement with a local fisher/trapper, was 175 kg/yr of caribou (equivalent to approximately 2 to 3 servings per day). This ingestion rate is conservative compared to an annual caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) from the ERFN’s Country Food Study (CanNorth 2017) and 54.4 kg/yr for the total game diet for a high traditional foods consumer in the Boreal Shield as per the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al. 2018). Thus, the local fisher/trapper <b>represents</b> <del>is relatively extreme</del> <b>an intensive land user</b> with respect to local game consumption. <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 2:</p> <p>10.1.6.2 Residual Effects Characterization (excerpt only)</p> <p>For non-carcinogens, the results of the HHRA predicted no exceedances of the HQ benchmark (HQ&lt;0.2) for human receptors for non-carcinogens (cadmium, copper, chromium, cobalt, molybdenum, uranium, and zinc) during all phases of the Project. The one exception was selenium for the fisher/trapper at Russell Lake, where the incremental Project HQ for the fisher/trapper from fish ingestion (northern pike and white sucker) was predicted to be 0.93. <del>The traditional foods diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper which is representative of one person, who consumes a unique composition and quantity of traditional foods. Most</del> <b>Many</b> people fishing, hunting, and trapping in the Project Area would consume traditional foods more consistent with the average traditional foods consumer diet, which was developed from the ERFN country foods study (CanNorth 2017). <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 3:</p> <p>11.1.2.1 English River First Nation</p> <p>Indigenous Knowledge (referred to as Traditional Knowledge or TK by the ERFN) was provided by ERFN for consideration in the EIS. This included several reports:</p> <ul style="list-style-type: none"><li>• <i>Wheeler River Project – Summary of Health and Socio-Economic Study Results</i>, which summarizes results from 16 interviews that were conducted for the health and socio-economic topics (ERFN and SVS 2022a).</li></ul>

<sup>1</sup> Unless otherwise stated, the section noted refers to the draft EIS.  
<sup>2</sup> Where IR contents note “See also related IR(s)”, responses from Denison may be similar or provided in a single detailed response, but it was preferred to keep original IRs distinct.

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							<ul style="list-style-type: none"><li>• <i>Wheeler River Project - Summary of Traditional Knowledge Study Results</i>, which analyzed and presented results from 21 land use interviews that provided both IK and LK and included details on ERFN’s resource harvesting locations, species harvested, travel routes, cabins and special sites (ERFN and SVS 2022b).</li><li>• <i>The English River First Nation Country Foods Study Final Report</i>, which conducted in 2016 through funding secured from the First Nations Environmental Contaminants Program to complete a country foods study. The study involved three components: a dietary study, a sampling program, and a human health risk evaluation. The overall study objectives were to examine country food usage by ERFN community members and to assess if the country foods are safe to eat. The involvement of ERFN community members was one of the fundamental goals of the study, which relied heavily on TK to identify what and where to sample (CanNorth 2017a).</li><li>• <i>The English River First Nation Aboriginal Traditional Knowledge Summary Report</i>, which was compiled by Environment Canada on behalf of ERFN to summarize information for the purposes of recovery of the Woodland boreal caribou population. Ten individuals (mostly Elders) were selected by ERFN to complete TK interviews to understand boreal Caribou in the English River Traditional Territory (ERFN 2011).</li></ul> <p>Local Knowledge also was provided by an ERFN trapper, fisher, and resource harvester (ERFN Trapper) who resided in and conducted resource use in the Project Area. The ERFN Trapper explained the use of the area by outfitters and cabin lease holders, fish and wildlife abundance and distribution, species harvested for traditional use, and navigation and travel along waterbodies and roads. On October 29, 2019, at Denison’s Project exploration camp, the resource user attended a full-day interview. Notes from this interview were finalized on January 2, 2020, with their approval and are used in most ILRU components herein. Unfortunately, prior to the filing of the EIS, the ERFN Trapper passed away. <b>Despite his passing, ERFN considers the ERFN Trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use.</b></p>
IR-02	Canadian Nuclear Safety Commission (CNSC)	Mitigation Measures	General  Appendix 16-C	<p><b>Context:</b> Denison’s 2019 Wheeler River Terms of Reference states: “The EIA will also discuss the monitoring programs required to demonstrate regulatory compliance and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.”</p> <p>The CNSC’s <a href="#">Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS)</a>, also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p><b>Rationale:</b> The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p>	CNSC staff expect Denison to provide a comprehensive list of commitments along with the next version of the EIS, including any commitments made to Indigenous Nations and communities and other stakeholders (As committed in the Wheeler River Terms of reference, and as noted in the November 28 <sup>th</sup> , 2022 email from CNSC staff to Denison: <i>Future Submission of a Commitments Table for Wheeler River EIS</i> ).	A list of commitments, including specific commitment or mitigation measures related to Project effects as an outcome of engagement, made in the draft EIS, throughout the Federal information request period and the Provincial comment response period, will be included with the submission of the revised draft EIS. For clarity, this would not include any private, confidential accommodations made under contractual agreements.	No EIS updates are anticipated to address this IR at this time.  Denison acknowledges that a comprehensive list of Project-related commitments will be provided for the record as part of the process of finalizing the EIS.
IR-03	CNSC	Site preparation	Section 1.3.2 Temporal Boundaries	<p><b>Context:</b> The EIS and TSD-ERA provide assessment on the project timeframe, including construction, operation, and decommissioning phases.</p> <p><b>Rational:</b> The site preparation phase is not included in the timeframe</p>	Please provide an assessment of those facility characteristics and activities that may interact with the environment during the site preparation phase, along with an assessment of their potential effects, in order to reflect the entire lifecycle or provide a rationale for its exclusion.	The EIS phase 'Construction' includes site preparation activities and as such these site preparation activities have been assessed within the EIS and the supporting documentation, including Appendix 10-A.	Section 5.3.4 of the final EIS will be modified as follows:  Temporal boundaries are based on the different phases of the Project: <b>Construction (including</b>

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			Appendix 10-A (ERA)	(EIS and TSD-ERA). As per REGDOC 2.9.1, the sub-section 4.1.1 Complexity of the environmental risk assessment requirements states that “The applicant or licensee shall identify facility characteristics and activities that may interact with the environment during the relevant phase of the facility or activity’s lifecycle (for example, site preparation, construction, operation, and decommissioning.”		<p>EIS Section 5 Approach and Methodology of the Assessment, Section 5.3.4 outlines the temporal boundaries for the assessment and the Project activity tables used throughout the EIS include elements of site preparation in the Construction phase. The list of key project activities included in the Construction phase are included below; elements related to site preparation are shown in <b>bold</b>:</p> <p>Construction Activities</p> <ul style="list-style-type: none"><li>• <b>Development of access roads and air strip</b></li><li>• <b>Site preparation and earthworks; clearing, levelling, and grading of the Project Area</b></li><li>• Power generation - generators</li><li>• Installation of main substation and distribution of power around site</li><li>• Wellfield and freeze hole drilling; ground freezing</li><li>• Batch plant operation (concrete); crusher at borrow area</li><li>• Development of surface infrastructure (camp, operations centre, plants, ponds, pads, and support facilities)</li><li>• Waste management (composting, domestic and industrial landfill operation, recycling)</li><li>• Water management (including treatment and site runoff)</li><li>• Groundwater supply</li><li>• Surface water withdrawal</li><li>• Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)</li><li>• On-site and off-site operation of vehicles and transport of materials</li><li>• Air transportation for workers</li><li>• Regulatory site inspections</li><li>• Engagement – site visit from Interested Parties</li></ul>	<p><b>site preparation), Operation, Decommissioning, and Post-Decommissioning</b>, as described in Table 5.3-3.</p> <p>Section 1.3.2 of Appendix 10-A will be modified in the final EIS as follows:</p> <p>Consistent with the Wheeler River Project EIS, the temporal boundaries of the assessment include the following Project phases: construction (<b>which includes site preparation</b>), operation, decommissioning, and post-decommissioning (Table 1-1).</p>
IR-04	Environment and Climate Change Canada (ECCC)	Fish and fish habitat	Section 2, Project Description Section: Glossary	<p><b>Context:</b> The Proponent defines ‘clean waste rock’ as “Waste rock generated as sandstone cuttings and core from drilling activities associated with well and freeze hole development that does not have uranium containing materials”.</p> <p>ECCC notes that the use of the term “Clean Waste Rock” could be misunderstood to mean that the waste rock is devoid of any contaminant. Even when the waste rock referred to as “clean waste rock” does not contain uranium materials, it could contain other metals or contaminants that could have adverse environmental effects. It is also not clear whether the “clean waste rock” is characterized for Acid Rock Drainage/Metal Leaching (ARD/ML) given that some portion of the basement rock is to be drilled out to anchor the freeze walls and may have ARD/ML potential.</p> <p><b>Rationale:</b> The current definition of ‘clean waste rock’ in the draft EIS could lead to inappropriate handling and disposal if it is assumed to be devoid of any metals or other contaminants that might negatively affect the environment.</p>	Provide a clear and more detailed definition of the term ‘clean waste rock’.	<p>Clean waste rock is defined as non-mineralized and non-potentially acid generating (PAG) rock. Clean waste rock will be sent to a storage pad (clean waste rock pad) that is proposed to be lined with an impermeable geomembrane collecting precipitation that will be monitored for quality and would allow for treatment if necessary.</p> <p>The clean waste rock pad is expected to hold approximately 7,800 m³ of clean waste rock.</p> <p>Further characterization and test work are ongoing to confirm the ARD/ML characteristics of this waste rock. From the historically completed testing it is recognized that the non-mineralized mine rock is expected to include both non-PAG and PAG mine rock.</p> <p>The clean waste rock pile is being evaluated for potential segregation of the PAG mine rock. However, it is noted that, as observed in the six field barrel tests on Phoenix mine rock, including four bins that were identified as containing PAG mine rock, no net-acidity was observed over at least the first two years of the field barrel testing. In all barrel tests the pH values were greater than 7 and were producing substantial alkalinity (SRK, 2020). This indicates that the potential lag-time to net-acid generation would be on the scale of years and monitoring/collection/potential treatment could be pursued as conditions at the clean rock pile develop.</p> <p>It is noted that the non-mineralized mine rock is expected to have central tendency (i.e., median) solids contents that are generally similar to the average upper continental crustal abundance contents (Rudnick and Gao, 2014).</p> <p>The field barrel tests have all maintained neutral pH conditions and metals concentrations and their respective loading rates have generally either been stable or decreasing over the test duration (SRK 2020). However, further testing is required to confirm the expected behaviour at field-scale over operational-timescales.</p> <p>It is noted that comparing field barrel leachate concentrations are not directly representative of expected contact water within an at-scale storage pad; however, it is recognized that the clean waste rock pad is of a modest size and that loadings to contact water are expected to be directly correlated with the quantity of rock held within a catchment. Further, the barrel tests were performed on materials that were crushed to less than 1mm, field-scale mine rock of larger grain sizes would be expected to have appreciably lower mass loading rates than the unit rates observed in the field cells.</p> <p>Confirmatory sampling of both the waste rock and drainage at the clean waste rock is planned during both construction and operations.</p> <p>References:</p> <p>Rudnick, R.L. and S. Gao. 2014. Composition of the Continental Crust. Treatise on Geochemistry (Second Edition) Volume 4, 2014, Pages 1-51</p> <p>SRK Consulting Inc. (SRK).2020. Wheeler River On-site Kinetic Leach Tests, Progress Update – Draft. Prepared for Denison Mines Corp. January 2020.</p>	<p>Section 2.2.4.8 of the final EIS will be updated as follows:</p> <p>Clean waste rock (<b>non-mineralized and non-potentially acid generating [PAG] rock</b>) will be generated as sandstone cuttings and core from drilling activities. Based on the current wellfield and freeze wall design, approximately 7,800 m³ of clean waste rock will be generated. Clean waste rock will be stored on a 2,500 m2 single geomembrane liner (Figure 2.2-26) and can be used for road construction and/or concrete production. <b>The clean waste rock will be assayed and tested for PAG during Operations to ensure the material can be reused when required.</b></p>
IR-05	CNSC	Change to an environmental component due to hazardous contaminants	Section 2.2.1.2	<p><b>Context:</b> Water volumes for mud/diamond drilling is listed as minimal as the mud will be re-used. The mud is identified as a mixture of water, clay, and environmentally friendly polymers that clean out the cuttings and help to keep the drilling bit cool.</p> <p><b>Rationale:</b> Although the mud for drilling will be re-used, there could be environmental impacts should there be an accident while drilling.</p>	Please identify the components of the environmentally friendly polymers for the drilling mud and potential environmental impacts should the mud not be recovered.	Two primary drilling methodologies are planned for the development of the wellfield that will be comprised of monitor, injection, recovery and freeze wells. The two primary forms of drilling are diamond and mud rotary drilling. Diamond drilling will be used for freeze, monitor and small diameter injection wells. Mud rotary drilling will be used for recovery and larger diameter injection wells. Both methodologies employ similar mud management programs as part of the drilling process in that they both use a combination of light polymer and bentonite products to stabilize the subsurface formation during drilling and well installation.	No EIS updates are anticipated to address this IR at this time.



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						<p>Various products are used at specific depths to stabilize the formation and include Ultra PAC, Sawdust, Prima Seal, Premium Gel, Prairie Drill, KCl, Hyper drill, Hydrated lime, Envirofloc, Caustic Soda, Calcium Chloride, Purevis and bentonite. All products used on the Wheeler River Project are considered environmentally friendly and safe for use for workers as indicated by their respective safety data sheet (SDS) and product data sheet (PDS. The use of drilling muds was addressed within the A&amp;M hazards screening (Table 3-2; in Appendix A of Appendix 14-A) and characterized it as a low risk event.</p> <p>Potential worker safety risks primarily include slipping hazards at the worksite as the products generally create non-adhesive bonds in surfaces that are contacted.</p> <p>All of the products used are routinely landspread on farmer’s fields in the Oil and Gas industry in both Saskatchewan and Alberta at the same quantities or greater proposed for use on the Wheeler River Project. As a vast array and combination of products are used, the specific compositions are not presented herein but are available upon request.</p>	
IR-06	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>feasibility of meeting remediation targets.</li><li>groundwater flow conditions and validation of flow models.</li><li>mobilization of contaminants (e.g., Al, Se or V).</li><li>potential for free gas evolution/two-phase flow.</li><li>identifying composition of lixiviant and production solutions.</li><li>success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>	Please see Attachment IR-06.	<p>The following text will be added to the final EIS, under a new heading, Section 2.2.1.6 ISR Mining-Related Inputs for the EIS:</p> <p>It is important to note that Denison is completing a sequential EA and licensing process for the Project (see Section 1). Detailed ISR mining-related information needed to support licensing and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.</p> <p>For the EIS, an understanding of ISR design is needed to describe potential effects related to Project activities within the biophysical environment (EIS Part II, Section 6 to 9), human environment (EIS Part III Sections 10 to 13), and accidents and malfunction (Section 14) assessments. Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.</p> <p>Importantly, since the mine design includes the freeze wall, movement of mining solution is restricted and contained horizontally during operations. Wellfield pumping provides the hydraulic containment to keep mining solution within the 50 m mining area (see Section 2.2.1.4.2). During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface water or down gradient groundwater environments, and the groundwater assessment (Section 7) focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions. During mining area remediation (see Section 2.3.3.1.1), the freeze wall will remain in place until decommissioning objectives are achieved. Refinement of the mining area decommissioning objectives and associated modelling will be done through updates to the Decommissioning Plan, and will be bounded by the objectives evaluated in the EIS.</p>
IR-07	ECCC	Fish and fish habitat	Section 2.2.1.4.2, Wellfield Operation  Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	<p><b>Context:</b> The description in Sections 2.2.1.4.2 and 2.2.1.4.2.2 refer to the differential rates of injection and withdrawal, which implies that more solution will be withdrawn through the recovery well than volume of mining solution injected. According to the description of the site, a freeze wall will create a barrier between the uranium deposit to be mined and outside the isolated area to prevent inflow of groundwater from the sandstone outside the freeze wall. Secondly, it was indicated that the basement rock below the uranium deposit will prevent infusion of groundwater from below.</p> <p>The Proponent stated that inward hydraulic gradient will be created</p>	Clarify where the extra groundwater will come from to sustain this differential rate of injection and withdrawals during operation and if this extra water has been accounted for in the model and the amount of water that ends up in the receiving environment.	<p>The freeze wall will provide hydraulic containment between the internal wellfield and the external regional groundwater system with each well pattern maintaining a minimum 1% 'bleed' to maintain hydraulic gradients towards recovery wells.</p> <p>The "extra" water pumped (i.e., the water pumped in excess of injection) will be derived from stored groundwater within the sandstone units above the ore zone, and from the underlying paleoweathered zone, within each phase of Operation that is surrounded by freeze walls. The volume of stored water was estimated using the calibrated groundwater flow model, which contains 3D volumes for the saturated soil and rock within each of the walled phases, including appropriate porosity values. These volumes of stored water were compared to the volume pumped within each phase of operation, over the expected period of extraction</p>	No EIS updates are anticipated to address this IR.

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				<p>by recovering more solution than is being injected. In general, the wellfield will operate to draw a minimum of 1% more solution out of the wellfield compared to solutions injected in. This will help avoid increased subsurface pressures from injection pressure build up within the deposit.</p> <p><b>Rationale:</b> It is not clear where the extra groundwater will come from that will sustain this differential rate of injection and withdrawals as the freeze wall and bedrock basement will isolate the injection well from groundwater.</p> <p>If it is assumed that there is limited amount of groundwater present in the sandstone layer above the uranium deposit, that amount of groundwater in the sandstone layer is finite and will be exhausted at some point. Therefore, it is not clear where the extra groundwater will come from. If the extra volume of water is not accounted for in the modelling, that would ultimately affect the volume of water that ends up in the receiving environment and likewise the amount of contaminants contained.</p>		<p>based on the mining plan. The stored volume of water was calculated to be 3.4 (Phase 1) to 9.7 (Phase 4) times the estimated excess pumped volume. In other words, there is ample stored water within each walled phase to supply the excess pumped volume. The excess pumping creates a hydraulic gradient toward the ore zone within each walled phase, which will help to avoid vertical spreading of the UBS during operations. If monitoring during operations indicates water levels are falling quicker than anticipated, additional water could be added within the walled phase, within the Upper Sandstone Aquifer.</p> <p>The volume of water reduction within each phase of operations was evaluated within model simulations presented in Appendix 7C, Section 2.7. The volume reduction within mined phases was found to be minor compared to the volume of water pumped from the Upper Sandstone Aquifer located outside the freeze wall confines and within the regional groundwater system during decommissioning (i.e., pumping at 35.5 m<sup>3</sup>/hr). The pumping of groundwater for process water results in an order of magnitude more water volume extraction than the estimated volume required to replenish stored water when the freeze walls are thawed.</p>	
IR-08	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.1.4.2.2 Project Description	<p><b>Context:</b> This section describes how an inward hydraulic gradient will be created within the mining area as a secondary containment method for control of mining solution. While the process is described, there is no information on contingency measures in place for pump failure or system maintenance solutions. There is also no information on how quickly the hydraulic gradient, and therefore secondary containment, would be compromised if any pumps stopped working. It is also unclear how primary containment (i.e., well design) failure, such as physical/mechanical issues compromising casings, would affect the creation of the hydraulic gradient and secondary containment as well.</p> <p><b>Rationale:</b> It is important to have contingency planning in place in the event that there are any issues with the hydraulic gradient and secondary containment system for control of the acidic mining solution.</p> <p>There is no information in this section on how the hydraulic gradient (i.e., secondary containment) would be maintained if a well or pump (i.e., Primary containment) experienced problems.</p>	Provide further information regarding how the inward hydraulic gradient system functions, with particular focus on how the hydraulic gradient and secondary containment will be maintained if any wells or pumps were compromised.	<p>The following highlights the three levels of containment that will be in place to mitigate the potential for loss of containment of the mining solution. Mining solution containment was discussed in the draft EIS, Section 2.2.1.4.2 Wellfield Operation. As noted in the IR, the hydraulic gradient created in the mining zone between injection and recovery wells provides for secondary containment.</p> <p>i. Primary Containment (Well Design) The well configuration is designed to make sure fluids, whether injected or extracted, are confined to set depth locations. In the case of most injection and extraction wells, this would refer to the surface injection point and the screened location at the ore zone depth. The cased and sealed well in all other portions of the well design ensure no interaction with groundwater from other formations from surface to the deposit depth, thus preventing dilution from inward fluid flow of formation waters or outward migration from the well. Well integrity is monitored through live pressure monitoring systems in the annulus of the wells for leak detection and scheduled compliance checks via wireline tools of well integrity.</p> <p>ii. Secondary Containment (Hydraulic Gradient) Hydraulic gradients within the wellfield are maintained initially on a per pattern basis comprising of a single extraction well with four injection wells. In this initial stage of wellfield operations, all solutions from the four injection wells are drawn towards the single extraction well. As wellfield development progresses subsequent adjacent patterns are constructed. In these subsequent stages, the fluid from the injection wells is now drawn toward multiple extraction wells, essentially dividing the recovered solution between the number of operating extraction wells. As subsequent progression of wellfield development evolves, the inward hydraulic gradient of fluids injected will be further divided by adjacent extraction wells.</p> <p>In upset conditions, such as pump failure, or during scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. This is a standard approach used in ISR mining. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.</p> <p>iii. Tertiary Containment (Freeze Wall) The freeze wall provides two main benefits:</p> <ol style="list-style-type: none"> <li>A defined area for the mining process to occur with the establishment of clear ‘no flow’ boundaries being the freeze wall itself.</li> <li>Essentially removes the effects of the regional groundwater system and regional hydraulic gradient within the confines of the freeze wall. In the event of an upset condition, groundwater velocity is essentially null preventing any migration of fluids up or down gradient. This allows time to recover any fluids in a controlled manner while re-establishing operating conditions in what would otherwise be considered a ‘stagnant’ system.</li> </ol>	<p>The following text will be added to the final EIS in section 2.2.1.4.2.2 Secondary Containment of Mining Solutions.</p> <p>“In the case of an upset condition, such as pump failure, or scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.”</p>
IR-09	CNSC	Geology and Groundwater	Section 2.2.1.4.2.2	<p><b>Context:</b> This section indicates that mining solution within the mining area can primarily be controlled by maintaining an inward hydraulic gradient. The inward hydraulic gradient will be created by recovering more solution than is being injected.</p> <p><b>Rationale:</b> If, for some reason, the recovered solution is much more than that being injected, an excessive drawdown could be created. If, by accident, mining solution is leaking into the upper sandstone aquifer through crack in injection/recovery well casing at the same time, it would be challenging to remediate the upper sandstone aquifer in dry conditions (due to excessive drawdown).</p>	Please clarify if any measure will be implemented to avoid excessive drawdown and develop contingency measures to address such accident.	<p>The measures that will be implemented to avoid excessive drawdown are as follows:</p> <p>Continuous (real-time) water level monitoring will be implemented for hydraulic head measurements in individual wells as well as the surrounding open aquifer system contained within the boundaries of the freeze wall. These monitor wells will be installed at various depths throughout the mining area (i.e., within the freeze wall) ranging from the shallow groundwater system to the deposit depth and further, through the paleoweathered zone, into basement rock below the deposit and mining horizon. The mining methods operational success and efficiencies are benefitted by maintaining a shallow depth to water to reduce the magnitude of hydrostatic head needed to be applied to pump within each recovery well.</p> <p>In the event that excessive drawdown was identified through the monitoring system, it could be mitigated. Water would be pumped into the overburden aquifer to offset such injection and pumping imbalance. Water sources would include those from both groundwater and surface sources previously assessed.</p> <p>It is noted that leakage of “mining solution” into the upper aquifer is a hypothetical accident</p>	No EIS updates are anticipated to address this IR.



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						or malfunction that would not be allowed to persist as it would be identified by monitoring. Individual wells will be monitored for integrity and well operation would stop if a leak were detected to prevent or limit migration of fluid outside of the mining zone. Further, all monitor, injection and recovery wells can be retrofitted with down hole pumps to recover solution that may have leaked or migrated in an upset condition. Additional recovery wells can be installed at select depth to further increase recovery if the need should arise.	
IR-10	ECCC	Fish and fish habitat	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>	<p>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</p> <p>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</p> <p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p><b>Technical Discussion Required:</b> Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause.</p>	Denison met with the FIRT reviewers on April 19, 2023 to discuss the response to IR-10. Greg Newman, from Newmans Geotechnique Incorporated, attended the meeting to provide information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting Saskatchewan mining operations. A written response to IR-10, summarizing the material presented by Greg Newman, is included here as Attachment IR-10.	No EIS updates are anticipated to address this IR.
IR-11	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3 Project Description	<p><b>Context:</b> It is unclear how much contact water may be produced during the drilling of the mine well field during the construction phase of the proposed Project. Figure 2.2-14 indicates that no water will be produced during the drilling process in the construction phase. In Section 2.2.1.2 both mud rotary drilling and diamond drilling are proposed for the creation of wells. Both processes require water, however only mud rotary drilling produces liquid mud that is then reused in the drilling process.</p> <p><b>Rationale:</b> It is unclear if the liquid mud produced during drilling can be reused indefinitely with further water additions, or if this eventually becomes the clean sand grain cutting and how it will be disposed of (i.e., liquid or solid waste). If the mud produced from drilling is classified as liquid waste and disposed of as contact water, it is not clear if this is accounted for in the site water management plan and water balance during the construction phase. Contact water from well drilling during the construction phase has not been quantified or accounted for in Figure 2.2-1, and therefore it is unclear if proposed infrastructure during the construction phase has the capacity to contain this waste stream in addition to the waste streams currently outlined in Figure 2.2-1.</p>	Provide further information on potential wastewater produced during the construction phase from drilling processes, and if proposed infrastructure can contain any water produced.	A centrifuge will be used for separating out solids during both diamond and mud rotary drilling to recycle fluids. Only solid drill cuttings, not wastewater, will be produced and all muds and waters will be recycled as part of the drilling process. Upon completion of a drilling campaign, all remaining mud and water will be stripped of remaining solids, treated with mud zymes to break down polymers, and injected back down into the mineralized horizon. During active drill campaigns clean water will be held in approved tanks as part of the drill program between well drilling.	No EIS updates are anticipated to address this IR.
IR-12	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p>	<p>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</p> <p>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</p>	<p>1. and 2. Denison's approach to site water management is keep non-contact water “clean” – that is, the management approach provides that non-contact water does not come into contact with site aspects that may impart constituents/contaminants of concern and that non-contact water mingles with contact water. Contact water is water expected at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17), and also includes leachate collected from landfills. As such, runoff from the airstrip and site roads is considered non-contact water and will not be actively managed. However, should a spill occur, the spill response plan will be followed. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs.</p> <p>By following best practice and mitigation measures outlined in the EIS, Denison does not anticipate a need to continually manage water at the airstrip or along site roads as the water here will be clean, non-contact runoff. Examples of relevant mitigation measures include:</p> <ul style="list-style-type: none"><li>• Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li><li>• Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li><li>• Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li><li>• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li></ul> <p>Refer to Section 14 of the draft EIS for the screening and evaluation of various accident and malfunction scenarios. Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Additionally, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water</p>	No EIS updates are anticipated to address this IR.

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				<p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>		<p>removal means such as vac trucks or sump pumps could be employed and the areas would be re-graded to minimize water accumulation.</p> <p>3. As indicated in the response to IR-12, points 1 and 2 above, Denison expects contact water requiring management is at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17). For this area, the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m<sup>3</sup>. The wellfield runoff pond has been sized appropriately (38,200 m<sup>3</sup> with 1 m of freeboard) to contain this volume of water.</p> <p>4. Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.</p>	
IR-13	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	<p><b>Context:</b> The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).</p> <p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p><b>Rationale:</b> ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>	<p>Please provide:</p> <p>1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching;</p> <p>a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML.</p> <p>b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.</p> <p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>	<p>1. The waste rock from the basement is potentially acid generating due to localized pyrite mineralization. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units. Rock recovered from basement during drilling will be further characterized prior to or during drilling activities.</p> <p>1a. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further explorative works are ongoing part of ongoing Engineering activities and with confirmation of characterization through assays of representative samples.</p> <p>1b. Basement rock will be tested for potential for acid generation. It is expected that a portion will be potentially acid generating. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units.</p> <p>2. All basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. See also response to IR-04</p> <p>3. Clean waste rock will be generated as sandstone cuttings from drilling activities. Clean waste rock will be stored on the clean waste rock pad. The clean waste pile will be assayed and tested for Potential Acid Generation (PAG) during operations to ensure the material can be reused when required. Potentially acid generating waste rock will be stored on the special waste pad. Special waste is defined as mineralized materials that cannot be disposed of in the clean waste pile. It is primarily made of drill cores and cuttings from wellfield construction. A double-lined process water pond with leak detection has been designed to capture water from various areas, including the process precipitates storage pad and special waste pad. The pond will be designed to hold up to 30,000 m<sup>3</sup> of water and will be located next to the processing plant. The pond has been designed to hold a probable maximum precipitation event. The pond will be able to receive water from all site ponds and monitoring wells.</p> <p>The ponds that are designed to receive materials recovered during drilling activities are all lined with a leachate collection pond that will be monitored for water quality. The environmental monitoring program that will be presented during licensing will cover characterization of materials placed in the clean and special waste ponds to ensure environmental protection.</p>	<p>Section 2 of the final EIS will be updated per below:</p> <p>2.2.4.7 Special Waste and Special Waste Pad</p> <p>During Operation, the special waste pad is expected to contain special waste that is primarily mineralized core, <del>and</del> cuttings from wellfield development, <b>basement rock, and any waste rock determined to be potentially acid generating (PAG)</b>. Special waste from drilling activities is defined as uranium containing materials that cannot be disposed of in the clean waste pile, <b>including PAG waste rock</b>. Special waste will be determined by Denison geologists based on ore zone intersection expectations, <del>and</del> probe reading taken during wellfield drilling activities, <b>and results of systematic assays to characterize the acid generating potential of the waste rock</b>. Based on the current wellfield and freeze wall design, approximately <del>150</del> <b>2,000</b> m<sup>3</sup> of special waste rock will be generated.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings generated during wellfield development to recover uranium. This reprocessing may be done by placing the material in tanks with mining solution or placing the material underground into the mining area at the end of a well's production.</p> <p>The special waste pad may be used to temporarily store other materials that may be radioactive (e.g., contaminated soil) prior to final disposal in the industrial landfill or a licensed off-site facility.</p> <p>The special waste pad is estimated to be 2,500 m2 in size and will be constructed with a double composite liner system with leak detection capabilities (Figure 2.2-25). Any contact water coming off the special waste pad will be directed to the wellfield runoff pond (Section 2.2.3.5).</p> <p>2.9.1.3.3 Waste Management Program</p> <p>The Waste Management Program would include requirements and processes to ensure that Denison's activities that involve planning for, handling, transporting, processing, storage, and disposal of wastes are performed in a manner that complies with applicable regulatory and licence requirements and protects workers, the public, and the environment.</p> <p>The Waste Management Program would include identification of waste inventory and the characteristics of the waste (radiological and hazardous non-radiological), waste segregation, waste packaging and transfer requirements, and the plan for storage or disposal of the wastes. <b>The Waste Management Program will detail the plans for waste rock segregation based on mineralized content and acid generating potential.</b></p>

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IR-14	CNSC	Wastes and Decommissioning	<p>Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)</p> <p>Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)</p>	<p><b>Context:</b> The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)</p> <p>Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as <i>Complete</i>.</p> <p><b>Rationale:</b> Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.</p>	<p>How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?</p>	<p>Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached. Please see response to IR-28 for information on how Denison will provide this information as the EA process advances.</p> <p>The option to leave concrete foundations in place will be discussed with Indigenous Nations and communities as decommissioning plans become more defined.</p> <p>The conceptual decommissioning plan (CDP) included in the draft EIS contains the appropriate level of detail for this stage of the Project. As described in Section 2.3.3, the details of the decommissioning plan will evolve and become more specific as the Project advances. The subsequent iteration of the plan is the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan will evolve over time and the plan will become more refined as the Project advances. Denison is committed to continue to engage with Indigenous Nations and communities to solicit input.</p> <p>The comment in Section 4 on page 4-33: "Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?" was addressed in the draft EIS in the following manner:</p> <p>- Concern about responsible authority for restoring the environment, including contaminants when mining concludes: Denison is responsible for decommissioning. Denison’s decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure.</p> <p>- How long will it take to have the environment fully restored: Based on best practice and technical studies completed for the Project, the active decommissioning phase is anticipated to be 5 years. The Post-Decommissioning phase extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program (Government of Saskatchewan 2009) or direct release of the land back to the Crown. Post-Decommissioning is expected to last 15 years and during this phase, monitoring will be conducted until the site-specific decommissioning and reclamation objectives for the Project are met.</p> <p>- if Denison is no longer the operator, how will this be completed?: The financial assurance process provides certainty that the Project can be decommissioned as planned. The Project will not be issued an approval to operate until the decommissioning plan and associated cost estimate are accepted by the Minister of Environment and the financial assurance is in place. If Denison is unable to complete the decommissioning for any reason (e.g., bankruptcy), the finances are available for the Province of Saskatchewan to complete the activities as planned. The PDP will include an associated estimate for the decommissioning costs and Denison will provide financial assurance to confirm the identified decommissioning activities can be completed as planned. Updates to the financial assurance are done in conjunction with updates to the decommissioning plan, on a frequency of every five years during operations.</p> <p>References: Government of Saskatchewan. 2009. <i>Institutional Control Program: Post Closure Management of Decommissioned Mine/Mill Properties Located on Crown Land in Saskatchewan</i>. Ministry of Energy and Resources. December 2009.</p>	<p>Refer to IR-28 for information on EIS updates related to issues and concerns.</p>
IR-15	ECCC	Fish and fish habitat	<p>Section 2.2.3.4 Project Description</p> <p>Section 8.1.3.4.2, Aquatic Environment</p>	<p><b>Context:</b> In Section 2.2.3.4 it is stated that the estimated PMP event for Project infrastructure planning is 483.3mm. In Section 8.1.3.4.2 it is stated that the PMP is 489.3 mm.</p> <p><b>Rationale:</b> It is unclear which value is the correct PMP value and if Project infrastructure has been planned correctly.</p>	<p>Provide the correct PMP value and verify that Project infrastructure has been designed utilizing the correct value.</p>	<p>The PMP event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program (1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes.</p> <p>The PMP value in Section 2 will be updated from 483.3 mm to 493 mm in the final EIS. The PMP value used in Section 8 (489.3 mm) will not be updated because it is less than the design PMP and, as such, was conservative.</p> <p>References:  Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.</p> <p>Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>	<p>Section 2.2.3.4 of the final EIS will be updated as follows: “The pond will be surrounded by a 2.0 m berm, have capacity for 0.5 m storage from a probable maximum precipitation (PMP) event estimated to be <del>483.3 mm</del> 493 mm, and allow for maintenance of 1.0 m of free board.”</p>



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IR-16	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> The EIS and technical supporting documents do not provide sufficient justification for the selection of the proposed wastewater treatment systems for the industrial wastewater treatment plant or the domestic wastewater treatment plant.</p> <p>In addition, it is not clear how the upper bound of the industrial wastewater treatment plant effluent quality was obtained.</p> <p><b>Rationale:</b> Draft REGDOC-2.9.2 formally documents the CNSC’s expectations to licensees for controlling releases to the environment. For proposed new facilities, these expectations include conducting a best available technology and techniques, economically achievable (BATEA) Assessment, and determining key parameters necessary to support the EIS. These include identifying:</p> <ul style="list-style-type: none"> <li>environmental release targets to inform the design of wastewater treatment systems to constrain the quantity and concentration of contaminants and physical stressors released into the environment,</li> <li>the best available technology and techniques through an options analysis; and</li> <li>the anticipated influent characteristics, overall treatment efficiencies, and maximum predicted design release as the output of the assessment.</li> </ul> <p>Consideration of the principle of pollution prevention and BATEA is also a requirement of REGDOC-2.9.1.</p> <p>CNSC staff have met with Denison to discuss the expectations in draft REGDOC-2.9.2.</p>	<p>Please provide a summary of the BATEA assessment to justify the selection of the wastewater treatment plant system.</p> <p>As part of the summary, please identify the anticipated environmental release targets used to inform the design, as well as the maximum predicted design release concentrations and loadings to the receiving environment. The maximum predicted design releases should be used in the ERA to demonstrate protection of people and the environment.</p>	<p>Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (e.g., effluent quality) needed for the EIS were developed by Denison’s Project engineers early in the EA process to allow for the biophysical and human assessments to advance. An example of one of these outputs is the IWWTP effluent quality. The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects.</p> <p>As stated in the Draft REGDOC 2.9.2 Denison understands that a BATEA assessment be conducted to determine the predicted design release characteristics as part of the licence application for a new facility or activity.</p> <p>Outside of the EIS process, the Project detailed engineering is progressing, including the design of the IWWTP and associated refinement of effluent quality predictions. Denison is following Draft REGDOC 2.9.2 to arrive at a treatment option that remains within the bounds of the EA, which ultimately predicts no significant impacts to the receiving environment. The maximum design release characteristics for the IWWTP will be provided as part of Denison’s licence application to the CNSC.</p> <p>Denison met with the CNSC specialist from the Health Sciences and Environmental Compliance Division on December 7, 2022 to discuss the approach associated with a sequential EA and Licensing, and it was agreed that the above approach is acceptable.</p> <p>Denison is committed to completing the BATEA and providing the details to the CNSC.</p>	No EIS updates are anticipated to address this IR.
IR-17	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> It is also acknowledged that Denison stated in meetings with CNSC staff that Denison intends to propose final release targets to the CNSC as part of the licence application submission.</p> <p><b>Rationale:</b> It is not clear in the submission whether Denison has considered whether any applicable technology-based performance standards exist in Canada or internationally, and would be relevant as effluent discharge targets, in order to ensure principles of pollution prevention are applied. Consideration of this would help ensure that the proposed effluent discharge targets harmonize with existing federal, provincial/territorial, and/or municipal requirements. For example, there are release limits for radium-226, TSS, and pH outlined in the federal Metal and Diamond Mining Effluent Regulations, which have been demonstrated to be achievable in the uranium mine and mill industry.</p> <p>In addition, countries like the United States, where in-situ recovery has been conducted in the past, have specific technology-based limits. These are known as New Source Performance Standards and are identified in US Code of Federal Regulations (US CFR) 40, Chapter 1, Subchapter N, Part 440 - Ore Mining and Dressing Point Source Category. It is not clear whether these have been considered in Denison’s assessment. These should be considered when identifying suitable achievable technologies.</p>	Denison should harmonize their proposed Effluent Release Targets with the technology-based performance standards that exist in the Metal and Diamond Mining Effluent Regulations where applicable, or other suitable international regulations.	<p>Denison appreciates the comment and is committed to meeting all MDMER release targets.</p> <p>The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects. Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (effluent quality) developed for the IWWTP were necessary and determined by Denison’s Project engineers early in the process to allow for the EIS biophysical and human assessments to advance.</p> <p>Proposed effluent release to the environment starts at Operation phase and BATEA information will come with the application for the license to operate. Please also see response to IR-117.</p> <p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three."</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project (see IR-16). The effluent quality predictions provided in the EIS will continue to bound the assessment, and provide a conservative representation of risk to human health and the environment.</p>	No EIS updates are anticipated to address this IR.
IR-18	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description Appendix 8-E	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The</p>	<ol style="list-style-type: none"> <li>Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</li> <li>Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</li> </ol>	<p>Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria and other requirements of the regulations. The lack of the MDMER general parameters and Schedule 4 substances in the draft EIS table 2.2-1 should not be misconstrued to mean Denison was not intending to meet these requirements. Rather these tables were developed based on rigorous screening to identify COPCs and then model these in the receiving environment. Table 2.2-1 in the draft EIS is not reflective of the proposed monitoring parameters during effluent release. Regardless, Denison will update the table; please see the response below.</p> <p>1) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p>	Table 2.2-1 and Appendix 8-E will be updated in the final EIS; the updated version of the table is provided in attachment IR-18.

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				<p>proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	<p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>	<p>2) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted.</p> <p>3) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p> <p>4) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Applicable screening criteria have been updated to identify most applicable acute or chronic thresholds for the protection of aquatic life.</p> <p>5) As noted in response to IR-16 and IR-17 effluent discharge criteria as depicted in the draft EIS provide a bounding scenario of the basis of the assessment of Project effects and final effluent quality will meet prescribe limits developed through licensing and permitting, as informed by the BATEA evaluation process. In that context, it is expected that the uranium concentration in effluent would be lower than assumed for the purpose of the evaluation in the draft EIS and it is understood that uranium concentrations (or concentrations of other constituents) that resulted in acute toxicity would be not be permitted. Accordingly, the need for and types of mitigation measures as might be needed for uranium (or other constituents) would be developed as part of the process of developing final effluent quality limits in the permitting and licensing processes.</p>	
IR-19	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.4 Project Description	<p><b>Context:</b> In this section, it is proposed that the IWWTP precipitate pond will have a single geosynthetic composite liner system, which is used for ponds/pads that only store non-radioactive materials.</p> <p>However, from Section 2.2.3.9 on industrial wastewater treatment, it is unclear if the precipitates from the stage three neutralization process that are pumped to the IWWTP precipitates pond will have any residual radioactivity.</p> <p><b>Rationale:</b> For the protection of the surrounding environment, it is important that any ponds/pads that are expected to store radiological contaminants be designed to have proper controls (i.e., liners with monitoring systems) in place.</p>	<p>1. Confirm the characterization of the precipitates that are to be stored in the IWWTP precipitate pond.</p> <p>2. If radiological constituents are expected within those precipitates, update the draft EIS to ensure the proposed geosynthetic liner system for the IWWTP precipitate pond will be adequate to ensure the protection of the surrounding environment.</p>	<p>1. The IWWTP precipitate pond will contain non-radiological, gypsum-like material. As outlined in Section 2.2.4.5 and 2.2.4.6, any radioactive precipitates generated during the first stage of the IWWTP will be directed to the process precipitate pond, not the IWWTP precipitate pond.</p> <p>Waste segregation and management will be important for Denison during Operation. The Waste Management Program will be established and approved by the CNSC as part of licensing. Denison will conduct regular assays of slurry sent to the IWWTP precipitate pond during Operation to confirm the quality of these precipitates.</p> <p>2. In consideration of the above, radiological constituents are not expected within the IWWTP precipitate pond.</p>	No EIS updates are anticipated to address this IR.
IR-20	NRCan	Fish and fish habitat	Section 2.3.3.1.1 Appendix 7-C	<p><b>Context:</b> The proponent’s objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent’s acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCan’s opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent’s decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>	<p>NRCan requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	In the final EIS, Table 3-5 in Appendix 7-C will be updated. The updated table is provided here as Appendix B to Attachment IR-20, IR-67, IR-69.
IR-21	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.3.3.1.3, Project Description	<p><b>Context:</b> The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p><b>Rationale:</b> From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>	<p>Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.</p>	<p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p> <p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface. Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p> <p>Further, this potential subsidence, if it were to occur, would be limited to the footprint directly above the deposit which will not contain any decommissioned waste management infrastructure. Two main Project components containing waste in the Post-Decommissioning</p>	No EIS updates are anticipated to address this IR.



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						<p>period will be the IWWTP precipitate pond (which will contain non-radioactive gypsum-like material) and the Industrial Landfill. All other wastes will be disposed of off-site. Spatially, the mining area is about 500 m from the IWWTP precipitate pond and about 800 m from industrial landfill.</p> <p>Given the negligible risk and magnitude of surface subsidence (2.4 to 2.8 mm) which would be limited to the footprint directly above the deposit, along with the distance from this area to on-site decommissioning wastes, there is negligible risk for effects of subsidence to the planned decommissioning of waste management infrastructure.</p>	
IR-22	NRCan	Fish and fish habitat	Section 2.10  Appendix 2-C, section 1.1.1.4	<p><b>Context:</b> With respect to the choice of In-Situ Recovery (ISR) mining solution, two alternatives were assessed: alkaline and acidic lixivants (Appendix 2-C, sec. 1.1.1.4). In the consideration of technical and economic feasibility of the alternatives (Table 2, Appendix 2-C), the proponent concludes that: Option 1 (alkaline) is not technically feasible based on the uranium deposit geochemistry. Option 2 (acidic) is technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium. Accordingly, the alkaline alternative was not carried forward into the Environmental Assessment (EIS, Table 2.10-1; Appendix 2-C, Table 3).</p> <p>While acidic ISR solutions are widely used internationally (e.g., Kazakhstan), in the United States, where the environmental regulatory regime is more strict, alkaline solutions have been used exclusively since 1970.</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent should provide a more thorough technical justification for adopting an acidic ISR lixiviant.</p>	<p>In the Alternative Means Assessment (Appendix 2-C), NRCan requests that the proponent provides a more thorough technical justification for selecting an acidic ISR lixiviant rather than a less environmentally problematic alkaline leach used exclusively in the USA.</p>	<p>The following additional information will be added to Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution:</p> <p>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</p> <p>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth, grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub>- complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previously examined in detail.</p> <p>As noted in Table 2 of Appendix 2-C, the alkaline leach option for mining solution was determined to not be technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium.</p>	<p>Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution will be updated as follow (additions in <b>bold</b>, deletions in <del>strike through</del>):</p> <p><b>Two options were considered for mining solution: Option 1: alkaline solution and 2. acidic solution.</b></p> <p>Factors determining the choice between acid or alkaline ISR technology are: composition of the host rock and ores, reagent cost and consumption, the degree of uranium recovery, and the intensity of the process (IAEA 2001). The leach intensity is determined as the sum of the leach duration, solution ratio (liquid/solid), and average uranium concentration in the recovery solution.</p> <p><del>1. Alkaline solution</del> Alkaline or high-pH mining solutions are used at a number of uranium ISR operations. The mining solution is typically made with carbonate or bicarbonate. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. Ores with a higher carbonate content normally require alkaline (bicarbonate) leaching.</p> <p><del>2. Acidic solution</del> Acidic or low-pH mining solutions are used at a number of uranium ISR operations. The acidic mining solution is typically made with dilute sulfuric acid. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. For economic sulphuric acid leaching, the carbonate content should not exceed 2% CO<sub>2</sub>.</p> <p><b>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</b></p> <p><b>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth,</b></p>

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							<p>grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub> complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previous examined in detail.</p>



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IR-23	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	<p><b>Context:</b> There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.</p> <p>A few examples:</p> <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There's lots of heavy muskeg there. A lot of us have been there, and we'd like to know there'll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn't happen. Even the permafrost is now further down. In the Wheeler River area, where there's some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> <p><b>Rationale:</b> Appendix 2-C, Alternative Means assessment, states (p.3): "Engagement with Interested Parties naturally included alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and <i>Appendix 2-A Engagement Database Summary – Project Description</i> for details of engagement information referenced in this alternative means assessment."</p> <p>It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.</p>	Please explain how comments and concerns collected during Denison's engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it's appendices.	<p>Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement topics, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. Two main areas where comments and concerns fed into and informed the Alternatives Assessment are: 1) Appendix 2-C, Section 1.2 Consideration of Technical and Economic Feasibility along with Land Use Screening, and 2) Appendix 2-C, Section 1.4 Evaluation of Alternative Means.</p> <p>The comparative evaluation of alternative means is presented in Appendix 2-C, Table 6 to Table 22. The evaluation considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in Appendix 2-C, Table 5, following the application of mitigation measures described in Appendix 2-C, Table 4. In each case, the preferred alternative and rationale for its selection were identified. In addition, specific input received from Indigenous groups and other Interested Parties that contributed to the selection of the preferred option was highlighted, when applicable. The alternative means assessment provided in the tables in this section was conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives.</p> <p>To follow-up on one of the examples listed in the context and rationale section of this IR, 16-EN-DesNd-101.1 was a comment related to interest in business opportunities. As noted in Appendix 2-A, this comment factored into the comparative evaluation of alternative means for waste management, domestic waste disposal in the section outlining input received from Interested Parties. For additional background, two options were under evaluation: Option 1 was collection and disposal off-site by a third-party contractor and Option 2 was collection and disposal in an on-site domestic landfill. The following text is available in Appendix 2-C, Table 17: Waste Management – Domestic Waste Disposal - Alternative Means Assessment:</p> <p>During seven years of engagement activities for the Project, Denison has understood the importance of designing a project that minimizes interactions with the biophysical environment and the importance of continued land use by Indigenous groups. Looking at domestic waste disposal options, the option to transport domestic waste off site to a nearby licensed facility may generate a local economic opportunity (16-EN-DesNd-101.1, 19-EN-VB-132.5, 21-ENSUR-446.48). However, the transport of material off site would increase traffic, which may have a negative effect on traditional land use, infrastructure and services, and wildlife (16-EN-ERFN-100.15) (21-EN-SUR-446.68). Increased traffic would also increase greenhouse gas emissions. Concerns related to climate change were raised during engagement and consultation activities completed by Denison (e.g., 22-EN-ERFN-621.15, 22-EN-SUR-652.57). It should be noted that these concerns pertain to climate change rather than GHG emissions specifically. The concerns included observations of climate-related changes that have been noticed by the English River First Nation (e.g., depth of permafrost; 16-EN-ERFN-100.17) and observations by the English River First Nation Trapper who provided local knowledge in support of the EIS (19-LK-ERFNTrap-134.232). While no specific feedback was received on the domestic waste disposal options, the above provides context on how Denison's fulsome engagement activities have influenced the selection of a preferred alternative for domestic waste disposal.</p> <p>Based on the evaluation of alternative means, a preferred alternative means for each respective Project component or activity was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided and input received by Interested Parties is presented. As shown in the above example, the input received from Interested Parties was an important part of the multifaceted evaluation.</p>	See attachment IR-24 for proposed content for final EIS Section 2.10, which, relative to the draft EIS, includes the addition of Section 2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment.
IR-24	CNSC	Alternative Means	Section 2.10.2 Alternative Means	<p><b>Context:</b> While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p><b>Rationale:</b> As noted in the Agency's <a href="#">Operational Policy Statement on Addressing "Purpose of" and "Alternative Means" under the CEAA 2012</a>: "If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice."</p>	Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.	Additional details from Appendix 2-C will be provided in Section 2.10 of the final EIS. Also, an example of alternative means evaluated for mining method will be added into Section 2.10.2 in the final EIS. It is noted that no new information would be presented in the final EIS Section 2.10.2 beyond that which was presented in the draft EIS Appendix 2-C.	See Attachment IR-24 for proposed updates to Section 2.10.2.
IR-25	CNSC	Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p><b>Context:</b> The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: "As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS." (p. 11-36)</p>	Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.	<p>A study agreement was signed with the MN-S to complete a Metis Knowledge Study by the end of October 2023. Denison has met with the MN-S to discuss the next steps and anticipated timeline, however no information has been provided to Denison, to date. When the study is completed within the agreed upon timeframe, Denison will update the final EIS to include relevant information in the assessment.</p> <p>It is important to note that Denison has incorporated Metis land use information and perspectives into the draft EIS, through the funding of the Kineepik Metis Land and Occupancy information along with the KML VEC statement, of which relevant information has been incorporated directly into the draft EIS to determine effects to the human environment.</p>	The final EIS will be updated with applicable information pertaining to the effects assessment from the Metis Knowledge Study when provided within the agreed upon timeframe (end of October 2023).

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				<p><b>Rationale:</b> More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.		
IR-26	CNSC	Precautionary principle and approach	Section 3.4.8 Lands Taken Up from an Indigenous Perspective (p. 3-14)	<p><b>Context:</b> Denison states: “Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach. Examples of concrete actions to address uncertainty in cases where IK and LK have differing conclusions on predicted Project effects include addressing uncertainty through monitoring and follow-up programs and communicating results of those monitoring and follow-up programs to demonstrate they have been responsive to the IK shared.” (p. 3-14)</p> <p><b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “In documenting the analyses included in the EIS, the proponent will demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.</p> <p>A document by Canada’s Privy Council Office, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a>.” (Section 2.5)</p>	Please clarify how the precautionary principle, and the Privy Council Office’s, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a> has been considered and incorporated into the EA described in the EIS.	<p>Page 3-14 of the EIS notes that "Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach."</p> <p>The precautionary approach to the evaluation of effects is described in Section 5.8.1.2.2 of the EIS, which specifically deals with the confidence of predictions and states:</p> <p>"In this EA, the precautionary approach to the evaluation of potential effects was adopted, recognizing areas of uncertainty and uses conservative assumptions and approaches within the assessment process. Areas of uncertainty in the process and in predictions for each VC are identified and discussed in each VC-specific section, or on a KI-specific basis as applicable."</p> <p>"Confidence predictions are defined as low, moderate, or high. Where a high degree of uncertainty regarding a residual adverse effect is evident, the confidence level may be low. A high level of confidence is assigned to predictions that have direct, site-specific quantitative data to support the predictions. Low or moderate degrees of uncertainty are manageable through monitoring and follow-up programs to confirm the absence, presence, and extent of residual adverse effects."</p> <p>The Privy Council Office’s, A Framework for the Application of Precaution in Science-based Decision Making About Risk was not specifically referred to in making decisions regarding discrepancies among IK and western scientific knowledge. Rather ERFN, KML/Pinehouse, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML/Pinehouse declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). An example of where greater precaution was exercised is found in the conclusions for effects on Indigenous Land and Resource Use, in which the overall confidence rating was moderate based on the communities’ previous experience with the uranium industry, but could not "be considered as high as the Indigenous COIs lack certainty about ISR mining technique" (Section 11.1.6.4).</p>	No EIS updates are anticipated to address this IR.
IR-27	CNSC	Cumulative Effects Analysis	Section 3.4.8	<p><b>Context:</b> During an outreach and engagement trip by CNSC in October 2022, an abandoned exploration camp adjacent to the proposed Wheeler River site was observed. This site has not been identified within the EIS as part of the cumulative effects assessment. As noted in section 3.4.8, KML has also raised concerns with Denison related to abandoned camps and industrial waste left with no programs for clean-up.</p> <p><b>Rationale:</b> Section 9.4.3 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> states that “The applicant shall assess any residual adverse environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area.”</p>	Please specify why abandoned exploration camps and industrial waste aren’t taken into consideration when completing cumulative effects assessment.	<p>Section 5.9 outlines the general methods and approach for cumulative effects assessments, while each biophysical and human environment assessment provides details on their Valued Component (VC)-specific approach. The inclusion list in Section 5 does include exploration and mining activities, and options for other projects and activities, as appropriate.</p> <p>With this approach the footprint of the abandoned exploration camp was considered within the terrestrial cumulative effects assessment.</p> <p>Section 11 Land and Resource Use notes that existing projects or activities were not considered as part of the cumulative effects assessment because they were captured and assessed within baseline conditions or existing conditions. This approach would include the abandoned exploration camp adjacent to the proposed Wheeler River site.</p>	No EIS updates are anticipated to address this IR.
IR-28	CNSC	Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>3. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>	Please see response in Attachment IR-28.	<ul style="list-style-type: none"><li>• Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices</li><li>• Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)</li><li>• Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)</li><li>• Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)</li><li>• Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)</li><li>• Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)</li><li>• Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)</li><li>• Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)</li><li>• Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)</li><li>• Table 4.3-10: Key Issues and Concerns from Ya’thi Néné Lands and Resources Office (and corresponding table in the IER)</li></ul>

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							<ul style="list-style-type: none"><li>Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse</li><li>Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval</li><li>Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse</li></ul> A new table will be included for Peter Ballantyne Cree Nation as well into the final EIS and in the IER. <ul style="list-style-type: none"><li>Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description</li><li>Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description</li><li>Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater</li><li>Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment</li><li>Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment</li><li>Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health</li><li>Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use</li><li>Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life</li><li>Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics</li><li>Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions</li><li>Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project</li></ul>
IR-29	CNSC	Current use of lands and resources for traditional purposes	Section 4.3.2 and IER	<p><b>Context:</b> In this section, Denison includes the engagement with BNDN and includes a summary of issues and concerns table for the Nation. Within the history of interactions (Section 4.3.3.2.1).</p> <p><b>Rationale:</b> Denison states that they have been providing information on the project to BNDN in 2019, 2021 and again in 2022 and that Denison and BNDN have not responded to date in order to advance further engagement and dialogue.</p>	Please ensure updated information of any additional engagement activities that Denison has completed with BNDN related to understanding their current and traditional land use and potential interests near the proposed project is provided.	<p>Denison is able to provide the following information with respect to engagement with BNDN.</p> <p>Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.</p> <p>On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.</p> <p>On May 10, 2023, Denison met with BNDN again, to discuss a process for engagement going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison’s access to data BNDN previously referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to further funding from Denison to BNDN. Denison continued to request the available site-specific information in order to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN in order to potentially adjust engagement approaches with BNDN.</p> <p>On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided further information from BNDN that BNDN would connect with Denison in the future to determine next steps together.</p> <p>On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.</p> <p>Subject to the development of a specific engagement process between Denison and BNDN, as identified above, Denison is committed to maintaining an open dialogue with BNDN regarding their interests in the Project. Denison will make sure the above information, and any further information in this respect, including potential resolution of issues, will be included in the final EIS and an update to the IER.</p>	Updates will be included in the final EIS Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER) as part of response to IR-28.
IR-30	CNSC	Indigenous physical and cultural heritage	Section 4.3.2.1.3, Table 4.3.2	<p><b>Context:</b> Concerns were raised during engagement sessions that “Elders are not being consulted as most of the engagement has been through online means and without a translator”.</p>	How has Denison adapted engagement with Elders from the ERFN since receiving this comment on March 31, 2021?	Since receiving the comment about the challenge with virtual engagement activities and associated translation for those requesting it, Denison has incorporated simultaneous Dene translation into the Zoom virtual meeting feature. This was used in a virtual meeting	No EIS updates are anticipated to address this IR.



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				<b>Rationale:</b> There’s no indication that a translator has been employed to engage with Elders since 2021 in the engagement Table 4.3.2.		undertaken for the Athabasca Basin First Nations and Communities, in September 2021. The feedback received was overwhelmingly positive. Going forward, should Denison have to deploy virtual meetings where translations are required, this tool will be deployed again.  For all in person meetings, Denison provides a translator, who can assist with anyone requiring discussion to occur in their language.	
IR-31	CNSC	Indigenous Engagement	Section 4.4.2.1.3, Key Engagement Activities (p. 4-88)	<b>Context and Rationale:</b> Regarding the following: “An open house for the general public was planned to be hosted in 2022 on preliminary effects and mitigation, but due to concerns identified by MN-S about hosting a public open house in a community with a significant Métis population, this meeting was postponed by Denison. Denison looks forward to rescheduling the meeting in collaboration with the MN-S.” (p. 4-88)	Please provide an update on the evolution or progress of this engagement with local communities, following collaboration with MN-S (or otherwise).	Denison continues to respect the delegated Duty to Consult to the Metis Nation - Saskatchewan for a number of communities with strong presence of Metis Citizens for engagement about the Wheeler River Project. As such, Denison will follow the Metis Nation - Saskatchewan direction in this regard until such time as this direction changes.  Denison is pleased to report that on February 11 and 12, 2023, the MN-S coordinated a meeting for Denison, the CNSC, the Province of Saskatchewan and the Metis Locals from Northern Regions 1 and 3 to provide an overview of the Project and respond to questions and concerns.	Updates will be included in the final EIS accordingly.
IR-32	CNSC	Current use of lands and resources for traditional purposes	Section 5.3  Section 9.0 Terrestrial Environment	<b>Context:</b> Some sections of the EIS (such as Fish and Fish Habitat, Indigenous Lands and resource use) indicate that Indigenous and/or local knowledge was considered when defining the spatial boundaries. However, this is not included in other sections, such as Terrestrial Environment.  <b>Rationale:</b> Section 5.2.2 of CNSC’s Generic EIS Guidelines require that spatial boundaries be defined by considering, but not limited to, the following criteria: Community and Indigenous traditional knowledge, ecological and technical considerations.	Please provide any additional details about how any comments or concerns raised were considered in defining the spatial boundaries with Indigenous Nations and communities with respect to spatial boundaries, for the Terrestrial Section and which specific Indigenous Nations and communities were engaged on these topics and how their input and knowledge was incorporated into the EIS.  If already presented in the EIS text body, please indicate where this information can be found or link to Section 4 of the EIS or in the IER.	The rationale for the definition of study areas for the purpose of the assessment of the Terrestrial Environment valued components (VCs) is described in Section 9.1.1 of the draft EIS. The Project Area and Local Study Area (LSA) were delineated based on the expected extent of potential direct (footprint) and indirect (sensory disturbance) Project effects; whereas, the Regional Study Area (RSA) considered an 8 km buffer around the Project Area to provide an appropriate spatial scale upon which potential Project effects could be evaluated at the landscape scale where key Terrestrial Environment VCs reside and move within and upon which cumulative effects could be assessed.  No specific comments or concerns were raised on the spatial scale of the Terrestrial Environment study areas during engagement activities, though considerable input was solicited / received regarding many of the Terrestrial Environment VCs that helped to contribute how the assessment study areas were defined. This is especially true in consideration of the relatively high number of comments received through engagement regarding wildlife (as represented by ungulates, furbearers, woodland caribou, and birds in the draft EIS) and wildlife use by local and Indigenous people/ communities (see Sections 9.3.3.1.2, 9.3.3.2.2, 9.3.3.3.2, 9.4.3.1.2, 9.4.3.2.2, 9.4.3.3.2 in the draft EIS Appendix 9-A for details). Cumulatively, this input puts high importance on and speaks to the broad knowledge of wildlife in the vicinity of the Project, informing the need to define the RSA to an appropriate spatial extent, as was the case on the draft EIS.  In addition, and within the context of the IR, it is appropriate to also consider the assessment of terrestrial environment from the perspective of Land and Resource Use per Section 11 of the draft EIS, since the two (Terrestrial Environment and Land Are Resource Use) are so intimately related. For context the Terrestrial Environment RSA, fits within the Indigenous Land and Resource Use RSA. Section 11 of the EIS is focused on Land and Resource Use and includes consideration for various terrestrial VCs and key indicators (KIs) as resources. With respect to Indigenous Land and Resource Use, the definition of spatial boundaries is offered in Table 11.2-2 which notes that the LSA is inclusive of direct and indirect effects to relevant VCs will occur, including the maximum combined extent of supporting VCs associated with the aquatic, terrestrial, noise, and health LSAs. It is inclusive of trapping, fishing, and travel through and adjacent to the Project Area. The RSA is inclusive of trapping block N-18, which represent a familiar reference for local Indigenous communities and capture the broad land usage patterns of local communities. Trapping blocks are defined regions and have membership that is regulated by a local trapping association and membership is generally only open to local Indigenous community residents though non-Indigenous trappers may also participate as members of the trapping association. If resource use activities were displaced, it is likely this would still occur within the N-18 trapping block area where individual resource users already have familiarity.	No EIS updates are anticipated to address this IR.
IR-33	CNSC	Residual Effect Characterization	Section 5.8.1, Definitions for Residual Effects Characterization and Significance  Section 5.8.1.1, Residual Effects Characteristics  Section 8, Table 8.3-9: Fish and Fish Habitat - Surface Water Quality	<b>Context:</b> Denison uses specific criteria (Residual Effect Characteristics: Direction, magnitude, geographic extent, duration, frequency, reversibility, context and likelihood) and associated ratings (e.g., adverse/positive, low/moderate/high) for the predicted effects assessment. However, it is unclear whether an aggregation method was used in order to determine whether impacts will be significant or not significant, depending on the combination of rating categories (i.e., weightings that were calculated, use of decision rules).  For example, medium term and long term are both used to represent the same time category: “Effects are expected to last between 3 to 38 years (i.e., effects expected during Construction through to the end of post-Decommissioning).” (See table 8.4-13 on p. 8-200 compared to table 8.4-12 on p. 8-199 and table 8.5-9 on p. 8-246).  <b>Rationale:</b> The Generic Guidelines state: “The method used to describe the level of the adverse effect should be transparent and reproducible.”  In Table 8.3-11, duration was moderate, but again uses same rationale. There is no ‘moderate’ in Table 8.3-8, and by the same rationale, this should be medium-term to be consistent with definitions provided and summary Table 8.3-12.  It was noted that all three tables should be deemed medium-term	If an aggregation method was used and ratings (e.g., High, medium, low) were weighted, what weightings were used, how were these calculated? Please also describe any decision rules that informed the determination of significance.  If no aggregation was used, how did Denison ensure that results were consistent, given the varying rankings for each of the key criteria, and varying combination?  Regarding inconsistencies in ratings, please use consistent terminology for same rating.	Denison did not use an aggregation method with weighted ratings. The assessment approach and methodology was outlined in draft EIS Section 5, Approach and Methodology. Please note that Section 5.8 provided a guide for technical leads to conduct residual effects evaluation; however, Section 5.8 also recognizes that the specific definitions and ratings for some characteristics may be developed on a VC-specific basis as presented in each VC-specific section.  Denison reviewed the draft EIS to ensure results were consistent. This included checks on the consistent application of characteristics and ratings along with any supporting rationale. Nevertheless, as pointed out by the CNSC, there appear to be some inconsistencies in Section 8 of the draft EIS. The final EIS will be updated, specifically Section 8 where inconsistencies were highlighted in IR-33 context and rationale text. Importantly, these are effectively editorial issues and do not change the assessment summaries or conclusions.	Ratings for duration and frequency in Section 8 of the final EIS will be updated. Residual effect characteristics and ratings will be consistent between definitions tables and subsequent summary (results) tables within a section.  This will include consistent use of the ratings for the residual effect characteristic of duration, as follows: <ul style="list-style-type: none"><li>• Short-term – Less than 3 years (i.e., effect happens during Construction only).</li><li>• Medium-term – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</li><li>• Long-term – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</li></ul>

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				based on definitions of ratings outlined in Table 8.3-8. Frequency was also showing up as "continuous" and "continuously" in these tables.			<p>This will include consistent use of the ratings for the residual effect characteristic of frequency, as follows:</p> <ul style="list-style-type: none"> <li>Infrequent – Effect occurs several times at sporadic intervals.</li> <li>Frequent – Effect occurs many times on a regular basis.</li> <li>Continuous – Effect occurs continuously.</li> </ul>
IR-34	CNSC	Cumulative Effects Analysis	Section 5.9.2.2 (p. 5-41)	<p><b>Context:</b> Denison identifies the Gryphon deposit as a project that is not reasonably foreseeable. The direct quote from the EIS indicates that the “Development of the Gryphon deposit as an underground mine was evaluated at the prefeasibility level in 2018 but has not advanced to feasibility study or EA. Denison has not announced an intent to proceed with the development of the Gryphon deposit.” (p. 5-41)</p> <p><b>Rationale:</b> The guidance <a href="#">Assessing Cumulative Environmental Effects under the CEAA, 2012</a> defines <i>Reasonably Foreseeable</i> as a “physical activity [that] is expected to proceed, e.g. the proponent has publicly disclosed its intention to seek the necessary EA or other authorizations to proceed.”</p> <p>In a press release by Denison Mines (2018: <a href="#">Denison announces decision to advance Wheeler River Project following positive PFS results</a>), Denison publicly disclosed intention to seek the necessary EA for Gryphon to proceed: “After careful consideration of the risks and opportunities associated with permitting and concurrent advancement of project engineering activities, the Company has decided to submit a PD and initiate the EA process in early 2019 for the Phoenix ISR operation, and to bring the Gryphon operation forward, at a later date, as required to achieve the PFS plan of Gryphon first production by 2030.”</p> <p>Further, Denison’s <a href="#">Wheeler River Webpage</a> references a “start of pre-production activities for the Gryphon operation in 2026”</p>	Please update the cumulative effects assessment in the EIS to include the Gryphon deposit as a Present or Reasonably Foreseeable Project.	<p>Denison has not publicly disclosed its intention to seek the necessary EA or other authorizations to proceed with mining the Gryphon deposit on the Wheeler River property at this time and does not meet any of the criteria for a reasonably foreseeable project as per the guidance for Assessment Cumulative Effects under the CEAA 2012 (below). A future physical activity could be considered reasonably foreseeable and should generally be included in the cumulative effects assessment if one or more of the following criteria are met:</p> <ul style="list-style-type: none"> <li>The intent to proceed is officially announced by a proponent. This information could be found in news media, the proponent’s website or via an announcement from the proponent directly to regulatory agencies.</li> <li>The physical activity is under regulatory review (i.e., the application is in process). This can be known, for example, if information about the review or application is available on a government website, or an EA notice has been made public.</li> <li>The submission for regulatory review is imminent. This could be known if the collection of data has already commenced, regulatory authorities have been contacted about information requirements, or through an announcement from the proponent.</li> <li>The physical activity is identified in a publicly available development plan that is approved or for which approval is anticipated (e.g., a wastewater treatment plant in a city’s long term development plan).</li> <li>The physical activity supports – or is consistent with – the long-term economic or financial assumptions and engineering assumptions made for the project’s planning purposes.</li> <li>A physical activity is required in order for the project to proceed (e.g., rail or port transportation facilities, or a transmission line).</li> <li>The economic feasibility of the project is contingent upon the future development.</li> <li>The completion of the project would facilitate or enable the future development.</li> </ul> <p>The Gryphon deposit is an exploration phase property and is inherently captured as such in the cumulative effects assessment because the levels of disturbance from these activities to date are captured with the characterization of existing conditions. It would be inappropriate to consider mining of the Gryphon deposit within the cumulative effects assessment as a mining operation as Gryphon cannot be considered a reasonably foreseeable activity. As is widely understood, very few exploration phase projects become operating mines.</p> <p>We note that the press release and the prefeasibility study referenced in the IR were from 2018. The Wheeler River Project Provincial Technical Proposal and Federal Project Description used to initiate the provincial and federal EA processes was submitted in February 2019. This represents Denison’s most recent plans for development and the Project scope does not include underground mining of the Gryphon deposit. Denison acknowledges that, if development of the Gryphon deposit as an underground mine is proposed in the future, this would require additional regulatory review and approval.</p>	No EIS updates are anticipated to address this IR.
IR-35	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>	Please consider acrolein in the assessment or provide a rationale for its exclusion.	An analysis of acrolein risks is provided in Attachment IR-35.	The analysis provided in Attachment IR-35 will be appended in its entirety to Appendix 6-A in the final EIS.
IR-36	CNSC	Other	Section 6, Table 6.1-11 Baseline External Gamma Monitoring	<p><b>Context:</b> For one of the exposures in the summary table for baseline external gamma monitoring (Table 6.1-11), the cell states "Destroyed in Field".</p> <p><b>Rationale:</b> No rationale or indication as to why or how it was destroyed is provided.</p>	Please provide any additional info available as to how equipment was destroyed.	Gamma monitor 8 was destroyed in the field by wildlife.	Table 6.1-11 in the EIS will be updated to say "Destroyed in Field by Wildlife"
IR-37	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<p><b>Context:</b> "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."</p>	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.	As described in Section B.1 of Appendix 6-A, staff at the Saskatchewan Ministry of Environment (Air Quality Branch) were consulted on the selection of CALPUFF and developing the CALMET meteorological data set, beginning in 2019. The CALMET consultation included an initial discussion about the general approach, and once the CALMET run was completed, two technical memos were produced and reviewed by Ministry staff including: 1) a memo completed in March 2020 summarizing the general CALMET approach and results (e.g., wind roses, temperature data, precipitation data); and 2) a follow-up memo completed in May 2021, which answered specific questions posed by Ministry staff. Ministry staff also completed a review and provided feedback on the CALPUFF model setup in August 2021.	No EIS updates are anticipated to address this IR.

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				<p><b>Rationale:</b> Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry" OR "Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.</p> <p>Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).</p>			
IR-38	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.1, Potential Interactions Between the Project and Valued Component / Key Indicators	<p><b>Context:</b> In this section, the Proponent identifies primary interactions between Project activities and air quality valued components and their associated key indicators. These primary interactions may result in an adverse effect on the valued component. Among the primary interactions are the use of emergency generators in a backup role should there be an interruption of the provincial electrical grid. However, it is not evident what is the anticipated frequency and duration of interruption to grid power.</p> <p><b>Rationale:</b> The Proponent states in the conservative operation scenario that while the site will be powered from the provincial grid at the operations stage, the back-up power generators were assumed to be operating under emergency conditions as a worst-case scenario. ECCC acknowledges the positive impact of extending the electrical grid to the Project site with resultant reduction in generator emissions. The impact of an interruption in grid power would be greatest during the winter months when energy use would be greatest and surface-based temperature inversions, which vertically trap emissions, would be strongest.</p>	Provide an evaluation of a worst-case scenario of grid power interruptions (i.e., average aggregate length of power outages) during the winter months for this section of the electrical power grid.	<p>Denison expects an average of six outages per year based on information provided by SaskPower. An outage would be anticipated to last a few hours per event.</p> <p>The air quality assessment conservatively assumed that the generators would be in operation 24/7 to predict worst-case concentrations in all months of the year, including the winter months. Given the above, Denison can confirm it has evaluated an appropriately conservative worst-case scenario for use of the diesel generators in the air quality assessment.</p>	No EIS updates are anticipated to address this IR.
IR-39	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.2, Potential Project-Related Effects	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent's CALPUFF model runs indicated exceedances for 24-hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.	Additional information on diurnal and seasonal influences of the modelled exceedances is provided in Attachment IR-39 in this document.	No EIS updates are anticipated to address this IR.
IR-40	CNSC	Air Quality	Section 6.1.6.2.1, Air quality significance determination	<p><b>Context:</b> Significance determination was not conducted for air quality due to interconnectedness with other assessment endpoints.</p> <p><b>Rationale:</b> It is not clear where and how these air quality assessment endpoints were factored into the assessment.</p>	Please provide additional information to demonstrate where and how these air quality assessment endpoints were factored in.	Noted in Section 6.1.1.1 of the draft EIS, Air Quality was identified as an intermediate Valued Component (VC) (i.e., does not have an assessment endpoint). Air quality assessment endpoints and the significance of potential effects of Project-related changes to ambient air quality were considered in Section 9 (Terrestrial Environment), Section 10 (Human Health) and Section 11 (Land and Resource Use). For additional reference, Figure 6.1 2 of the draft EIS is a graphic representation of the main linkages among the Air Quality VC and other VCs, illustrating the flow of assessment information from the Air Quality VC. By way of example, the habitat alteration effects considered for avian and wildlife VC and Key Indicators (KIs) included dust deposition, which could change avian and wildlife use through an indirect effect.	No EIS updates are anticipated to address this IR.
IR-41	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<p><b>Context:</b> The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."</p> <p><b>Rationale:</b> If La Loche monitoring station is located near anthropogenic sources and the project is not, use of this data is not a conservative or realistic representation of background.</p> <p>For a realistic approach, background data considered should be upper 95th percentile (or max if n&lt;10) from an area representative of project location</p> <p>For a conservative approach, background data from an area located even further from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was</p>	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.	<p>The Saskatchewan Ministry of Environment requires that background concentration data be added to air model predictions and an accepted set of data is provided in the Saskatchewan Air Quality Modelling Guideline. Following Ministry requirements, the northern regional data set was selected, which is based on monitoring data from the La Loche station. Because the La Loche station is located near anthropogenic sources, the background values are likely higher than background in the Project Area. This means that the total air model predictions (modelled + background) are likely more conservative than would necessarily have been the case had a similar data set been available that was free of any anthropological influence.</p> <p>Further consideration of the use of the La Loche data set is provided in Appendix 6-A, Section 6.0 of the draft EIS.</p>	No EIS updates are anticipated to address this IR.



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				added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.			
IR-42	Health Canada (HC)	Physical stressors (noise and vibration)	Section 6.2.4.2.2, (p. 6-66)  Section 6, Section 6.2.9, (p. 6-72)	<p>Nighttime noise impacts are not adequately considered for human receptors.</p> <p><b>Context:</b> The EIS states in Section 6.2.9 that, “While the predicted sound levels were less than the guideline values, the increase from baseline was predicted to be noticeable” (p. 6-72). No information is provided on individual noise events occurring during the nighttime period.</p> <p><b>Rationale:</b> While the increase from baseline is predicted to be noticeable, it is important to also consider that changes to the characteristics of the sound from baseline (e.g., a change in frequency, changes in sound modulation, increased impulsiveness or tonality, or a shift in noise from the daytime to being more at night) may cause noise to be even more noticeable. Consult <a href="#">ANSI S12.9-2005/Part 4</a>, clause A.1.3 for further information.</p> <p>In particular, consideration should be given to potential impacts on sleep, where adverse impacts are reported to begin when sound levels inside bedrooms exceed 30 dBA for continuous noise sources and 45 dBA LAm<sub>ax</sub> for discrete noise events (<a href="#">WHO, 1999</a>).</p>	<p>1. Provide a description of the project- related nighttime noise sources that may impact human receptors as well as a qualitative discussion of the resulting potential impacts on perception considering not only changes in sound levels but also sound characteristics (e.g., tonality, impulsivity).</p> <p>2. Confirm whether individual nighttime noise events exceeding 45 dBA LAM<sub>ax</sub> outdoors (or 30 dBA indoors) are expected to occur more than 15 times over the nighttime period at any nearby potentially noise-sensitive human receptor location(s). This may be of particular concern if some construction and/or operations activities occur during sleeping hours.</p>	<p>1. During Construction, the nighttime noise sources that are the highest contributors to sound levels at the nearest human receptor location are expected to be construction equipment (bulldozers, trucks, cement mixing and crusher). During Operation, the primary contributors are truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels per ANSI S12.9-2005 Part 4.</p> <p>2. For Construction, the crusher was modelled at its maximum sound output. The diesel-powered equipment (dozers, drill rigs) was adjusted for partial operation. When adjusted to provide maximum sound levels instead, the predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> during the nighttime hours for either Construction or Operation.</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>Section 6.2.4.2.2 will be clarified as follows: The nighttime sound levels were not predicted to exceed the PSL of 36 dBA at any of the identified receptors during Construction or Operation. As with the daytime sound levels, the maximum predicted nighttime sound levels were predicted at the property identified as 302586/Risk2. The predictions at this location were 35.9 dBA and 34.0 dBA for Construction and Operation, respectively, and were similarly primarily attributable to drilling activity in the wellfield, concrete batching (during Construction), and movement of trucks on the access road. During Construction, the nighttime noise sources that were the highest contributors to sound levels at the nearest human receptor location consisted of construction equipment (bulldozers, trucks, cement mixing and crusher operation). During Operation, the primary contributors at night were truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels. The crusher was modelled at its maximum sound output, while the diesel-powered equipment (e.g., dozers, drill rigs) were adjusted for partial operation over the respective daytime and nighttime periods. To account for potential issues resulting from equipment operating at maximum levels (as opposed to daytime and nighttime averages), the models were run with the partial operation adjustments removed, for comparison to the Health Canada recommended criteria value of 45 dBA L<sub>max</sub> at night. The predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> for either Construction or Operation."</p>
IR-43	HC	Physical stressors (noise and vibration)	Section 6.2.5, (p. 6-66)  Section 6.2.5, (p. 6-71)	<p>Mitigation measures for project-related noise were not identified for the Construction phase.</p> <p><b>Context:</b> The mitigation measures provided in Section 6.2.5, including a complaint management system is also to be implemented as part of the EMS, are only proposed for the operations phase.</p> <p>However, construction activities are predicted to last more than one year. Construction noise will involve the use of equipment operating at the site, construction of surface facilities, drilling, and partial operation of the freeze plant. It will also include regular truck trips and air traffic for personnel changes.</p> <p><b>Rationale:</b> It is unclear if listed mitigation measures also apply to the construction phase (or only to the operations phase).</p>	<p>1. Clarify whether mitigation measures and the proposed EMS apply to the Construction phase. If not, identify mitigation measures for noise impacts related to Construction phase activities, and consider applying the EMS to the Construction phase and implementing the community complaints and response procedure from the beginning of construction activities.</p> <p>2. Health Canada suggests that construction noise lasting longer than 1 year be assessed as operational noise, and that noise mitigation measures be applied also to the construction phase. Special consideration should be given to mitigation measures for construction noise that occurs at night, in order to minimize impacts on sleep (i.e., avoiding tonal or impulsive noise sources at night).</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of Appendix H of Health Canada (2017), which identifies additional construction noise mitigation measures that could also be considered to reduce project- related noise.</p>	<p>1. Mitigation measures and the proposed EMS apply to both Construction and Operation. As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison will collaborate with English River First Nation (ERFN) and Kineepik Metis Local (KML) on a community specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous communities of ERFN and KML will be sharing information in an agreed-upon fashion. If noise from construction activities form part of the interests for each of these Indigenous communities.</p> <p>2. See response to IR-42 regarding nighttime work and potential for sleep disturbance.</p> <p>The draft EIS will be updated to include the above clarifications.</p>	<p>The first paragraph of Section 6.2.5 will be revised to clarify the applicability of mitigation measures as follows: "Strategies to reduce the likelihood and magnitude of the predicted effects include source elimination and utilizing planning measures to counter the conditions that contributed to the predicted effects. Mitigation measures <b>to be applied during both Construction and Operation</b> include:..."</p> <p>The first paragraph of Section 6.2.8 will be revised to clarify the applicability of the EMS as follows: "An EMS will be implemented and include air quality and noise management and monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines that have been adopted for this assessment <b>during both Construction and Operation.</b>"</p>
IR-44	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p><b>Context:</b> Section 6.2.8 discusses Monitoring and Follow- up. The proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p><b>Rationale:</b> Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see <a href="#">Health Canada, 2017</a>).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per <a href="#">Health Canada (2017)</a>.</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>	<p>1. Denison is undertaking sequential EA and licensing processes with the CNSC. As such, a detailed management system based on the CNSC’s safety and control areas and focused on anticipated compliance verification criteria will be developed over the upcoming months to support licensing activities.</p> <p>Further to this, a framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section. Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing, and as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.</p> <p>As noted in Section 6.2.8 of the draft EIS, a commitment to have a community complaints and response procedure for noise has been made by Denison. Consistent with Denison’s approach to sequential EA and licensing and as highlighted above the specific details associated with this complaints and response procedure, consistent with provincial and federal guidelines, will be developed at that time. Nevertheless, further information concerning the framework / approach to the community complaints and response procedure is provided below for reference.</p>	No updates to the EIS in response to this IR.



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						<p>Denison is committed to designing the noise monitoring and follow-up plan and an associated procedure in accordance with provincial and federal guidelines and industry best practice.</p> <p>The plan will identify:</p> <ul style="list-style-type: none"><li>• Project-related noise sources and control measures;</li><li>• How complaints will be filed, acknowledged, investigated, and resolved, including general timeframes for each phase;</li><li>• How confidentiality of a complainant’s identity will be respected, if requested, how anonymous complaints can be filed and how assistance for those who may face barriers to the procedure can be accommodated;</li><li>• How those involved in executing the plan will receive training and be made aware of the plan;</li><li>• How potentially affected communities will be engaged;</li><li>• How complaints and their resolutions will be tracked and recorded;</li><li>• How the performance of the plan will be monitored and evaluated and how this information shall be communicated; and</li><li>• How the plan will be updated.</li></ul> <p>It is anticipated that the following procedure specific to noise complaints is expected to be applied:</p> <ul style="list-style-type: none"><li>• Each complaint would be logged/recorded and include the following information:<ul style="list-style-type: none"><li>○ the name, address and contact information of the complainant (if provided);</li><li>○ the time and date of the complaint;</li><li>○ the nature of the complaint; and</li><li>○ meteorological conditions at the time of complaint (i.e., wind direction).</li></ul></li><li>• Determine the specific cause(s) of the complaint and take short-term and immediate actions to resolve the cause of the complaint;</li><li>• Provide a prompt response to the complainant (within 24-hours) and follow-up as needed based on the required actions to resolve the complaint; and</li><li>• Prepare and retain on-site a written report that:<ul style="list-style-type: none"><li>○ identifies the cause of the complaint;</li><li>○ identifies the actions taken to appropriately deal with the cause of the complaint; and</li><li>○ identifies any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.</li></ul></li></ul> <p>2. Denison has committed to working with its Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local), to understand the issues and concerns they have relative to the Project, and resolution of some specific items of interest or concerns may be resolved through the negotiation process of private contractual arrangements or agreements. The noise complaint mechanism will be one area that will be raised specifically with the Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local).</p>	
IR-45	HC	Change to an environmental component due to hazardous contaminants	Section 6 Air Quality Technical Supporting Document Section 6.3.1	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p><b>Context:</b> Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: “concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel”. However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p><b>Rationale:</b> Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p><b>References:</b> [1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table. <sup>1</sup>	An evaluation of carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022) is provided in Attachment IR-45.	No updates to the EIS in response to this IR.

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				<p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>			
IR-46	HC	Physical stressors (noise and vibration)	Appendix 6-A Table A-1	<p>Low-frequency noise and associated potential human health effects were not assessed.</p> <p><b>Context:</b> Some equipment that may emit low-frequency noise (LFN) have been listed in Table A-1: Assessment Scenarios and Sound Level Data (Section 6 Appendix A); however, no information describing potential impacts of this type of sound on nearby human receptors are presented.</p> <p><b>Rationale:</b> Low frequency noise can be associated with the introduction of noticeable vibrations and rattles in nearby structures. Research indicates that annoyance related to noise is greater when low-frequency noise is present (ISO 1996-1:2003). As sound environments are usually characterized using A-weighted decibel levels (dBA) that reflect the frequencies most audible to the human ear, the impacts of low- frequency noise may need to be assessed separately.</p>	<p>1. Clarify whether any project-related activities (construction, operation and/or decommissioning) may produce LFN that could impact off-site human receptors. Evaluate LFN in the noise assessment, if and where applicable. See Appendix C of <a href="#">Health Canada (2017)</a> for a discussion of LFN.</p>	<p>Appendix C.2 of Health Canada (2017) identifies an approach to assessing LFN from ANSI, which states that the energy sum of the 16-63 Hz octave bands should be less than 70 dBZ to avoid rattles due to LFN. The energy sum of the 16-63 Hz octave bands at the nearest human receptors is expected to be well below 70 dBZ (predictions indicate the values are in the order of 44 dBZ at the nearest human receptor).</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>The following paragraph will be appended to the end of Section 5.1 of Appendix 6-E:</p> <p>"In addition to the Ldn and %HA assessment methods, Health Canada (2017) also recommends assessing the potential for low frequency noise (LFN) impacts such as noise-induced vibration or rattles in building structures. The recommended approach from ANSI is to combine the predicted receptor sound levels in the 16 to 63 Hz octave bands and compare the total to a criterion of 70 dBZ. The maximum prediction for this assessment was 44 dBZ, and, therefore, LFN is not predicted to be a concern for the Project."</p>
IR-47	ECCC	Air Quality	Appendix 6-A, A.1	<p><b>Context and Rationale:</b> Verification of the following calculation is required for assessing predicted emissions of dust from general construction. It appears the result of 0.70 ton/acre/month is incorrect and should instead be 0.314 ton/acre/month.</p> <p>Appendix 6-A, Appendix A, A.1 (p. A4) TSP Emission Factor for General Construction:</p> $EF\ (TSP) = 0.11 \frac{\text{ton}}{\text{acre month}} \times 1.2 \frac{\text{ton}}{\text{acre month}} \div 0.42 \frac{\text{ton}}{\text{acre month}} = 0.70 \frac{\text{ton}}{\text{acre month}}$	<p>Explain how the emission factor total suspended particulates (EF (TSP)) result was obtained or rectify if it is incorrect and update the draft EIS to reflect the correction.</p>	<p>The formula incorrectly displayed the wrong units. It is 0.314 ton/acre/month, which converts to 0.70 tonnes/hectare/month. Denison confirms that this was a typographical error, and the result of the calculation is unchanged.</p>	<p>In Appendix 6-A, the formula will be changed to:</p> $EF\ (TSP) = 0.11 \frac{\text{ton}}{\text{acre month}} \times 1.2 \frac{\text{ton}}{\text{acre month}} \div 0.42 \frac{\text{ton}}{\text{acre month}} = 0.314 \frac{\text{ton}}{\text{acre month}} = 0.70 \frac{\text{tonnes}}{\text{ha month}}$
IR-48	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p><b>Context:</b> Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p><b>Rationale:</b> The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	<p>1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.</p>	<p>A new figure will be added to Section 6.2 of the final EIS showing the Project Area, Local Study Area, the receptor locations, and nearby land leases (both traditional and recreational). A copy of this new figure has been included with this IR response.</p> <p>As noted in the context and rationale for this IR, Denison included the receptor locations on the contour maps with the predicted noise levels (Appendix 6-E, Figures 8 to 15); as such, no edits to the Appendix 6-E figures are proposed in response to this IR.</p>	<p>A new figure will be added to Section 6.2 and a copy of the figure has been included with this IR response in Attachment: IR-48. The new EIS Figure will be 6.2-4; figure numbering will shift and Figure 6.2.4 Baseline Monitoring Locations for Noise in the draft EIS will become Figure 6.2.5 in the final EIS.</p>
IR-49	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The Noise Source Characterization is incomplete.</p> <p><b>Context:</b> Section 3.0 of the Draft EIS Section 6 Appendix 6- E discusses Source Characterization. There is no detail regarding potential tonal or impulsive noise sources in Section 3.0.</p> <p><b>Rationale:</b> The draft EIS should include a description of sound source characteristics (e.g., tonal, impulsive, highly impulsive) in order to properly inform the quantitative noise assessment and which assumptions/adjustments need to be applied and to properly evaluate impacts of project noise on health of affected receptors.</p>	<p>1. Identify any tonal, regularly impulsive, highly impulsive, or high-energy impulsive noises likely to be produced during project activities that could be audible at noise sensitive receptors. Furthermore, describe the timing (e.g., hours of night-time activities), frequency and duration of noise events, and their sound characteristics, including frequency spectrum. See <a href="#">Health Canada (2017)</a> for details.</p>	<p>No tonal or impulse sources were identified for either assessment scenario. Construction activity was assumed to occur 24-hours per day as a conservative measure. The frequency spectrum data for each source is included in Table A.1 of Appendix 6-E.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rational for inapplicability to sources identified.</p>	<p>The following paragraph will be appended to the end of Section 3.0 of Appendix 6-E:</p> <p>"Upon establishing the source sound levels for inclusion in the predictive modelling, the list was reviewed to determine whether there were any sources with special sound characteristics such as tonality or impulse noise. Health Canada (2017) recommends the application of source adjustments in accordance with ISO 1996-1 for such sources as these are associated with increased annoyance. No tonal or impulsive noise sources were identified in the Construction or Operation scenarios."</p>
IR-50	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The description of noise modelling does not document or justify the use of sound level adjustments.</p> <p><b>Context:</b> ISO Standard 9613-2 has been used for the sound level modelling; however, it is unclear if all applicable adjustments have been considered as per ISO 1996-1:2016 (Table A.1).</p> <p><b>Rationale:</b> When modelling techniques are used to estimate present (baseline) or future (construction and operational) sound levels, these techniques and any accompanying assumptions, including the use of sound level adjustments, it is important to provide appropriate documentation and justification.</p> <p>Note that in situations where more than one source characteristic</p>	<p>1. Clarify whether ISO-1996-1:2016 has been considered in the modelling to account for any applicable sound level adjustments. Adjustments should be considered when calculating Ln (night- time sound level) and Ldn (day-night sound level). In addition, if applicable, adjustments can be applied depending on the noise characteristic (impulsive, highly impulsive, etc.), and because the project location is considered to be in a quiet rural area. See: ISO 1996-1:2016 and Health Canada (2017) for details.</p>	<p>No tonal or impulse sources were identified for the assessment scenario. As discussed in Section 6.2.1.2.1 of the draft EIS, the assessment did include the 10 dBA nighttime penalty inherent in the calculation of Ldn, and also included the HC recommended adjustment of +10 dBA to the Ldn levels to account for the Project location being in a quiet rural area.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rationale for inapplicability to sources identified. The noted time-of-day and rural adjustments are already discussed in the draft EIS and applied in the assessment.</p>	<p>Appendix 6-E will be updated, per the paragraph outlined in the response to IR-49, which is expected to resolve the comment about tonal and impulse noise.</p> <p>The comment regarding the adjustment to account for the Project being in a quiet rural area was already accounted for in the draft EIS as outlined in Section 6.2.1.2.1.</p>

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				adjustment is applicable (e.g., impulsive or tonal), only the higher of the adjustments is used. However, all time-of-day adjustments and the quiet rural area adjustment are to be added to the highest of the applicable source adjustments.			
IR-51	CNSC	Geology and Groundwater	Section 7, Figure 7.8-1  Appendix 7-C	<b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.  <b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?	Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).  Please clarify how the establishment of a continuous freeze wall will be monitored.	1: The information in the legend of Figure 7.8-1 will be updated to indicate that 2 well clusters target the Lower Sandstone Aquifer and the Intermediate Sandstone Aquitard. The target hydrostratigraphic units for the 4 well clusters are the Lower Sandstone Aquifer, the Intermediate Sandstone Aquitard, the Upper Sandstone Aquifer, and the overburden aquifer.  2: The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.	1: Figure 7-8.1 has been provided in Attachment IR-51 and will be updated in the final EIS to provide information in the legend on the hydrostratigraphic units being monitored in each well cluster.  2: The following text will appear in Section 2 (2.2.1.5 Monitoring Well Network) regarding monitoring to demonstrate a continuous freeze wall.  The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.
IR-52	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater  Appendix 7	<b>Context:</b> According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid, hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.  Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the centre surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long”.  As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.  <b>Rationale:</b> The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.	1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells was not presented.  2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.	Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the hydrogeologic assessment in the EA. The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and groundwater quality of the mining zone following remediation.  During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface or down gradient environment, and the assessment focuses on post removal of the freeze wall, once the groundwater flow returns to pre mining conditions.  The injection and recovery wells will be set up such that they are within the confines of the ore itself. Migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall are minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. If significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice and would be contained therein limiting any excursion outside of the mining horizon.  Additionally, continuous 3D modelling has been conducted for the purposes of mining operations beginning in 2019 through 2023, which has successfully demonstrated control of the mining solutions and recovered uranium bearing solution to the ore zone depth and not beyond the mining zone within the confines of the freeze wall. Furthermore, modelling had demonstrated that mining solutions will be maintained within the deposit area laterally and not contact the freeze wall, which is located at a 25 m stand-off distance.  For more information on how Denison’s extensive field testing and lab informed the design of the ISR mine and the mining zone remediation objectives please see the response to IR-6.	No updates to the EIS in response to this IR.
IR-53	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<b>Context:</b> The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.  However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper	Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).	The calibrated hydraulic conductivity values are consistent with observed data. The calibrated K value for the intermediate aquitard was 1x10 <sup>-8</sup> m/s, which is in the middle of the range of values reported from point testing within this unit (Range: 10 <sup>-10</sup> to 3.8x10 <sup>-6</sup> m/s), and similar to the geomean value (8.4 x10 <sup>-9</sup> m/s). Thus, the calibrated K value is within a factor of 1.2 of, and higher than, the geomean value. The hydraulic conductivity value for the Intermediate Aquitard is similar to that applied by AECL at Cigar Lake (5x10 <sup>-8</sup> m/s). Similarly, the K values applied for the Upper and Lower Sandstone Aquifer units are consistent with the field measured values, particularly for this fractured rock environment. The high end of the	No updates to the EIS in response to this IR.



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				<p>and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p><b>Rationale:</b> It is not clear how representative the calibrated K values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>		<p>packer tested range of K values varied by 2 orders of magnitude between the aquifer and aquitard units, which is consistent with the definition of aquifer / aquitard differentiation. The interpretation of an aquifer-aquitard-aquifer sequence is consistent with the AECL interpretation of the Athabasca Sandstone at the Cigar Lake mine.</p> <p>When packer testing in fractured rock, the hydraulic conductivity associated with any test depends on whether the packed zone contains a continuous fracture set. However, for the unit as a whole, it is important that the model represent the hydraulic conductivity (or transmissivity) representative of the interconnected fracture network. Thus, it is appropriate that the applied hydraulic conductivity values within the aquifers are consistent with the higher end of tested conductivity values within those units. Within aquitard units, having singular higher conductivity fracture values from packer tests that test local fractures only, does not necessarily indicate large-scale transmissivity.</p> <p>A fault feature is suspected along the western perimeter of the Lower Sandstone Aquifer near Kratchkowsky and Williams Lake, located 1.5 km west of the mine site (also as depicted on the Hydrogeological Conceptual Site Model). This feature was interpreted to exist based on the similarity in groundwater levels between deep and shallow aquifers in that particular area (c.f., water levels along the creek south of Williams Lake and within GWR-029, as well as water levels recorded in open boreholes near Kratchkowsky Lake), as well as geochemistry in GWR-029. The geochemistry and water levels show in the vicinity of GWR-029 are different, however, than conditions within the Lower Sandstone aquifer further east of this area, above and east of the Phoenix deposit.</p> <p>The effect of the fault feature along the western edge of the Lower Sandstone aquifer was incorporated within the numerical model both through enhanced hydraulic conductivity parameters, as required to match observed water levels, and boundary conditions applied to introduce as much inflowing water to the Lower Sandstone Aquifer as the water level data suggest is reasonable.</p>	
IR-54	CNSC	Geology and Groundwater	Section 7.3.1	<p><b>Context:</b> EIS states: “The most important associated topographic features in the region are the northwest to southeast trending drumlins and eskers....” This is not the trend shown on the provided maps, nor described elsewhere in the report, e.g., Section 7.3.2.1</p> <p><b>Rationale:</b> Inaccurate information in the EIS</p>	Please update the EIS where required to accurately describe the topographical features.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS.	<p>In Section 7.3.1. the text will be updated to say the following:</p> <p>“The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...”</p>
IR-55	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;  Appendix 7-C, section 2.8	<p><b>Context:</b> According to the proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p><b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated</p>	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.	<p>Denison acknowledges the IR from the review and based on feedback from the assessment team who conducted the hydrogeological modelling for the EA the following is provided in response.</p> <p>The viewpoint from the third-party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed. This higher hydraulic conductivity scenario allows more water to flow laterally through the Intermediate Sandstone unit. Specified head values applied at the model boundaries are employed, such that the amount of water entering / leaving the domain is only limited by the simulated transmissivity and hydraulic gradients. Under this revised calibration, the simulated flow to Whitefish Lake from the Lower Sandstone aquifer would be 0.57% (i.e., &lt; 1%, similar to the model presented in the draft EIS) of the discharge to Whitefish Lake, and the simulated travel time from the ore zone to Whitefish Lake is approximately 250 years. The results of this revised calibrated scenario, with a hydraulic conductivity of 1.E-07 within the Intermediate Sandstone unit, are very similar to those obtained in the base calibrated model. This is the case because the higher flow through the Intermediate Sandstone unit migrates laterally until it reaches the desilicified zone, where it merges with flow from the Lower Sandstone Aquifer travelling upward toward Whitefish Lake. The additional flow contribution through the ISS contemplated by the reviewer would enhance dilution within the desilicified zone and thereby reduce concentrations reaching Whitefish Lake.</p>	No updates to the EIS in response to this IR.

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				in the proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).			
IR-56	CNSC	Geology and Groundwater	Section 7.3.3.2	<p><b>Context:</b> It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p><b>Rationale:</b> It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?	<p>All historic exploration boreholes drilled to date containing a mineralized intersection, with grades higher than 1% U3O8, have been grouted a minimum 25 m above and below the mineralized intersection. The addition of grout to these depths is within the defined depths of the hydrogeologically modelled areas from operational mining scenarios conducted to date. The extent of the mining solution migration (i.e. the mining area) for the purpose on the EA extends 50 meters above the ore zone depth.</p> <p>During Operation, select exploration boreholes will be re-utilized for narrow diameter injection wells that will be developed with monitoring devices for the determination of excursions and water levels. Exploration boreholes not selected for the use of narrow injection wells will be grouted to surface to seal off any remaining conduit. Many of the exploration boreholes previously installed through the desilicified zone that overlies the deposit have collapsed, sealing the zone and acting akin to previous and natural state of the desilicified zone itself.</p> <p>The potential impact of the open, unplugged boreholes was evaluated as part of the numerical model sensitivity simulations performed and presented in Appendix 7-C. In general, while these open boreholes have the potential to create preferential flow paths, they were not found to create a meaningful differences in the groundwater flow paths, or mass transport conditions. This is partially because the simulated groundwater gradients are downward above the ore zone where the open coreholes are most prevalent. Further east, within the desilicified zone, unplugged coreholes are interpreted to have collapsed, such that they do not represent preferential transport pathways in the future</p>	No updates to the EIS in response to this IR.
IR-57	NRCan	Fish and fish habitat	Section 7.3.3.2  Appendix 7-A, sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).	Please see response in Attachment IR-57.	In the final EIS, Section 2.5.2 of Appendix 7-C will be updated to include information provided in Attachment IR-57.
IR-58	ECCC	Fish and fish habitat	Section 7.3.2.4, Ore Deposit	<p><b>Context:</b> The Proponent states that the Phoenix ore bodies are long and narrow (approximately 25 to 50 m wide) and are located within or near a graphitic pelite unit. Hydrothermal alteration associated with the ore zone is a discontinuous envelope of clay alteration and a sulphide-cemented rock zone that extends into the overlying sandstone and the underlying basement (Figure 7.3-3). This black, clay-rich zone is approximately 3 m thick on average and locally hydraulically isolates the ore zone from the overlying sandstones and underlying weathered basement rock.</p> <p><b>Rationale:</b> As indicated by the Proponent, a 3 m black clay rich zone isolates the ore zone from the overlying sandstones and underlying weathered basement rock. It is, however, unclear whether this discontinuous clay layer will prevent downward migration of uranium-bearing solution into the Paleo-weathered basement rock or horizontal flow along the unconformity surface to escape into the</p>	<p>1. Verify that there will be no downward migration of mining solution into the paleo- weathered basement rock or that there is no flow along the unconformity surface.</p> <p>2. If downward migration of the mining solution occurs, explain how it will be mitigated.</p>	<p>1. A portion of the paleoweathered zone is comprised of high grade mineralization of the deposit and will be subject to mining activities controlled by the inward hydraulic gradient induced by pumping. As is discussed in Section 4.1 of Appendix 7-C, potential exists for downward migration of the solubility enhancing fluids used during mining operation and the UBS because of the density and specific gravity of these fluids (greater than that of sea water). However, the downward migration will be limited by the competent unaltered basement rocks below the paleoweathered zone, which is characterized as having very low hydraulic conductivity (Section 2.3 of Appendix 7-C).</p> <p>2. As discussed above, some migration of mining fluids in the paleoweathered zone is expected and groundwater quality in this zone remediated post-mining. The entire thickness of the paleoweathered zone beneath the ore zone was included in the numerical model (Appendix 7-C) as having water quality represented by the "Restored Solution" (Figure 4-1 of Appendix 7-C). That assumption is inherent in the conservative source zone applied to all mass transport simulations. Further conservatism within the numerical model was exclusion of low permeability natural barrier zones (i.e., clays) identified in the geological model for the</p>	No updates to the EIS in response to this IR.

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				environment. Escape of uranium-bearing solution into the environment will have a negative effect on the receiving environment.		ore zone - meaning, it was not assumed that these zones would serve to mitigate against migration of mining fluids into the paleoweathered zone. If downward migration of the mining solution were to occur this would be under an upset condition where monitoring wells placed below the mining horizon would collect these solutions via installed groundwater pumps preventing further migration away from the mining horizon.	
IR-59	CNSC	Fish and fish habitat	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)	<b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.  <b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.	Acknowledged. Figure 7-4.2 in the EIS and Figure 2-18 of Appendix 7-C will be replaced for clarity.	The updated figure provided in Attachment IR-59 will replace Figure 7-4.2 in the final EIS and Figure 2-18 of Appendix 7-C.
IR-60	NRCan	Fish and fish habitat	Section 7.4.2.1  Appendix 7-C, section 5.2.1, Appendix B	<b>Context:</b> In the discussion of the limitations of the numerical groundwater flow model (Appendix 7-C, sec. 5.2.1), the proponent invokes the well known modeling principles of "Occam's razor" and "Parsimony" which guided the parametrization of hydraulic conductivity in model layers. The proponent states that hydrogeologic property values were applied uniformly for, among other units, the Lower Sandstone aquifer beyond the immediate area of desilicified materials. However, in the layer parametrization for the Lower Sandstone aquifer (Appendix 7-C, Appendix B, Figure B-5), NRCan notes a large zone of enhanced conductivity (1 E-05 m/s) extending south from Kratchkowsky Lake, which contrasts with the value (2 E-07 m/s) assigned elsewhere outside the desilicified zone. NRCan also notes the extremely detailed parametrization of hydraulic conductivity in the clay cap overlying the ore zone where borehole control is dense (Appendix 7-C, Appendix B, Figure B-6).  <b>Rationale:</b> In NRCan's opinion, these model features appear to violate the principle of "Parsimony" and require greater justification supported by field observations.	NRCan requests that the proponent provide justification based on field evidence for the multiple hydraulic conductivity zones assigned to the Lower Sandstone aquifer and the clay cap above the ore zone.	We reaffirm that the hydraulic conductivity zones applied are consistent with the principles of parsimony and Occam's Razor. The hydraulic conductivity along the western portion of the model area within the Lower Sandstone Aquifer reflects the identified fault zone discussed in IR-53. This zone was added to better represent observed water levels within that portion of the model area. Further, this high hydraulic conductivity zone permits additional water inflow into the Lower Sandstone Aquifer than would otherwise exist if a lower hydraulic conductivity zone were applied here, resulting in conservative modelling predictions of flow through the Lower Sandstone Aquifer (which is consistent with the requests in IR-55).  The high-resolution representation of the clay cap zones is consistent with other contemporaneous work within the ore zone completed by Petrotek (2020) and subsequently by Denison. This resolution of parameter values is consistent with the high data density contained at the Phoenix ore body. Extensive hydrogeologic core logging and permeameter sampling were conducted on over 3,000 mineralized and lower sandstone drill cores to demonstrate and identify the spatial distribution of the various hydrogeologic units contained within the ore zone itself, for purposes of optimizing mining scenarios and flow pathways for recovery. Each hydrogeological unit has specific hydraulic conductivity values based on this extensive test work in addition to various field packer and pump/injection test work.	No updates to the EIS in response to this IR.
IR-61	CNSC	Geology and Groundwater	Section 7.4.2	<b>Context:</b> There is no discussion of potential induced seismicity from mining processes.  <b>Rationale:</b> Induced seismicity may lead to a loss of process as identified for natural seismicity.	Please provide information on the potential mining-induced seismicity.	Natural seismic activity in Northern Saskatchewan is quite rare with no significant events in recorded history (refer to draft EIS Section 15.2 Seismic Events).  Compared to conventional mining techniques, the potential for mining-induced seismicity from ISR mining is quite low. Potential for mining-induced events for the Project could be postulated to occur as the result of a few sources: 1. collapse of cavity voids from leaching, 2. hydraulic fracturing, and, 3. use of permeability enhancement techniques, and each is discussed further below.  <ol style="list-style-type: none"><li><b>Collapse of cavity voids.</b> To clarify, the portion of the deposit being mined is never truly a void (as in a large empty underground cavern); rather, what remains will be a honeycomb textured environment with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses. In terms of void space creation and collapse of the overlying strata, modelling has demonstrated that only 0.05% by volume of desilicified material immediately overlies the ore zone and would be subject to collapse (RESPEC 2023; included here as Attachment IR-21). This low volume and percentage is determined to not be of significant seismic concern.</li><li><b>Hydraulic fracturing.</b> Draft EIS Section 2.2.1.4.2 Wellfield Operation provides a comparison of ISR mining pressures to conventional fracking pressures used in the oil and gas industry. Conventional fracking pressures used in the oil and gas industry can vary; however, common pressures to induce fracturing can range up to 15,000 psi and require injection of fracking fluids of up to 16,000 liter per minute over periods of three to four days. Fracking fluids are comprised of a slurry of water, proppant (generally silica sand), and chemical additives to support and maintain the open fracture system after fracking is conducted. Conversely, ISR mining for the Project is planned at nominal pressures of 100 psi, intermittent pressures of up to 250 psi, and average flow rates of 30 liters per minute within a recovery well. The ISR mining method proposed for the Project is markedly different than fracking. For example, looking at intermittent pressures alone, ISR pressures are anticipated to be 60 times lower than fracking pressures.</li><li><b>Permeability enhancement techniques.</b> Draft EIS Section 2.2.1.4.3 Permeability Enhancement outlines the three types of techniques being considered for the Project: mechanical, Propellant, and hydraulic options. Propellants are classified as a low hazard explosive (S.1 special-purpose explosives, low hazard explosives, per Explosive Regulations, section 36). Propellants technically do not explode (like classic mine explosives which detonate) but rather burn through a process called deflagration. Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds. Neither ISR mining or permeability enhancement is expected to produce mining-induced seismicity.</li></ol>	No updates to the EIS in response to this IR.



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IR-62	ECCC	Fish and fish habitat	Section 7.4.2, Potential Project-related Effects	<p><b>Context:</b> The Proponent indicates that the mining area includes:</p> <ul style="list-style-type: none"> <li>the ‘active mining area’, which is the target ore zone;</li> <li>a zone extending between 11 and 13 m above the active mining area that represents the maximum vertical height over which the injected mining fluids will migrate upwards from the ore zone during active mining; and</li> <li>a zone extending 50 m vertically upwards from the active mining area (that incorporates the active mining area and the 11 to 13 m zone defined in the previous bullet) that was selected to account for potential upset conditions.</li> </ul> <p><b>Rationale:</b> It is not clear to ECCC how the Proponent would be able to limit the mining solution migration within 11 &amp; 13 m above active mining as the maximum vertical height over which the injected mining fluid will migrate. As the mining fluid will be injected under pressure into zones with possible presence of fractures, the pressure may also cause additional fractures and given that the solution is warm/hot will possibly dissolve the other cementing material in the sandstone above, making it difficult to accurately predict where the solution will migrate to.</p>	<p>1. Explain plans to limit the upward migration of mining solution into the overlying layer to 11 and 13m above the ore zone.</p> <p>2. Explain what impacts will occur if the mining solution migrates beyond the predicted height.</p>	<p>1. More detail on engineered controls for containment of mining solution is provided in the draft EIS, Section 2.2.1.4.2 Wellfield Operation; see also the response to IR-08. Continuous monitoring of pump and injection wells will confirm containment of mining solutions to the lower 11 to 13 m above the ore zone during active operations.</p> <p>2. Additional monitoring wells located above this elevation will be installed to make sure this depth is achieved. These monitoring wells can be retrofitted to be pumping wells if needed to provide additional control of mining solutions. Denison has established a conservative mining area of 50 m above the ore zone in the EIS, which will be remediated to acceptable criteria post mining. Additionally, the freeze wall will be in place throughout Operations and will provide horizontal containment of solutions.</p>	No updates to the EIS in response to this IR.
IR-63	CNSC	Geology and groundwater	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning  Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.	See response in Attachment IR-63.	The information provided in Attachment IR-63 will be attached to Appendix 7-C in the final EIS.
IR-64	ECCC CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation  Appendix 7-A, Appendix K (p. 12)	<p><b>Context:</b> The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.</p> <p><b>Rationale:</b> ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.</p> <p>It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.</p>	<p>Explain:</p> <ul style="list-style-type: none"> <li>Will this be revisited with updated data based on extraction feasibility results?</li> <li>How will the surface expression of a subsidence will be limited to 7.5 cm and localized?</li> </ul> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.</p>	Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including subunits within the altered zone (RESPEC 2023; included as Attachment IR-21) and the surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm. Denison is not anticipating the need for remediation measures with the surface subsidence being negligible within the context of changes in terrain as it relates to decommissioning objectives.	No updates to the EIS in response to this IR.
IR-65	CNSC	Geology and Groundwater	Section 7.4.2.2	<p><b>Context:</b> It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?</p> <p><b>Rationale:</b> Surface facilities and wells may be impacted if there is unaccounted for subsidence.</p>	Please provide additional details for any dewatering/pumping induced subsidence.	<p>No pumping and/or dewatering subsidence is anticipated to occur as the fluid balance will remain relatively stable during Operation with no additional stresses placed on the mining horizon. Refer also to response to IR-07.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No updates to the EIS in response to this IR.

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						<p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface.</p> <p>Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p>	
IR-66	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<p><b>Context:</b> Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.</p> <p><b>Rationale:</b> Subsidence may impact wells and surface infrastructure.</p>	<p>Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.</p>	<p>Please see response to IR-64 for an updated analysis of surface subsidence (2.4 to 2.8 mm at surface; RESPEC 2023 included as Attachment IR-21). The predicted changes at surface related to subsidence is beyond the range of current Lidar technology with resolution at 10 cm. As such, Denison believes the level of risk for subsidence is negligible and that monitoring and contingency plans are commensurate with this low level of risk.</p> <p>Injection and recovery wells will be collared at surface and surveyed regularly to monitor for any changes in collar height over time. This monitoring will be added to Section 7 of final EIS for the Geology VC.</p>	<p>Update to Table 7.5-1 in Section 7 of the final EIS to note that subsidence estimates are in the mm range and mitigation measures are not required. Injection and recovery well collar height monitoring will also be added to Section 7 of the final EIS.</p>
IR-67	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<p><b>Context:</b> Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.</p> <p><b>Rationale:</b> The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).</p>	<p>1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.</p> <p>2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.</p> <p>3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-68	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7	<p><b>Context:</b> Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone.</p> <p><b>Rationale:</b> In NRCan's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCan notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCan's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.</p>	<p>NRCan requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.</p>	<p>Please see response in Attachment IR-68, IR-94, IR-97.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-69	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCan's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the</p>	<p>NRCan requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>

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				choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This Information is important when considering source terms in reactive transport modeling.			
IR-70	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p><b>Context:</b> The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p><b>Rationale:</b> A hydraulic conductivity (K) value of 5x10<sup>-6</sup> m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.	<p>Based on coreflood and column tests performed in the laboratory, a modest increase in the flow rate through the core was observed post-leaching. This is described in more detail in the response to IR-69. Based on the available information, the hydraulic conductivity in the ore zone was raised to be a uniform value of 2E-07 m/s to be represent the effective dissolution of any clay cap materials.</p> <p>However, the post-mining conductivity of the ore zone is not important to the fate and transport of the COPCs in the restored solution towards Whitefish Lake, as it represents a small portion of the flow path. Key parameters controlling transport rates to Whitefish Lake were the hydraulic conductivity of the lower sediments and the desilicified zone. Scenarios 5, 6, and 7 of the parameter uncertainty assessment presented in Section 4.7, Appendix 7-C, systematically explore the highest parameter values consistent with the observed data used for model calibration. As indicated by these scenarios, the geochemical assimilation capacity outweighs the uncertainty in hydraulic conductivity values.</p>	No updates to the EIS in response to this IR.
IR-71	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	<p><b>Context:</b> The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p> <p><b>Rationale:</b> It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.</p>	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.	<p>The experience of the Project team regarding studies of climate change and the impacts on groundwater at other sites generally shows a range of potential positive and offsetting negative impacts. While warmer temperatures will lead to extended periods of summer drought conditions extending into early fall, warmer winters are predicted as well, resulting in less snowpack accumulation, more frequent snowmelt events, and more frequent rainfall during periods when evapotranspiration is negligible. These warmer winter conditions are often simulated to produce enhanced groundwater recharge during late fall, winter, and early spring conditions. In particular, the lack of enhanced snowpack is simulated to result in less severe spring run-off conditions, indicating that more of the winter precipitation that falls will infiltrate. Overall, this is anticipated to result in enhanced groundwater recharge in the mid- to late-century periods.</p> <p>If, however, lower groundwater recharge was to result from climate change, it would reduce the groundwater driving force for mass transport of mining related fluids, and reduce mass loading to receiving water bodies such as Whitefish Lake. In other words, lower groundwater recharge resulting from higher evapotranspiration would result in slower mass transport to the receiving water bodies, reducing the risk of exposure.</p>	No updates to the EIS in response to this IR
IR-72	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<p><b>Context:</b> Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.</p> <p><b>Rationale:</b> It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?</p>	Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.	<p>Loss of freezing to the freeze wall is considered an accident and malfunction, and highly unlikely, although if it occurs, will be signaled earlier by operational monitoring than through monitoring of groundwater quality. Details of the monitoring of the integrity of the freeze wall are provided in IR-51 and include ground temperature monitoring achieved through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground and will provide early detection of any upset conditions can be identified and addressed.</p> <p>For more information on the freeze wall integrity see attached technical response IR-10</p> <p>The groundwater monitoring network and plan, as presented in the draft EIS, was designed primarily to detect excursions of mining fluids, but also considers upset conditions related to the freeze wall. The parameters being measured in groundwater include electrical conductivity (EC) and chloride, which is a key indicator of freeze wall brine (CaCl<sub>2</sub>), but is not expected to be a key indicator of migration of mining fluids. It is acknowledged that there was an oversight in the description of groundwater monitoring in Section 7.8.2 in not including chloride as a key performance indicator related to freeze wall upset conditions and brine migration; it has, however, been included in the Groundwater Monitoring Plan being developed for Licensing. Groundwater monitoring in wells and well clusters detailed in Figure 7-8.1 of the draft EIS (see IR-51 for updates to Figure 7-8.1) will include sampling for chloride and other key indicator parameters as well as continuous monitoring of EC (and pressure) at target hydrostratigraphic depths. The number of wells targeting the Lower Sandstone Aquifer is highest, with one monitoring well placed every 125 to 150 m distance along the freeze wall. The higher frequency of wells in this hydrostratigraphic unit reflects this as the unit where an upset condition with the freeze wall has the highest potential to allow migration of chemical constituents associated with the mining fluids laterally from the mining zone. Monitoring of</p>	<p>No updates to the EIS in response to this IR.</p> <p>The groundwater monitoring plan that will be submitted for licensing includes chloride and EC as key indicator parameters for demonstrating freeze wall integrity and, under upset conditions, delineating migration of brine in groundwater.</p>



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						these key parameters will also occur in wells in the overlying hydrostratigraphic units (Intermediate Sandstone Aquitard, Upper Sandstone Aquifer and Overburden Aquifer). The groundwater monitoring network serves as secondary means to demonstrate freeze wall integrity and, under upset conditions, delineate migration of brine in groundwater. In addition, changes in pressure and temperature will be monitored continuously in vibrating wire piezometers (VWPs) surrounding the freeze wall, again every 125 to 150 m along the freeze wall, and changes would be evaluated in terms of potential to signal a freeze wall upset condition.	
IR-73	CNSC	Geology and groundwater	Section 7.8.2.2, In Situ Recovery Mining Area  Appendix 7-A, Appendix C	<b>Context:</b> The EIS recommends that a follow-up study be carried out to supplement available data on hydraulic conductivity in the Desilicified Zone (DSZ).  <b>Rationale:</b> Appendix C (Summary of Hydraulic Testing Data and Conductivity Values) of Appendix 7A indicates that only n = 6 hydraulic conductivity values are available for the DSZ, one of which appears unreliable due to a problem with packer sealing. This is relatively few values compared to the Intermediate and Lower Sandstones. Additionally, limited hydraulic head data from boreholes screened in the DSZ is available (GWR-037, GWR-012 and GWR-014; See Figures 16/17 in Appendix 7-A) – most information appears to originate from open core holes. The information presented in its current form is insufficient considering the importance of this zone as a preferential pathway for contaminants following remediation activities, and the heterogeneity of the unit due to intense hydrothermal alteration and fracturing. Further information regarding hydrogeological properties and groundwater flow would aid greatly in validating and refining the numerical groundwater model.	As per the EIS recommendations, please provide additional information to supplement available data on hydraulic conductivity in the DSZ. Please provide the following information as part of the follow-up study: <ol style="list-style-type: none"><li>1. identification of the vertical conductivity (KV) as there is an upward flow component (isotropy was assumed in DSZ for numerical model, this assumption must be verified)</li><li>2. quantification of the horizontal and vertical flow gradients in the DSZ; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fracture/fault zones.</li></ol>	The specific information being asked for will be included in the final EIS. The detailed Groundwater Monitoring Plan will be provided to support licensing.  The need for additional data within the desilicified zone is recognized and Denison has committed to gathering that data during Construction. In the absence of such data, reasonable and conservative assumptions were made regarding the continuity, hydraulic conductivity, porosity and nature of the geochemically reactive solids of the desilicified zone. Conservatism on multiples levels provides confidence that conditions are likely more favourable than simulated within the draft EIS.	Section 7.8.2.2.1 of the final EIS will be updated to include these follow-up commitments related to the desilicified zone: <ol style="list-style-type: none"><li>1. identification of vertical conductivity;</li><li>2. quantification of horizontal and vertical flow gradients; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fractures/fault zones.</li></ol>
IR-74	CNSC	Geology and Groundwater	Section 7.8.2.3	<b>Context:</b> It is stated in Section 7.8.2.3 (p. 7-113, main EIS report) that, at the Post-Decommissioning Stage, “Excursion are signaled by a change in water quality that is outside of that bounded by modelling predictions”, and “The model predictions spatiotemporally bound COPC concentrations in the subsurface that do not pose a risk to the receiving environment. Water quality that is outside of this bounding is defined as representing a material increase over a meaningful period compared to the predicted values either in rate of change or magnitude of change of COPC concentrations.”  <b>Rationale:</b> It is not clear in which locations (e.g., is it in the mining area, or downstream of the mining area, or anywhere else?) the water quality is used to compare with the model predictions to determine if excursion occurs.	Please clarify in which locations the water quality data is used to compare with the model predictions to determine if excursion occurs.	These comparisons refer to conditions at the proposed monitoring well locations.	No updates to the EIS in response to this IR.
IR-75	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<b>Context:</b> The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.  <b>Rationale:</b> By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.	Additional conservative modelling scenarios were undertaken to address this (and other IRs). The modelling results show that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable (1.0 < factor of safety [FS] < 1.25), and no-failure conditions are apparent. The predicted surface displacement remains approximately 2.4 to 2.8 mm (RESPEC 2023; included here as Attachment IR-21).  For desilicified sandstone properties, failure conditions are predicted in 12.6% of the modeled desilicified sandstone volume, which is located within 20 to 35 m of the ore zone. Notable observations from modelling include that, based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone. The vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm, and quickly reduces to the range between 0 and 7 cm at a distance of 4 – 5 meters from the low-grade ore zone (RESPEC 2023).	No updates to the EIS in response to this IR.
IR-76	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<b>Context:</b> Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.  <b>Rationale:</b> Failure of steel casing may result in process loss or alter groundwater flow and quality.	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.	The well designs and operational monitoring of the wellfield will mitigate accidental release of mining solution or UBS in the sandstone above the mining area. Each well will have double containment: mining solution will travel inside an inner casing with the outer casing acting as secondary containment for the mining fluids. Wells will be continually monitored for operational parameters such as injection pressures, injection flow rates, and recovery flow rates. This data will be transmitted to the processing plant for remote monitoring through a master control system. Through the master control system, operators will be capable of controlling pumphouse production lines remotely. Wellfield monitoring will facilitate detection of any issues with the injection and recovery wells.  Specific to the steel casing for the injection and recovery wells, the conservative estimate of vertical strain in the steel casing passing through the altered sandstone provided in Appendix 7-A of the draft EIS is approaching the tensile and compressive yield limits; however, these estimates are likely an over-estimate of the actual casing strains because of the simplified, conservative assumptions used in the analysis. Altered sandstone within 25 m from the boundary of the mined excavation experiences tensile vertical strain greater than the yield limit (0.0018 strain) such that the vertical strain is relatively higher because of the presence	No updates to the EIS in response to this IR.

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						<p>of upper clay above the ore zone. The altered sandstone around the mined cavity similarly experiences compressive vertical strain greater than the yield limit (–0.0018 strain) for the radial span of 25 m. Where tensile strain exceeds the yield limit there is potential for well failure. These isolated areas that have been identified from the geomechanical study will need further assessment of well designs should a well be placed in these specific sub locations within the deposit area.</p> <p>A network of monitoring wells installed within the freeze wall area will be equipped with pressure instrumentation for the determination of the vertical strain/stresses placed on the formation to do mining zone space creation. This monitoring network is designed to detect if these strains may be approaching their acceptable levels prior to failure. The injection and recovery wells will also be equipped with devices for pressure and temperature that can detect a breach in the well casing if one were to occur. As a preventative measure, annual mechanical integrity testing is conducted on the wells to ensure their containment and compliancy.</p> <p>Active monitoring will allow for operational shutdown if a scenario is approaching a failure mode.</p>	
IR-77	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 1)	<p><b>Context:</b> It is reported in the appendix K report, within Appendix 7-A, that both phase I scoping analysis and phase II detailed strip model were investigated by numerical modelling. The analysis discussed influence on host rock stability as a result of incremental increase in volumetric extraction and graded conservative treatment of material properties.</p> <p><b>Rationale:</b> As critical components of a numerical geomechanical simulation, initial and boundary conditions are crucially important to the confidence and reliability of the modelling results. However, this information is absent from the current report. In-situ principal stresses largely affects the stability of the excavated host rock, and the vertical strain and surface subsidence. This information is also absent in current form.</p>	Please provide details on the boundary and initial conditions applied on stress loading and strain for the numerical analysis. In particular, the in-situ principal stresses, which are critical to correct understanding of the excavation disturbance to the host rock, should be provided and justified as appropriate.	<p>Several numerical models were conducted for material properties for altered sandstone. Presuming that the entire altered sandstone to be unconsolidated and desilicified.</p> <p>» For 0.0 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.1 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.5 MPa cohesion value, the numerical model reached equilibrium for friction angle of 20 degree.</p>	No updates to the EIS in response to this IR.
IR-78	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity  Appendix 7-C, Section 2.3.2.1, Porosity Values	<p><b>Context:</b> This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p><b>Rationale:</b> The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given the that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A, and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests, were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.</p>	<p>Effective porosity values applied in the numerical modelling are thoroughly discussed in section 2.3.2.1 and clearly presented in Table 2-4 of Appendix 7-C.</p> <p>Effective porosity values cannot be derived from packer tests, slug tests, or pumping tests. They can be inferred from core, although core is generally a very small sample of the subsurface and is generally limited to total porosity as opposed to the interconnected pore space. In fractured rock environments, the effective porosity is a combination of the fracture porosity and the portion of the total porosity interconnected with the fractures; thus, the effective porosity tends more toward the value of the fracture porosity. Effective porosity is rigorously determined using a successful tracer test; however, the success of a field based tracer test is not easily achieved as much of the tracer volume is often not intersected by downgradient wells. Consequently, most mass transport assessments use literature values for effective porosity (Anderson, Woessner and Hunt, 2015; pg 332). Further, the tracer test performed within a small portion (i.e., 10 m) of the ore zone, was not considered to be informative of the effective porosity values needed for the entire flow path between the ore zone and Whitefish Lake.</p> <p>For this study the effective porosity values applied in the Cigar Lake 3D model were used as a guide. Literature values suggested by Anderson, Woessner and Hunt (2015) would suggest higher values of effective porosity, which would be less conservative (i.e., result in slower groundwater velocities) than applied within this study.</p> <p>Reference: Anderson. M., W. Woessner, and R. Hunt. 2015. Applied Groundwater Modelling. Elsevier Inc.</p>	No update to the EIS in response to this IR.
IR-79	CNSC	Geology and groundwater	Appendix 7-A, Section 4, Groundwater Chemistry	<p><b>Context:</b> Table 4-1 in Section 4 of Appendix 7-A provides groundwater monitoring results from sampling activities carried out at 26 monitoring wells in 2019, 2020, and 2021. The majority of these wells were only sampled once (n = 8) or twice (n = 17). In some cases (Lower Sandstone Aquifer/Intermediate Sandstone Aquitard), the variability of results between sampling events is quite high. Data for the Paleoweathered Zone is sparse.</p> <p><b>Rationale:</b> Insufficient information is presented in the EIS and associated Appendices to concretely define baseline groundwater chemistry for the different hydrostratigraphic units. As defined in the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>: “Based on the scope of the project, the EIS will present sufficiently detailed baseline information to determine the effects the project could have on the VCs and analyze those effects”. This is particularly important given certain features of the study area (i.e., presence of zones of thermal alteration/desilicification, as well as hydraulically active fractures/faults), and the need to adequately characterize baseline</p>	Please provide the statistical basis (number of samples and variability) by which “baseline” is defined and the justification that the current information is sufficient to adequately characterize groundwater quality. In order to ensure sufficient baseline information is collected, further iterations of sample collection for groundwater monitoring wells in all defined hydrostratigraphic units may be required. In addition, groundwater quality downgradient from the proposed mining area should be further characterized to assess spatial influence of alteration and hydraulically active features,	<p>The statistical basis by which baseline groundwater data has been characterized, that is sample numbers included per hydrostratigraphic unit, median, maximum and minimum values, that describe the variability of the groundwater quality data were presented as Table 4-2 of Appendix 7A and Table 3-4 of Appendix 7C to the EIS. The primary purpose of the groundwater data collected as part of the baseline program is to provide a basis for evaluating the incremental change in groundwater quality with mining activities. The magnitude of any incremental changes in groundwater quality associated with the remediated groundwater, which was the focus of the modelling, was such that deviation in water quality from baseline conditions was possible to identify.</p> <p>Supplemental groundwater monitoring will be ongoing during all phases of the Project. Denison is committed to installing additional wells, with a focus on characterizing pre-mining conditions and monitoring through and post-mining immediately surrounding the freeze wall and downgradient of the mining zone, and will be re-initiating routine sampling that captures seasonal variability in 2024. A N288.7-compliant Groundwater Monitoring Plan is being developed to support permitting and licensing and will guide the aforementioned sampling.</p>	No updates to the EIS in response to this IR.

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				conditions in the Desilicified Zone downgradient from the proposed mining area. As an example, the US Nuclear Regulatory Commission (NRC) typically requires a minimum of four (4) quarterly samples from (i) surficial aquifers, (ii) production aquifers, (iii) overlying aquifers, and (iv) underlying aquifers to characterize preoperational groundwater quality (E. Striz, pers. comm.).			
IR-80	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model.</p> <p><b>Rationale:</b> The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO<sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO<sub>3</sub> or Ca-SO<sub>4</sub>/Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.</p>	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.	Please see response in Attachment IR-80.	Figure 26 of Appendix 7-A of the draft EIS will be separated into Figures 26 and 27, and the Figure numbering updated accordingly in that Appendix. Also, the text on pages 4.17-4.18 and 4.20 of Appendix 7-A of the draft EIS will be updated. These revised figures and text are outlined in Attachment IR-80.
IR-81	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p><b>Rationale:</b> Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., <sup>δ2</sup> H, <sup>δ18</sup> O) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.	Please see response in Attachment IR-81.	No updates to the EIS in response to this IR.
IR-82	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit  Appendix 7-C, Section 3.5	<p><b>Context:</b> A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p><b>Rationale:</b> A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p><b>Reference:</b></p>	<ol style="list-style-type: none"><li>1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2] below provide an example of simplified framework for characterizing redox conditions in aquifers.</li><li>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</li><li>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</li></ol> <p><b>Reference:</b> [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>	Please see response in Attachment IR-82.	No updates to the EIS in response to this IR.



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				[1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnvisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.			
IR-83	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p><b>Context:</b> Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p> <p><b>Rationale:</b> Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.</p>	Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.	Information requested here with respect to details of how the desilicified zone is considered in the geomechanical modelling is addressed in IR-75. Details linking the geochemical model with the geological model including core delineation of the desilicified zone above the mining zone is provided in RESPEC (2023), included here as Attachment IR-21.	No updates to the EIS in response to this IR.
IR-84	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.</p> <p><b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.</p>	1) Please clarify in Figure 2-10 where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. 2) Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.	1) As noted in Table 2-7 of Appendix 7-C of the EIS, under the heading "Surface Water Stations", the surface water stations used to evaluate baseflow to Whitefish Lake are stations SA-6 and SA-2. Both of these stations are demarked in Figure 2-10 of Appendix 7-C, illustrating the portion of Whitefish Lake that is monitored by these stations.  2) Stations SA-6 and SA-7 monitor upstream and downstream hydrologic conditions of the portion of Whitefish Lake adjacent to the Project. The difference in baseflow monitored between these stations is interpreted to be the contribution of groundwater to the portion of Whitefish Lake of interest. Within the report, the discharge between these stations has been referred to as "discharge to Whitefish Lake" although it is acknowledged that this refers strictly to the portion of Whitefish Lake adjacent to the Project.	No updates to the EIS in response to this IR.
IR-85	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C.</p> <p><b>Rationale:</b> It is not clear where Well A, Well B and Well C are located.</p>	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.	These three wells (referred within Appendix 7-C as "A", "B", and "C") are proposed wells to supply water to the mining operations. They are not yet constructed but are planned to be screened within the Upper Sandstone Aquifer. These wells were demarcated as "Freshwater wells" in Figure 2.2-1 of Section 2 of the EIS but were not labelled. Well A is located 200m northwest of the Phase 5 ISR injection area, Well B is located approximately 600 m south of the Phase 5 ISR injection area, while Well C is located 200 m northwest of the Phase 3 ISR injection area.	Figure 2.2-1 has been updated to label the “Freshwater wells” as “A”, “B”, and “C”. The updated figure is included in Attachment IR-85 and will replace the existing Figure 2.2-1 in the final EIS.
IR-86	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.</p> <p><b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.</p>	Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.	As stated in draft EIS Appendix 7-C, Section 2.7.2 (page 2.41) the calibrated, steady-state model was used as the basis for the transient model used to evaluate drawdown during operations. Only conditions immediately within the mining zone were altered within the transient model to reflect the proposed changes during mine operations. All boundary conditions that drive regional groundwater flow were unchanged for the transient model, and all hydrogeologic properties outside of the mining area were left unchanged. Changes made to the hydrogeologic properties were implemented transiently to represent the phased implementation of the freeze wall. Groundwater recharge was changed to reflect alterations to surficial land use and the implication of that land use change to groundwater recharge; transient pumping boundary conditions were incorporated to simulate the planned pumping demand for camp and ISR water requirements. The transient version of the model was used to evaluate changes to the groundwater discharge occurring at Whitefish Lake as documented in Appendix 7-C Section 2.7.	No updates to the EIS in response to this IR.
IR-87	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> In Section 2.8 (p. 2.45, Appendix 7-C) Parameter uncertainty assessment, only parameters for certain zones (part of each specific hydro-stratigraphic unit as shown in Figure 2-19, p. 2.46, Appendix 7-C) related to the pathway from the ore zone toward Whitefish Lake were allowed to vary in order to find combinations of parameter values that met statistical calibration criteria. If each hydro-stratigraphic units within the whole model domain were treated as parameter zones that can have varied hydraulic conductivity values, a different combination of parameter values could be obtained that</p>	It is recommended that the parameter zones in the Parameter uncertainty assessment include hydro-stratigraphic units in the whole model domain to investigate the possible combination of parameter values that could make the groundwater in the mined-out zone more active hydraulically.	As per the reviewer’s request, PEST++IES was applied to generate 50 calibrated realizations wherein all hydraulic conductivity parameter zones were allowed to vary. Of the 50 scenarios generated, the average contribution to Whitefish Lake from the Lower Sandstone Aquifer was 0.73%, with 48 of the 50 scenarios (96%) confirming the calibrated conceptualization. One of those scenarios is documented in the response to IR-55. It is noted that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, but as shown in the literature (Bradbury and Muldoon, 1990), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic	No updates to the EIS in response to this IR.

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				<p>meet statistical calibration criteria too.</p> <p><b>Rationale:</b> The parameter values for parameter zones between the mining area and Whitefish Lake is important in determining the hydraulic connection between the mining area and Whitefish Lake. Parameter values in other parameter zones could also be important. For example, if the K values for the intermediate sandstone aquitard are significantly larger than in the current calibration results, the interaction between the upper sandstone aquifer and the lower sandstone aquifer could be more active, and the mined-out zone could be more active hydraulically and groundwater in the minded-out zone could have a shorter residence time than in the current calibrated model.</p> <p>Additionally, it is noted that Figure 2.19 (p. 2.46, Appendix 7-C) illustrates the parameter zone for the intermediate sandstone aquitard. However, Figure 2.20 (p. 2.49, Appendix 7-C) did not include the intermediate sandstone aquitard in the results.</p>		<p>conductivities are best determined using long-term pumping tests, or a model and calibrating to observed water level trends.</p> <p>Please note that only parameter sets which are consistent with field observations (i.e., observed water level, baseflow, or geochemical observations) are considered relevant for prediction uncertainty analyses.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	
IR-88	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p> <p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in</p>	<p>It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active:</p> <ol style="list-style-type: none"><li>1. Determine the groundwater residence time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</li><li>2. Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</li><li>3. Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</li></ol>	<p>1) Denison believes that the best way to determine residence time as part of the EA is with the modelling approached used in the draft EIS. It is unclear how it would be possible to "determine the groundwater residence time within the Lower Sandstone Aquifer" other than by using a model. Available data (e.g., geochemistry) provide an indication of residence time, but not timing that can be compared to modelled results. The groundwater residence time within the Lower Sandstone Aquifer, downgradient of the ore zone, is simulated using the model to be 150 years or greater. Simulated residence time within the Lower Sandstone Aquifer upgradient of the ore zone is approximately 500 years.</p> <p>2) Particle tracking from the "mined-out" ore zone was incorporated within the EIS, as illustrated on Figure 4-4 of Appendix 7-C. The particle traces presented illustrate groundwater migration flow paths, path lengths, travel times, and velocities for water migrating from the mined-out ore zone. Reverse particle tracking indicates flow through the Lower Sandstone Aquifer flowing from upgradient areas flowing into the ore zone.</p> <p>3) The prediction uncertainty analysis (i.e., "sensitivity analysis") presented in Appendix 7-C included an evaluation of the change in the model prediction (i.e., plume migration) with respect to changes in the conductivity of materials along the flow path to the receptor, Whitefish Lake (i.e., Scenarios 4, 5, and 6) as well as regarding the hydraulic conductivity of the mined-out ore zone. As such we feel that the work requested by the reviewer has already been completed and reported upon within the draft EIS. In addition, the uncertainty of the Intermediate Sandstone Aquifer was evaluated (see IR55), where higher hydraulic conductivity within the Intermediate Sandstone Aquifer were found to reduce the proportion of water from the ore zone reaching Whitefish Lake, which would have the effect of further reducing (i.e., diluting) concentrations simulated and presented in the EIS documentation. As such, the conditions documented in the draft EIS are already conservative with respect to the uncertainty in these parameters.</p>	No updates to the EIS in response to this IR.

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				<p>the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be if the mined-out zones collapse.</p>			
IR-89	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p> <p><b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REDox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.</p> <p>See also related: IR-96.</p>	<p>1) Application of 5E-6 as the value for hydraulic conductivity within the desilicified zone is appropriate; the values of 5E-6 and 6E-6 are essentially the same number, particularly at the scale over which it is applied. We agree that the hydraulic conductivity of the desilicified zone is an important parameter to the fate and transport of dissolved minerals from the ore zone toward Whitefish Lake; that is why scenarios 4, 5, and 6 were designed to evaluate the prediction uncertainty related to the uncertainty of the desilicified zone, along with other hydraulic conductivity values along the transport migration pathway. Further, we recognize that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, and as shown in the literature (Bradbury and Muldoon, 2000), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic conductivities are best determined using a large-scale pumping test or a model calibrated to observed water levels, which is the approach we completed; the value of 5E-6 for the desilicified zone hydraulic conductivity provides an excellent match to observed water levels and baseflow discharge. In addition, packer tests in fractured rock tend to bias the hydraulic conductivity to be higher than is representative on the large scale, as testing is generally targeted on observed fracture zones. Given all this, we reaffirm that the applied hydraulic conductivity of 5E-6 is representative for the conductivity of the desilicified zone.</p> <p>2) Calibration-constrained uncertainty analyses were performed (i.e., the state of the practice) to evaluate the range of potential hydraulic conductivity values that could exist within the desilicified zone while still maintaining calibration. That analysis is presented in section 2.8 of Appendix 7-C. The most conservative of the parameter scenarios that are consistent with the field observational data were used for the prediction uncertainty analyses presented in Appendix 7-C, section 4.7. Scenarios 4, 5, and 6 explore higher hydraulic conductivity values which are supported by the observation data (i.e., calibration-constrained uncertainty analysis). The range of desilicified-zone hydraulic conductivity incorporated within those scenarios (Figure 2-21) is 1.6 to 3.2 m/d (i.e., 1.8E-5 to 3.7E-5 m/s); 3.2 m/d was the highest conductivity value for the desilicified zone (referred to as the Altered Zone within the Intermediate Aquitard on Figure 2-21) for all 50 calibrated realizations generated using PEST. As such, the EIS presented the prediction uncertainty with the highest hydraulic conductivity values supported by the observation data. It would not be appropriate to test scenarios with even higher values of hydraulic conductivity which would not be supported by the field observed groundwater levels. Thus, we do not feel it is appropriate to test scenarios where the hydraulic conductivity of the desilicified zone is orders of magnitude greater than suggested by field observations.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	No EIS updates are anticipated to address this IR.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-90	ECCC	Fish and fish habitat	Appendix 7-C, Section 2.4 and 2.6	<p><b>Context:</b> Hydraulic conductivities and hydraulic gradients play an important role in groundwater flow, geochemical modeling, and contaminant transport for the PHREEQC and FEFLOW models. Although there is an important vertical component to the contaminant transport, there is no distinction made between lateral and vertical hydraulic conductivities of hydraulic gradients.</p> <p><b>Rationale:</b> According to the conceptual model, there is an important vertical aspect to the groundwater flow thus incorporating any vertical hydraulic gradient or hydraulic conductivity information into the calibration would increase confidence in the results.</p> <p>Providing a distinct value for vertical hydraulic conductivity will improve the accuracy of the model in regards to the transport of contaminants to Whitefish Lake through the Desilicified zone, which is important to understand potential impacts to aquatic life.</p>	<ol style="list-style-type: none"><li>1. Explain if the vertical and lateral hydraulic gradients and hydraulic conductivities are assumed to be equivalent.</li><li>2. Provide a rationale for not distinguishing between vertical and lateral hydraulic gradients.</li><li>3. Alternatively, provide both lateral and vertical hydraulic gradient estimates and the implications on contaminant transport.</li></ol>	<ol style="list-style-type: none"><li>1. Lateral and vertical hydraulic conductivity values are assigned for every model element within the numerical modelling domain. In most areas, the vertical hydraulic conductivity is assumed to be 1/10th of the lateral hydraulic conductivity due to variability in the depositional environment (i.e., intermittent periods of quiet water deposits, and higher-energy water deposits) and fracturing (typically bedding plane fractures are more prevalent than vertical joints).</li><li>2. In the case of the desilicified zone the thermal alteration was conservatively assumed to have resulted in equivalent hydraulic conductivity values in the lateral and vertical directions. This conservative assumption within the desilicified zone is designed to over-predict mass transport potential to surface receptors.</li><li>3. The gradients applied are considered reasonable and defensible. By calibrating to 3D point observations of groundwater levels, and using surface water levels for hydrogeologic boundary conditions, the model has been inherently calibrated to 3-dimensional hydraulic gradients. Thus, lateral and vertical hydraulic gradients are incorporated within the analysis presented.</li></ol>	No updates to the EIS in response to this IR.
IR-91	NRCan	Fish and fish habitat	Appendix 7-C, section 2.5.2	<p><b>Context:</b> The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p><b>Rationale:</b> As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.	<p>The scales on Figure 2-13 of Appendix 7 have been corrected and included in Attachment IR-91.</p> <p>From a regional perspective, the available groundwater levels are clustered around the Phoenix deposit. However, Denison advanced monitoring well clusters to support hydrogeologic (and hydrochemical) characterization upgradient, downgradient, and cross-gradient to the deposit. Data from all of these wells were used to calibrate the numerical model. It is acknowledged that the hydrogeologic conditions are extrapolated from the available data; this is consistent with the state of the practice.</p>	The corrected Figure 2-13, which will be included in the final EIS, is appended as Attachment IR-91.
IR-92	CNSC	Geology and groundwater	Appendix 7-C, Section 3.2.1, Mineralogical Composition	<p><b>Context:</b> Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p><b>Rationale:</b> Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported.</p> <p>The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>	<ol style="list-style-type: none"><li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li><li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. dichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).</li></ol>	Please see response in Attachment IR-92.	<p>The updated version of Table 3-2 (provided in Attachment IR-92) will be included in the final EIS Appendix 7-C.</p> <p>To reflect the discussion in Attachment IR-92 and updates to Table 3-2 of Appendix 7-C, the following text will be included on page 3.29-3.20 of Appendix 7-C in the final EIS:</p> <p>Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.</p>
IR-93	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-10: Properties of	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical</p>	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport	Please see response in Attachment IR-93.	The updates to Table 3-10 of Appendix 7-C are detailed in Attachment IR-93 and will be included in the final EIS.

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			Adsorbing Mineral Phases	<p>reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Geothite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m2/g, this equals to 1600/6E4 mol/m2, or 0.0266 mol/m2, 1.6e4 sites/nm2.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm2. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters.</p> <p>The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>	modelling should be re-run to update the contents presented in the EIS report.		
IR-94	CNSC	Geology and Groundwater	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H+ sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.</p>	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-95	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-11	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated.</p> <p><b>Rationale:</b> It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these Kd analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients.</p> <p>In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of Kd value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.	Please see response in Attachment IR-95.	The updated version of Table 3-11 (provided in Attachment IR-95) will be included in the final EIS Appendix 7-C.
IR-96	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, "Transport parameters were specified for diffusion (1x10-9 m2/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)". The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the</p>	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89.</p>	Please see response in Attachment IR-96.	No updates to the EIS in response to this IR.

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				model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.  Further guidance on solute transport modelling can be found in BC MOE (2012) [1].  <b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.			
IR-97	ECCC	Fish and fish habitat	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b	<b>Context:</b> Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.  It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.  <b>Rationale:</b> The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.	1. Explain and clarify if mining operations will mobilize contaminants beyond operations?  2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?  3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-98	CNSC	Change to an environmental component due to hazardous contaminants	Section 8, Aquatic Environment	<b>Context:</b> It states in EIS in Section 8.3.7.1 (p. 8-151) that "Cameco's Key Lake Operation will overlap spatially and temporally with the Project".  <b>Rationale:</b> It is not clear whether there is the possibility that planned Denison discharges would eventually flow into and influence a background reference lake used by Key Lake operation.	Please provide supporting information to demonstrate whether discharges from the proposed operation will not eventually flow into a reference lake used by another existing operation.	Denison understands that Alpha Lake and McGowan Lake are used as reference lakes for a Cameco operation within the area of Denison's proposed project. Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.  Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan Lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.	No EIS updates are anticipated to address this IR.
IR-99	CNSC	Aquatic environment	Section 8, Water Quality, Table 8.2-13	<b>Context:</b> Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.  <b>Rationale:</b> It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.	The values provided in Table 8.2-13 for radiological COPCs are presented as Bq/L and the units provided in the sub-title (mg/L) are not consistent with the data provided. Table 8.2-13 is consistent with the data provided in Appendix 10-A (Environmental Risk Assessment), which specifies the concentrations as having been measured in Bq/L. Subsequent updates of the EIS will correct this inconsistency. Denison will review the final EIS to ensure this error is not repeated in other tables.	Table 8.2-13 will be revised to ensure the units for radiological parameters are expressed in Bq/L. The revised table is provided in Attachment IR-99.
IR-100	HC	Indigenous Peoples' health / Socio-economic conditions	Section 8, (p. 8-195)  Section 8.5.3, Table 8.5-2, (p. 8-226)	Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.  <b>Context:</b> Section 8 states "Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.  However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment" (p. 8-195).  Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.  In Section 8.5.3, fish tissue concentrations are compared to Health Canada's human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.  <b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.  Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day ( <a href="#">Health Canada, 2007</a> ) is a more	1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.  2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada's pTDI for methylmercury ( <a href="#">Health Canada, 2007</a> ).  3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.  See also related Advice to the Proponent: AD-31.	1. The intent is not to include mercury (and methylmercury) as a COPC for the assessment. As indicated in EIS Section 8.4.6.1, Residual Effects Characterization, mercury is not associated with the local geology and is not expected to be released in the effluent at measurable levels and was therefore not identified as a COPC. Denison notes that there is potential for increased methylmercury production in the receiving environment under a certain combination of factors to which the Project may contribute, such as increased nutrient levels in the environment; however, prediction of methylmercury production is not practical. Denison commits to monitoring mercury and methylmercury in the aquatic environment over the life of the Project to determine the potential changes in mercury concentrations in fish tissue over time. 2. As the Project advances and operational monitoring is underway, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight. This is a human health risk-based maximum permissible concentration. 3. Mercury data presented throughout the draft EIS represents total mercury. Denison agrees to included methylmercury as part of the constituents monitored in fish throughout all project phases.	A commitment will be added to Section 8 of the final EIS that as the Project advances, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight.  It will be clarified in the final EIS that mercury data presented is total mercury.



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				<p>appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing foetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>			
IR-101	ECCC	Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>Responses are numbered as listed in the IR. Figures associated with this IR are provided in Attachment IR-101.</p> <p>1) Below indicates the information that is presented in the draft EIS regarding wetland characteristics. This information was housed within the terrestrial environment component and potential impacts to wetlands as a valued component is further assessed under Section 9.2 of the draft EIS, and specifically Section 9.2.6.4. The following list indicates what information was provided in the draft EIS specific to information request #1. As such, repackaging the available information in Section 8 would be redundant and therefore in Denison’s view unnecessary.</p> <p>a) <i>Locations of Wetlands</i> <b>Section 9, Figure 9.2-8</b> on page 9-83 of the draft EIS presents a map of the RSA and LSA detailing the locations of various wetland features including bogs and fens.</p> <p>b) <i>Wetland Types</i> <b>Section 9, Figure 9.2-8</b> on page 9-83, and <b>Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS provides the geographical distribution and listing of the following wetland types within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – Black spruce treed bog</li><li>ii. BS18 – Labrador tea shrubby bog</li><li>iii. BS19 – Graminoid bog</li><li>iv. BS19/24 – Graminoid bog/Graminoid fen</li><li>v. BS20 – Open bog</li><li>vi. BS21 – Tamarack treed fen</li><li>vii. BS23 – Willow shrubby rich fen</li><li>viii. BS24 – Graminoid fen</li><li>ix. BS25 – Open fen</li><li>x. BS27 – Sedge rocky shore (shallow open water)</li></ul> <p>c) <i>Wetland Size</i> <b>Section 9, Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS lists the following wetland types and the cumulative area they encompass within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – 18.2 ha</li><li>ii. BS18 – 23.3 ha</li><li>iii. BS19 – 2.8 ha</li><li>iv. BS19/24 – 0.8 ha</li><li>v. BS20 – 0.6 ha</li><li>vi. BS21 – 1.9 ha</li><li>vii. BS23 – 0.6 ha</li><li>viii. BS25 – 0.4 ha</li><li>ix. BS27 – 4.2 ha</li></ul> <p>d) <i>Wetland Water Surface Elevation</i> Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 <b>Figure 1 Elevations of wetland features in the LSA.</b></p> <ul style="list-style-type: none"><li>• Wetlands 1.5 km west of the SSA range from 526-524 masl</li><li>• Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl</li><li>• Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl</li><li>• Wetlands north of the SSA and in the vicinity of the proposed air strip range from 514-508 masl.</li><li>• Wetlands situated further north of the SSA in the LSA were at an elevation of approximately 526 masl</li><li>• Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl</li><li>• Most wetland evaluated south of the SSA had elevations ranging from 491-488 masl</li></ul> <p>e) <i>Wetland Depth</i> – information associated with wetland depth for those in the LSA is not available.</p>	No EIS updates are required for this response.

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						<p>f) <i>Wetland Flow Pathways</i> - Nearly all wetlands are connected or adjacent to rivers and tributaries, and thus flow pathways are discernable in <b>Figure 9.2-8</b> of the draft EIS.</p> <p>g) <i>Presence of Fish and Fish Habitat</i> For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA.</p> <p>2) As noted in other parts of this IR response, the wetlands within the Project footprint are limited to two areas (i.e., stream crossings along the access road to the airstrip and powerline connection SE of Highway 914 [See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution in Attachment IR-101]) and these wetland areas can be avoided through design and construction mitigations. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>In regard to baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint:</p> <p>a) <i>Surface water quality in wetlands</i> – surface water quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, surface water quality was sampled and assessed at stream and lake stations situated upstream and downstream of wetland areas. These stations were selected for sampling as they were identified as providing repeatability (i.e., relative water depth) and informative with respect to desired segments of the system. For example, water quality was sampled at SA-4, SA-5, LA-6, SA-6 and LA-5 following the flow path from upstream to downstream, respectively. The water quality at these nodes was inclusive of upstream wetland influences. For further reference to surface water sampling station during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>b) <i>Sediment quality in wetlands</i> - sediment quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, sediment quality was sampled and assessed at depositional lake stations situated upstream and downstream of wetland areas. The sediment quality at these nodes would be inclusive of upstream wetland surface water and sediment influences. For further reference to sediment sampling stations during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>3) For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA</p> <p>However, when further scrutinizing the potential overprinting of wetland features as a result of the Project it is evident that even this loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and powerline connections are proposed (<b>See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution (Attachment IR-101)</b>).</p> <p>Wetlands associated with stream crossings have been identified to have mitigative designs (clear-span) to ensure no impacts to fish and fish habitat. The hydro-line as shown in Figure 1 will be constructed to avoid direct impacts to fish and fish habitat following best installation practices. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>As discussed in Section 8.1.6.1 of the EIS, water levels in the ponds and lakes in the vicinity of the of the Project are expected to experience negligible effects, with magnitudes of changes in water levels predicted to be in the sub-centimeter range. As natural fluctuations in lake water levels were approximately 0.4 m from 2011 to 2019, Project-related changes are not expected to be of a magnitude to compromise the Surface Water Quantity VC. It can then be considered a reasonable assumption that any changes to wetland features will have similar sub-centimeter impacts to water levels due to changes in surface flow and/or groundwater and therefore do not pose an indirect effect to water quantity or fish and fish habitat associated with these wetland features.</p> <p>4) As no impact is expected due to overprinting or due to draw down effects by the ISR, additional mitigation measures are not warranted. Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project. However, such changes are expected to be less than measurable.</p>	
IR-102	ECCC	Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including	<b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data	1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.	Please note: Figures and tables associated with this IR response as noted below are provided in Attachment IR-102. See also response IR-236.	Wording errors in Appendix 8-C, Appendix II, Table 1 will be updated in the final EIS as follows: - SA-2 extension method = Unit Area Runoff with Scaling and Offset

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			Appendix II, Table 1 (p. 2)	<p>from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>	<p>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</p> <p>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</p>	<p>1. As mentioned by ECCC and discussed in the draft EIS, baseline hydrometric datasets are available for the Project at various nodes throughout the watershed and these datasets are extended to cover a broader period of record to the Wheeler River station (06DA005) operated by Water Survey Canada. Datasets for local stations measured at the Project cover a range from 2010 to 2019, though the date records are not continuous over this period. There is value in the hydrometric data collected at the Project site and these data should inform the long-term estimates of flow at Project nodes. As such, relationships are established to link 06DA005 first to SA-1 via correlation, than SA-1 to the other stations at the Project via correlation, unit area runoff relationships and unit area runoff relationships with scaled and/or offset influences.</p> <p>The use of 06DA005 solely to extend the record at the Project is reasonable given that it is a direct receiver from the Project watersheds and has a watershed area approximately one order of magnitude larger the SA-1 which is the largest watershed monitored at the Project. Further, trends in the datasets for coincident dates are generally similar and correlated are sufficiently in agreement. 06DA005 is not a perfect proxy for long-term record extension; in particular a flow event in October 2016 results in proportionally greater flow rates than were observed at 06DA005. That said, it is the best available station and incorporates locally and regionally measured data which is standard practice.</p> <p>A wording error in Table 1 of Appendix II of Appendix 8-C indicates that for Assessment Nodes SA-2 and SA-3 the extension method is listed as Unit Area Runoff with Offset. Rather, SA-2 should be listed as Unit Area Runoff with Scaling and Offset and SA-3 should be listed as Unit Area Runoff with Scaling. Also, the source station for SA-5 should be noted as SA-6. These corrections will be made in the final EIS.</p> <p>All record extension methods follow the same equation format (presented below) where the variable Q represents discharge. Correlations may have influence over all five variables while Unit Area Runoff methods may only use one or two. The variable A through E are adjusted to define the fit of the extension method. The fit of the extension method is determined as the summation of the differences between the observed and estimated daily average discharge (or instantaneous measured discharge if the station did not have an installed datalogger) for coincident days in the datasets. Variables A through E are adjusted through a solver algorithm such that the summation of the differences is as near to zero as possible.</p> $Q_{Assessment\ Node} = A \cdot [B + C \cdot (Q_{Source\ Station} + D)^E]$ <p>Table 1 in Attachment IR-102 presents the variable used for each assessment node and indicates the source station for the calculation. In Attachment IR-102 following Table 1, figures 1 to 7 are presented for each assessment node show the estimated hydrograph for the station as well as measured discharges and reported hydrographs as daily average discharge. Figures are not presented for nodes LA-1 and LA-5 as there are no measured discharges immediately at the outlet of those lakes.</p> <p>2. Simple unit runoff relationships from larger watersheds are a reasonable approach when no other data are available for use at a Project. In this approach larger watersheds tend to have attenuation which impacts the timing and magnitude of runoff events When local data are available it is a better approach to understand the relationship of local flow rates within the broader context. As an example, at SA-3 if the unit area relationship is used from 06DA005 direct to that watershed it results in a dramatic under prediction; the measured data indicate that that watershed is capable of generating larger flow rates than would be expected simply based on a unit runoff.</p> <p>Regarding the comment on the use of constructing records based on constructed records, the same methodology is incorporated into developing hydrographs at the Project as is used to estimate flows at 06DA005. The long-term extension of the Project data simply relates the datasets in a manner which is acceptable to the Proponent’s technical experts.</p> <p>Using the record extension methodologies presented in Table 1 of Attachment IR1-2, ensures the data provide a better fit ultimately to 06DA005 as understood within the regional context.</p> <p>3. The proponent is of the professional opinion that the baseline water quantity metrics do not need to be revised and the information presented in the draft EIS and supporting documents is suitable for the intended purpose. As noted in the draft EIS, Section 8.1.6.2, “The confidence in the assessment of predicted effects on hydrology is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that water withdrawal and discharge scenarios presented herein represent the bounding case and hydrogeological modelling projections are not changed.”</p>	<p>- SA-3 extension method = Unit Area Runoff with Scaling - Source station for SA-5 = SA-6</p>
IR-103	ECCC	Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<p><b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.</p> <p>The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.</p> <p><b>Rationale:</b> IDF trends exhibit random behavior at some locations and</p>	<p>Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>ECCC correctly notes that the tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations. The closest gauged location to the Project is located 35 km_south southwest at the Key Lake Mine (KLM) and the IDF values at KLM for historical and future scenarios (Tables 1 and 2 below) are substantially lower than those predicted for the Project. The IDF-CC Tool estimated 1:100-year, 24-hour return period events of 79.9 and 88.6 mm during the current and predicted future values, respectively. As per Tables 1 and 2 those values are substantially larger, and more conservative than, the coincident values of 56.4 and 62.0 mm for KLM.</p> <p>The predicted values for the Project are likely strongly influenced by Cree Lake (4061861; 85 km west southwest) and Collins Bay SK (4061620; 130 km northeast). The interpolation may also be influenced by Stony Rapids A (4067PR5; 196 km north). The Cree Lake, Collins Bay SK and Stony Rapids A stations are all substantially higher than KLM; however, the</p>	<p>No EIS updates are anticipated to address this IR.</p>



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				correlated behavior at other locations. The choice of gauged locations will infer the statistics for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.		<p>geography, and likely the climate of KLM, is more similar to those of the Project than from the more distant stations.</p> <p>Despite the potential for the IDF_CC Tool to use weighting factors, the estimates provided by the tool for the purposes of assessing impacts of the project on the surface water hydrology are robust and conservative including in consideration of flooding or extreme weather events.</p> <p><u>IR-103 Table 1: Key Lake (4063753) – Historical IDF</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.39</td><td>6.66</td><td>7.11</td><td>7.37</td><td>7.43</td><td>7.56</td><td>7.65</td></tr><tr><td>10 min</td><td>7.46</td><td>10.11</td><td>11.40</td><td>12.39</td><td>12.66</td><td>13.37</td><td>13.94</td></tr><tr><td>15 min</td><td>9.22</td><td>12.44</td><td>13.97</td><td>15.12</td><td>15.42</td><td>16.23</td><td>16.86</td></tr><tr><td>30 min</td><td>11.50</td><td>16.59</td><td>19.20</td><td>21.24</td><td>21.81</td><td>23.36</td><td>24.63</td></tr><tr><td>1 h</td><td>13.72</td><td>18.91</td><td>21.28</td><td>23.00</td><td>23.45</td><td>24.61</td><td>25.49</td></tr><tr><td>2 h</td><td>15.71</td><td>22.25</td><td>26.04</td><td>29.31</td><td>30.29</td><td>33.09</td><td>35.61</td></tr><tr><td>6 h</td><td>21.93</td><td>27.85</td><td>30.92</td><td>33.36</td><td>34.05</td><td>35.92</td><td>37.48</td></tr><tr><td>12 h</td><td>26.57</td><td>33.31</td><td>36.50</td><td>38.87</td><td>39.50</td><td>41.17</td><td>42.46</td></tr><tr><td>24 h</td><td>35.57</td><td>44.63</td><td>48.82</td><td>51.86</td><td>52.67</td><td>54.76</td><td>56.35</td></tr></table> <p><u>IR-103 Table 2: Key Lake (4063753) – 2020 – 2050 Predicted IDF using CMIP6 Raw GCMs and SSP5.85</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.80</td><td>7.21</td><td>7.72</td><td>8.03</td><td>8.10</td><td>8.29</td><td>8.41</td></tr><tr><td>10 min</td><td>8.06</td><td>10.96</td><td>12.42</td><td>13.45</td><td>13.78</td><td>14.70</td><td>15.55</td></tr><tr><td>15 min</td><td>9.95</td><td>13.49</td><td>15.21</td><td>16.43</td><td>16.80</td><td>18.04</td><td>18.82</td></tr><tr><td>30 min</td><td>12.47</td><td>17.99</td><td>20.90</td><td>23.10</td><td>23.78</td><td>26.00</td><td>27.69</td></tr><tr><td>1 h</td><td>14.88</td><td>20.51</td><td>23.16</td><td>25.08</td><td>25.68</td><td>27.36</td><td>28.61</td></tr><tr><td>2 h</td><td>16.85</td><td>24.13</td><td>28.27</td><td>31.65</td><td>32.77</td><td>36.06</td><td>39.23</td></tr><tr><td>6 h</td><td>23.50</td><td>30.23</td><td>33.64</td><td>36.05</td><td>36.88</td><td>39.24</td><td>41.27</td></tr><tr><td>12 h</td><td>28.59</td><td>36.18</td><td>39.67</td><td>42.08</td><td>42.85</td><td>44.99</td><td>46.74</td></tr><tr><td>24 h</td><td>38.26</td><td>48.47</td><td>53.03</td><td>56.20</td><td>57.14</td><td>59.86</td><td>62.03</td></tr></table>	T (years)	2	5	10	20	25	50	100	5 min	5.39	6.66	7.11	7.37	7.43	7.56	7.65	10 min	7.46	10.11	11.40	12.39	12.66	13.37	13.94	15 min	9.22	12.44	13.97	15.12	15.42	16.23	16.86	30 min	11.50	16.59	19.20	21.24	21.81	23.36	24.63	1 h	13.72	18.91	21.28	23.00	23.45	24.61	25.49	2 h	15.71	22.25	26.04	29.31	30.29	33.09	35.61	6 h	21.93	27.85	30.92	33.36	34.05	35.92	37.48	12 h	26.57	33.31	36.50	38.87	39.50	41.17	42.46	24 h	35.57	44.63	48.82	51.86	52.67	54.76	56.35	T (years)	2	5	10	20	25	50	100	5 min	5.80	7.21	7.72	8.03	8.10	8.29	8.41	10 min	8.06	10.96	12.42	13.45	13.78	14.70	15.55	15 min	9.95	13.49	15.21	16.43	16.80	18.04	18.82	30 min	12.47	17.99	20.90	23.10	23.78	26.00	27.69	1 h	14.88	20.51	23.16	25.08	25.68	27.36	28.61	2 h	16.85	24.13	28.27	31.65	32.77	36.06	39.23	6 h	23.50	30.23	33.64	36.05	36.88	39.24	41.27	12 h	28.59	36.18	39.67	42.08	42.85	44.99	46.74	24 h	38.26	48.47	53.03	56.20	57.14	59.86	62.03	
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10 min	8.06	10.96	12.42	13.45	13.78	14.70	15.55																																																																																																																																																																
15 min	9.95	13.49	15.21	16.43	16.80	18.04	18.82																																																																																																																																																																
30 min	12.47	17.99	20.90	23.10	23.78	26.00	27.69																																																																																																																																																																
1 h	14.88	20.51	23.16	25.08	25.68	27.36	28.61																																																																																																																																																																
2 h	16.85	24.13	28.27	31.65	32.77	36.06	39.23																																																																																																																																																																
6 h	23.50	30.23	33.64	36.05	36.88	39.24	41.27																																																																																																																																																																
12 h	28.59	36.18	39.67	42.08	42.85	44.99	46.74																																																																																																																																																																
24 h	38.26	48.47	53.03	56.20	57.14	59.86	62.03																																																																																																																																																																
IR-104	ECCC	Fish and fish habitat	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>Please see response to IR-15, IR-236 and AD-15. Although there are a variety of methods available to derive a PMP, Denison’s selected PMP for engineering design (i.e., 493 mm; see response to IR-15; based on Canadian Climate Program [1994]) is over 5 times higher than observed and predicted 24 hour precipitation events (both 1 in 100 year, 24 hour return precipitation events and 24-hour maximum precipitation events; see response to AD-15), and as such, Denison is confident that the Project water management infrastructure will be appropriately designed. The PMP included in Section 8 of the draft EIS was 489.3 mm from a more recent publication (Atmospheric Environment Branch [1999]). Denison retained the higher of the two PMP values (i.e., 493 mm) for design purposes.</p> <p>The proponent will address the information requirements in reverse order of the way they are presented.</p> <p>2. The World Meteorological Organization (WMO) issued Manual on Estimation of Probable Maximum Precipitation (PMP) in 2009 (WMO-No. 1045), the third edition of this manual. This document presents several methodologies for estimation of PMP and is preceded by the similar second edition 1986 document titled “Manual for Estimation of Probable Maximum Precipitation (WMO No. 332)”. The 1986 document served as part of the foundation for analyses presented by Atmospheric Environment Branch (1999). WMO indicates that the 2009 document “keeps a majority of the content from the second edition” and newly added content since 1986 is for “directly estimating PMP for the requirements of a given project in a design watershed on probable maximum flood (PMF) in China, the United States of America, Australia and India.” As such, the proponent believes the Atmospheric Environment Branch (1999) analysis remains current within the context of the Project.</p> <p>Atmospheric Environmental Branch (1999) builds upon a similar document produced in 1994 (Canadian Climate Program, 1994). The 1994 text discusses methodology and results of analyses for northern Saskatchewan. Though the author is confident in their assessment, the author does indicate that values estimated through northern Saskatchewan may be “spurious” due to the scarcity of climatological data in the region. The use of the term “spurious” seems to be in reference to predicted PMP values which are substantially higher than those where data are available.</p> <p>Additional analyses would be possible for this assessment; however, climatological data remain scarce in northern Saskatchewan. Though there is uncertainty as to the result of</p>	No changes to the EIS are required.																																																																																																																																																																

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						<p>reassessment of PMP values in the vicinity of the Project, others have completed their own reassessment of PMP values based on locally monitored data which yielded a much smaller result for the PMP. In that situation the proponent opted to stay with a value of 489.3 mm as estimated by Atmospheric Environment Branch (1999) even though it was substantially larger than their reassessed value (NexGen Energy Ltd., 2022).</p> <p>1. Though it is presumed that methodologies have not changed appreciably to justify a reassessment of the PMP, the data scarcity component would also influence the potential for accurate estimation of the design storm. No new stations have been added in northern Saskatchewan with sufficient data record to improve regional observations which play a role in Hopkinson's analyses.</p> <p>Anecdotaly speaking, the estimates of 489.3 mm across the northern Saskatchewan region are considered very high by other practitioners in the industry. This seems to be supported by additional analyses completed for NexGen Energy Ltd. (2022). The acceptance of 489.3 mm or 493 mm as the PMP for the Project falls in line with magnitudes used by existing operators in the area and is likely a conservative estimate.</p> <p>References:</p> <p>Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p> <p>Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.</p> <p>NexGen Energy Ltd. 2022. Rook I Draft Environmental Impact Statement. June 2022.</p>	
IR-105	Directorate of Fisheries and Oceans (DFO)	Fish and fish habitat	<p>Section 8.1.4.1, Potential interactions between project and valued component/key indicators Surface Water Quantity</p> <p>Section 8.1.4.2.2, Surface Water Taking</p> <p>8.3.4.1, Potential interactions between project and valued component/key indicators</p>	<p><b>Context:</b> Table 8.1-8 and Table 8.3-6 in the EIS indicates a potential for freeze wall operation to influence groundwater interactions and surface water quantity and as a result, impact fish and fish habitat. Section 8.1.4.2.2 references Section 7 Geology and Groundwater for details on potential impacts. In addition, IR-63 notes the groundwater model does not describe the pathway in which groundwater would pass around the freeze wall during operation and any resulting potential effects on groundwater discharge to Whitefish Lake.</p> <p><b>Rationale:</b> As per IR-63, the groundwater model analysis is insufficient to make conclusions on the potential effects of the freeze wall on groundwater discharge into Whitefish Lake. DFO requires this information to fully understand if altered groundwater regimes will result in changes to Whitefish Lake water levels and any potential impacts to fish and fish habitat as a result of changing water levels.</p>	<p>1. Provide a more fulsome analysis of the potential impact of freeze wall operations on local and semi-regional groundwater regimes, and subsequently to fish and fish habitat within Whitefish Lake. The analysis should provide a rationale of how the scope of the groundwater model is relevant to and able to detect changes at the scale of fish and fish habitat.</p> <p>2. If impacts to fish and fish habitat in Whitefish Lake are predicted to occur due to changes in the groundwater regime, describe any mitigation measures that could be used to avoid these impacts.</p> <p>3. If impacts are predicted that cannot be avoided, characterize residual effects on fish and fish habitat.</p>	<p>Please refer to the disposition for IR-63 for a fulsome explanation of the minor impact that the freeze wall will have on the area and regional groundwater flows. It was concluded that the freeze-walled area is a relatively small disruption to the regional groundwater flow system.</p> <p>Potential indirect impact to the surface water hydrology at Whitefish Lake as a result of project induced changes to the hydrogeology of the area was considered as part of Section 8.1 and discussed in Appendix 8-C. The project impacts were inclusive of changes in groundwater contributions to LA-5 as listed in Table 4-1 of Appendix 8-C. The analysis included the most up to date information during the preparation of the EIS and which indicated a potential loss in contribution of 4-6 L/s of groundwater reporting to LA-5 through the operation and decommissioning phase. This input is anticipated to return to pre-disturbance conditions for Post-Decommissioning. More recent calculations of the potential loss of groundwater contribution to Whitefish Lake as 9.9 L/s. This change is within the same magnitude of that previously modelled and therefore is not likely to constitute a change in the assessment of significant effects for the aquatic environment.</p> <p>Recent modelling using a loss of 9.9 L/S indicates that the majority of this change is due to dewatering of the ISR area and not due to the freeze wall itself. As indicated in Attachment IR-63, the groundwater flow contours will locally deviate from their original paths due to the installation of the freeze wall and the pumping, yet this will not impact the larger spatial migration of groundwater to the lake. Furthermore, groundwater discharge distribution (i.e., seeps and upwellings) will continue to occur in a similar pattern during pumping as to pre-pumping. This indicates that while the overall groundwater discharge rate is reduced, the areas of primary groundwater discharge will remain unchanged. As such, fish which utilize LA-5 for critical life-history periods (namely Northern Pike) will not be impacted due to changes in groundwater interactions directly, or indirectly due to reductions in surface water levels or flow. As such, additional mitigation measures outside that currently proposed in the draft EIS are not suggested.</p>	Based on the response no revisions to the EIS are needed.
IR-106	CNSC	Change to an environmental component due to hazardous contaminants	Section 8.1.4.2.3, Surface Water Discharge	<p><b>Context:</b> It is stated in this section under construction that all site contact water will be held in the Clean Waste Rock Pond.</p> <p><b>Rationale:</b> It is unclear from this section what will happen to the contact water held in the Clean Waste Rock Pond, and whether it will be removed from site or released at a later time. What is the contingency plan if more contact water is produced during construction than the Clean Waste Rock Pond has capacity for.</p>	<p>Please indicate what will happen to the contact water stored in the Clean Waste Rock Pond during construction activities, will it be released after the wastewater treatment plant is installed? Further, please describe the contingency plan if contact water produced exceeds estimates and will exceed the volume of the clean waste rock pond?</p>	<p>During Construction, no effluent is expected to be released to the aquatic environment. Contact water stored in the Clean Waste Rock Pond during Construction will be held onsite until the Industrial Wastewater Treatment Plant (IWWTP) is commissioned. At that time the water from the pond would be conveyed to the IWWTP, treated, and released to Whitefish Lake per permit / license requirements.</p> <p>The sequence for Construction activities will occur in a logical manner based on Project execution plans. For example, construction of the wellfield runoff pond will be prioritized during the early part of Construction and it will able to hold 38,200 m<sup>3</sup> of water. This will provide contingency and additional water storage capacity if contact water produced exceeds estimates or the volume available in the Clean Waste Rock Pond.</p> <p>Other secondary contingency measures are also available should the volume of water requiring management exceed site infrastructure storage volume. This could include use a hydrovac for offsite disposal.</p>	No changes to the EIS are required.
IR-107	CNSC ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality</p>	<p>Please clarify what data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p>	<p>Surface water quality was sampled through 2016, 2018, and 2019 on a monthly basis which is generally consistent with federal requirements for assessing potential impacts through EA. Hydrological assessment has occurred from 2011 to 2019. Mean Annual Discharge (MAD) (m<sup>3</sup>/s) as measured at the Water Survey Canada (WSC) Wheeler River Watershed Station (06DA005) during 2016, 2018 and 2019 was 17.07, 17.34 and 19.23, respectively, all of which were slightly above the 43 year (1977 to 2019) average of 16.82. The MAD in 2016 and 2018 can be considered near average, with 2019 being considered an average-high flow year, but well below the maximum observed for the timeseries (27.62 m<sup>3</sup>/s). Since this period, there</p>	No changes to the EIS are required.

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				<p>characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”</p> <p>In addition, the “applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”</p>	<b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline	<p>have been no land use changes within the area that would constitute a major change in water quality.</p> <p>Baseline water quality samples were collected during years of average to average-high flows in the Wheeler River system and therefore representative of background conditions for assessment of potential impacts in the EIS. Additional conservatism was included in the impact assessment by using the 95<sup>th</sup> percentile values for baseline parameter concentrations when modelling potential effluent effects. As such, the surface water quality data collected are suitable for the intended purpose of assessing potential impacts and the additional conservativisms that were included as part of the assessment were precautionary.</p> <p>Given the above, Denison feels strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>Denison commits to the collection of additional surface water quality baseline data prior to project development starting to ensure updated baseline information is available for identification of any changes that might influence estimates of Project impacts. These data will be used to support permitting and licensing through updates to the ERA.</p>	
IR-108	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>	Please see Attachment IR-108.	Tables 8.2-2 and 8.2-3 will be updated in the final EIS, per Attachment IR-108.
IR-109	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. from the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.	Section 2 Project Description, Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds of the draft EIS outlines Denison's commitment to test effluent prior to discharge to Whitefish Lake, to ensure it meets federal and provincial discharge limits. Any pond not meeting the criteria will be recycled back to the Industrial Wastewater Treatment Plant via the process water pond.	No EIS updates are anticipated to address this IR.
IR-110	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment  Appendix 8-E, Section 2.1	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0 of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p>	<p>Provide confirmation of the diffuser depth and location.</p> <p>ECCC requests the opportunity to review the finalized diffuser design once it is available.</p>	The diffuser will be placed at a depth between 2.5 and 3 m. The mapping provided in the draft EIS and Appendix 8-E is based on coarse bathymetric information, which will be supplemented with more robust bathymetric surveys to support final siting and design associated with permitting and licensing.	No EIS updates are anticipated to address this IR.



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IR-111	CNSC	Fish and fish habitat	Section 8.2.4.2.2, Controlled Discharge	<p><b>Context:</b> This section of the EIS indicated that the scenario was assessed using a conservative assumption of a continuous freshwater withdrawal rate of 40.5 m3/hr, and a continuous effluent discharge rate of 81.0 m3/hr.</p> <p><b>Rationale:</b> The withdrawal rate assessed is half of the effluent rate, it is unclear from the text where the other half of the volume of effluent is coming from, if not drawn from the lake.</p>	Please clarify where the other half of the total volume of effluent discharged is from in the water balance between water intake and effluent.	Process water will be drawn from both groundwater and surface water (when required). The 81.0 m³/hr discharge rate conservatively assumes withdrawal from both sources at the maximum proposed rates. Please refer to Section 2.2.3 and specifically Figures 2.2-14, 2.2-15 and 2.2-16 of the draft EIS which depict the water balance for the Project for each of Construction, Operation and Decommissioning phases.	No EIS updates are anticipated to address this IR.																																																																																																												
IR-112	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.2, Aquatic Environment  Appendix 8-E, Section 1.2.1  Appendix 10-A (ERA), Section 3.1	<p><b>Context:</b> This section of the EIS states that, “for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of 81.0 m³/hr.” (p. 8-21)</p> <p>However, several sentences later it is stated that, “The approach to assessing Project-related effects on the Surface Water Quality VC was conservative for the following reasons: The assessment was based on a continuous (year-round) discharge rate at an expected average effluent discharge of 0.0101 m3/s (or 36.5 m3/hr) throughout Construction, Operation, and Decommissioning...”</p> <p>This is a continuous theme throughout Section 8, Aquatic Environment, where the discharge rate for the surface water quality assessment changes between 36.5 m3/hr and 81.0 m3/hr. However, in Appendix 10-A (ERA) the 36.5 m3/hr discharge rate is the only value used for the near and far-field modelling.</p> <p>It should be made clear in the main body of the draft EIS that the average effluent discharge rate of 36.5 m3/hr has been used as the input for the near- and far-field modelling for effluent, surface water and sediment quality predictions. The maximum upper bound discharge rate is 81 m3/hr; however, modelling for effluent, surface water and sediment quality was not completed for this discharge rate.</p> <p><b>Rationale:</b> It remains unclear throughout the draft EIS that all predictions of COPC concentrations in effluent, and receiving environment surface water and sediment are based upon the effluent discharge rate of 36.5 m3/hr, and not the maximum upper bound discharge rate of 81 m3/hr. All conclusions about risk to the environment and aquatic and terrestrial biota must make this clear. If the Proponent wishes to make conclusions based on the maximum upper bound discharge rate of 81 m3/hr, modelling needs to be conducted using this rate of discharge.</p>	<p>1. Confirm that the surface water quantity, quality, and aquatic biota risk assessments and modelling, were conducted using the discharge rate for 36.5 m3/hr within the draft EIS.</p> <p>2. Revise any statements or conclusions in the draft EIS to improve clarity about the usage of the maximum upper bound discharge rate of 81 m3/hr. Remove statements regarding use of the discharge rate of 81 m3/hr during modelling and risk assessments to the receiving environment as needed.</p>	<p>1. Denison confirms that the surface water quantity, quality, and aquatic biota risk assessments presented in the draft EIS and ERA (Appendix 10A) were conducted using the discharge rate for 36.5 m³/hr.</p> <p>2. Denison provides the following summary to clarify effluent discharge rates and identify updates to the final EIS:</p> <ul style="list-style-type: none"><li>Section 8.2.4.2.2 of the EIS will be modified (see details in EIS Updates column).</li><li>Appendix 8-E used an effluent discharge rate of 36.5 m³/hr, which is correct. No changes required.</li><li>Appendix 10-A used an effluent discharge rate of 36.5 m³/hr in the modelling and ERA results; however, in Section 6.2 of the ERA in Appendix 10-A, a sensitivity analysis was conducted to assess the effects on surface water and sediment when the effluent discharge rate is increased to the upper bound discharge rate of 81 m³/hr. No changes required.</li></ul>	<p>The sentence in Section 8.2.4.2.2 will be updated in the final EIS as follows:</p> <p>Denison does not intend to include constant freshwater withdrawal or effluent discharge throughout Operation; however, for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of <del>81.0</del> <b>36.5</b> m³/hr.</p>																																																																																																												
IR-113	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>Section 8.1.3.4 (and Appendix 8-C) provides a quantitative assessment of the potential changes in surface water quantity due to climate change. The 1:100 year, 24-hour return period rainfall events for the baseline and climate change influenced IDF curves are 79.9 mm and 88.6 mm, respectively. The PMP for the Project is estimated to be 493 mm (refer to IR-15 and AD-15) which is well above both 24-hour maximum precipitation and 1:100, 24 hour return precipitation events. The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change). The potential impacts of climate change to precipitation and therefore flows was summarized in Appendix 6-C, Table 10 with the total annual precipitation and the maximum 1-day events being variable over the next four decades (Table 1). Regardless, the climate change scenario indicates a potential increase in event based assimilative capacity in the receiving environment.</p> <p>TABLE 1- Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)</p> <table><tr><th>Year</th><th colspan="4">Total Annual (mm)</th><th colspan="4">Maximum 1-day (mm)</th></tr><tr><td></td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td></tr><tr><td>2011-2020</td><td>455</td><td>518</td><td>509</td><td>508</td><td>48</td><td>29</td><td>27</td><td>27</td></tr><tr><td>2030</td><td></td><td>528</td><td>503</td><td>537</td><td></td><td>27</td><td>24</td><td>26</td></tr><tr><td>2040</td><td></td><td>487</td><td>498</td><td>514</td><td></td><td>28</td><td>29</td><td>24</td></tr><tr><td>2050</td><td></td><td>504</td><td>524</td><td>520</td><td></td><td>26</td><td>29</td><td>33</td></tr><tr><td>2060</td><td></td><td>513</td><td>515</td><td>523</td><td></td><td>26</td><td>33</td><td>26</td></tr><tr><td>2070</td><td></td><td>527</td><td>534</td><td>568</td><td></td><td>29</td><td>31</td><td>28</td></tr><tr><td>2080</td><td></td><td>539</td><td>551</td><td>547</td><td></td><td>30</td><td>33</td><td>28</td></tr><tr><td>2090</td><td></td><td>543</td><td>545</td><td>548</td><td></td><td>31</td><td>32</td><td>35</td></tr><tr><td>2100</td><td></td><td>546</td><td>535</td><td>559</td><td></td><td>23</td><td>25</td><td>28</td></tr><tr><td colspan="2">Overall Increase:</td><td>28</td><td>26</td><td>51</td><td></td><td>-6</td><td>-2</td><td>1</td></tr></table> <p>To mitigate the potential for unplanned release of deleterious substances into the surface water environment even during the next 40 years of climate change, the PMP of 493 mm was</p>	Year	Total Annual (mm)				Maximum 1-day (mm)					Measure d	RCP 2.6	RCP 4.5	RCP 8.5	Measure d	RCP 2.6	RCP 4.5	RCP 8.5	2011-2020	455	518	509	508	48	29	27	27	2030		528	503	537		27	24	26	2040		487	498	514		28	29	24	2050		504	524	520		26	29	33	2060		513	515	523		26	33	26	2070		527	534	568		29	31	28	2080		539	551	547		30	33	28	2090		543	545	548		31	32	35	2100		546	535	559		23	25	28	Overall Increase:		28	26	51		-6	-2	1	No EIS updates are anticipated to address this IR.
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						used for water management engineering designs. During a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m <sup>3</sup> (excluding a freeboard of 1 meter). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.” As such, the project has been designed to manage water during PMP and greater, and therefore mitigation of potential impacts to water quality due to climate change has been initially included as part of the EIS. As a result, it is Denison's opinion that a quantitative assessment of potential impacts to surface water quality is not warranted as it is likely to indicate improved results from the conservative assessment of potential water quality changes during operation and decommissioning phases. Continued monitoring of background, effluent and receiver water quality will be undertaken and provide the ability for adaptive management throughout the life of the mine in association with potential climatic changes to the local and regional area.	
IR-114	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>	<ol style="list-style-type: none"><li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li><li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li><li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li></ol>	See response in Attachment IR-114.	Tables 8.2-9, 8.2-10, and 8.2-13 will be updated in the final EIS. The updated tables are provided in Attachment IR-114.
IR-115	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p><b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be</p>	<ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li><li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li></ol>	<ol style="list-style-type: none"><li>1. Table 8.2-8 has been updated and provided in Attachment IR-115</li><li>2. Denison believes that the water quality thresholds used in the assessment (Section 8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) were appropriate and reflect levels that are protective of aquatic life. The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is a reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.</li></ol>	Table 8.2-8 of the draft EIS will be replaced per the IR response as indicated.

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.		<p>3. Denison has selected the Saskatchewan specific guideline for molybdenum of 31 mg/L to be the most appropriate for the Project. It was derived from recent data following the CCME (2007) protocol. The molybdenum water quality objective based on the 5th percentile (HC5) of the species sensitivity distribution (SSD) according to the CCME protocol; 18 data points for 12 different species were used, mainly EC10 data (WSA, 2017). The CCME guideline is identified as an interim guideline and was based on multiplying the lowest chronic toxicity value, the 28-d LC50 of 0.73 mg/L for rainbow trout (O. mykiss), by a safety factor of 0.1. This original study by Birge (1978) has not been reproducible, either using the original methods or using standard methods (Davies et al. 2005). No changes to the EIS are proposed in this regard.</p> <p><u>References:</u>            Birge, W.J. 1978. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. Special Collections, USDA National Agricultural Library. Accessed February 16, 2023, <a href="https://www.nal.usda.gov/exhibits/speccoll/items/show/5224">https://www.nal.usda.gov/exhibits/speccoll/items/show/5224</a>.</p> <p>CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life.</p> <p>Davies, T.D., J. Pickard and K.J. Hall. 2005. Acute molybdenum toxicity to rainbow trout and other fish. Journal of Environmental Engineering &amp; Science 4: 481-485.</p> <p>WSA (Saskatchewan Water Security Agency). 2017. Saskatchewan Water Quality Objective for the Protection of Aquatic Life – Molybdenum. Fact Sheet. Report No. WSA 514.</p>	
IR-116	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3	<p><b>Context:</b> Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p><b>Rationale:</b> It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>	<p>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</p> <p>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</p>	See response in Attachment IR-116.	The EIS will be updated with the information provided in Attachment IR-116. Specifically, Table 8.2-14 and Table 8.4.9 of the EIS will be replaced by Table 1 of Attachment IR-116 and Table 8.5.5 will be replaced by Table 2 of Attachment IR-116..
IR-117	CNSC	Human health with respect to hazardous contaminants	Section 8.2.4, Table 8.2-9	<p><b>Context:</b> CNSC staff note that some of the effluent quality predictions in the EIS are quite high for a uranium mine and mill facility compared to the existing facilities.</p> <p>For example, the upper bound effluent quality of molybdenum is 2.5 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.213 mg/L.</p> <p>Also, the upper bound effluent quality of copper is 0.022 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.002 mg/L.</p> <p><b>Rationale:</b> Surface water quality models should be based on the anticipated effluent quality. From discussions with Denison, it appears that the effluent quality predictions may change based on the results of more bench scale tests that are still being conducted and continued optimization of the design of the water treatment plant.</p>	<p>Please provide the anticipated effluent quality of the constituents of potential concern during normal operations.</p> <p>Once Denison has refined the effluent quality predictions, Denison is expected to update the inputs into the surface water quality model.</p>	<p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the draft EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in the middle part of Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three." The derived effluent quality based on not exceeding a water and sediment quality guideline was only used for a handful of constituents. The ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. In addition, Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project. The effluent quality predictions provided in the EIS will continue to bound the assessment and provide a conservative representation of risk to human health and the environment. No changes to the EIS are proposed in this regard. See also responses to IR-16 and IR-18.</p>	<p>Revisions to the draft EIS and ERA (Appendix 10-A) will be made per the IR response as indicated below.</p> <p>Section 10.1.4.2.2 of the EIS and Section 3.1.1.2 of the ERA (Appendix 10-A) will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab results. The text in both sections will read "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium."</p>
IR-118	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.6.1, Section 8.4.6.1 and Section 8.5.6.1, Aquatic Environment	<p><b>Context:</b> It is unclear if Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. No information regarding the future centuries scenario has been provided in the rationale summary for ratings.</p> <p><b>Rationale:</b> Groundwater seepage of COPCs may have future impacts to surface water quality, sediment quality and aquatic receptors; however, the extent of residual effects is unclear without further information.</p>	Provide further information regarding how groundwater seep. of COPCs may have future impacts to surface water quality, sediment quality, and aquatic receptors, and any residual effects that may persist.	It can be confirmed that Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 did take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. Ground water contributions to surface water as a result of excursions or migration from the shallow groundwater aquifer to Whitefish Lake was well documented in Section 7 and Appendix 7-C. For the COPCs identified in the effluent, the predicted mass flux from groundwater into Whitefish Lake Middle starting 200 years after the Project phases, during the future centuries, was input to the IMPACT model to predict the water and sediment concentrations over time at the exposed locations. The COPCs in groundwater will be released to Whitefish Lake Middle at a predicted mass flux as shown in Table 3-4 (Appendix 7-C) The results of the predictive modelling were then used to support	No EIS updates are anticipated to address this IR.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
						the environmental risk assessment to assess potential impacts and risks to surface water, sediment and aquatic biota. The IMPACT model scenario for the future centuries was undertaken specifically to investigate the potential for groundwater migration to Whitefish Lake in future centuries to impact the aquatic environment of Whitefish Lake. For each medium or receptor (i.e., surface water, sediment or aquatic biota) no risk was identified during the future centuries period (Appendix 10-A). Additional information concerning potential impacts of groundwater interactions with Whitefish Lake are provided in IR-116.	
IR-119	CNSC	Fish and fish habitat	Section 8.3.1.2, Table 8.3-1, Sediment quality	<p><b>Context:</b> Sediment quality isn't considered a key indicator for fish and fish habitat, but the accumulation of contaminants in sediment porewater without habitat alteration is similar to the key indicator 'change in surface water quality from baseline conditions' that is considered.</p> <p><b>Rationale:</b> It is not clear whether sediment was just considered for physical disturbance, and why chemical changes are missing from key indicator list for fish and fish habitat.</p>	Please provide the rationale for exclusion of sediment quality from the key indicator list for fish and fish habitat.	<p>Sediment quality was not included as an indicator for the Fish and Fish Habitat VC, rather Sediment Quality and Benthic Invertebrates were elevated to VCs within the EIS (Section 8.4). In the draft EIS Section 8.4.1.1, Sediment Quality VC was identified as having interrelations or linkages to Benthic Invertebrates (VC) as their medium of support to life-cycles as well as the Fish and Fish Health VC. Specifically, the sediment that benthic invertebrates inhabit as the medium responsible for their ability to carry out their life processes. Benthic invertebrates provide an important forage base for fish species. Aquatic sediments and benthic invertebrates (food supply) are inferred as part of the definition of fish habitat under subsection 2(1) of the Fisheries Act, 1985 (Government of Canada 2019).</p> <p>Alterations to Sediment Quality in an aquatic environment can directly affect Fish and Fish Habitat and this was taken into consideration both with respect to physical and chemical changes. Under Section 8.4.1.2 and Table 8.4.1, key indicators and measurable parameters for sediment quality were provided and included:</p> <ul style="list-style-type: none"><li>- Sediment quantity and physical quality (particle size) from baseline conditions</li><li>- Change in sediment quality (chemical) from baseline concentrations</li></ul> <p>The results of the assessment of potential effects and significance of those effects for sediment quality as a VC are directly translatable to Fish and Fish Habitat as identified in Sections 8.3.1.1 and 8.4.1.1. As such, providing the same assessment within both sections is considered redundant.</p>	No EIS updates are anticipated to address this IR.
IR-120	CNSC	Aquatic species	Section 8.3.3 and 8.5, Aquatic Environment	<p><b>Context:</b> Although downstream impacts are not predicted by Denison it is important from an ecosystem perspective to establish baseline locations to monitor for potential cumulative effects to the aquatic environment due to the Key Lake and Wheeler River Operations to ensure the aquatic environment is being protected from cumulative impacts.</p> <p>Denison should consider adding a far-field exposure location and collecting baseline aquatic ecosystem baseline data in Russell Lake including:</p> <ul style="list-style-type: none"><li>• Water quality/chemistry</li><li>• Sediment chemistry/quality</li><li>• Benthic invertebrate chemistry /community</li><li>• Large-bodied fish tissue/chemistry</li></ul> <p><b>Rationale:</b> Russell Lake is identified as part of the RSA for the aquatic environment, but it appears that no detailed aquatic baseline data was completed in far-field location in Russell Lake. In addition, several Indigenous Nations and communities and local resource users have indicated that Russell Lake is an important body of water both culturally for traditional use and was once used as commercial fishery.</p>	<p>If Denison has not collected baseline aquatic studies in the far-field downstream receiving environment of Russell Lake, please provide a rationale for why.</p> <p>If a far-field Russell Lake location was sampled as part of baseline data collection, more information about the process and results with regards to sampling at Russell Lake should be included in the EIS. This information would be valuable to help determine potential cumulative effects downstream in the Russell Lake drainage system (due to the Key Lake Operation) which has been identified as a key concern and area of interest by several Indigenous Nations and communities.</p>	<p>Aquatic baseline surveys were conducted at two stations (LAB-1 and LAB-2) in Russell Lake and were considered 'far-field' stations in relation to the proposed mining plan for the Wheeler River Project. Data collection methods and results are presented in the draft EIS throughout the applicable subsections of <b>Section 8</b>.</p> <ul style="list-style-type: none"><li>• <b>Section 8.2</b> details the Surface Water Quality methods and results,</li><li>• <b>Sections 8.3</b> and <b>8.5</b> detail fish habitat, community, and health methods and results; and</li><li>• <b>Section 8.4</b> details sediment quality and benthic invertebrate community and chemistry methods and results.</li></ul> <p>A breakdown of where specific processes and results are located for each of these components is presented below:</p> <p><b><u>Surface Water Quality/Chemistry:</u></b> Surface Water Quality was sampled in Russell Lake. Methods and metrics are presented in <b>Section 8.2.3.1</b>. Water was sampled in Russell Lake and presented in <b>Table 8.2-2</b> (Pages 8-60 to 8-62) of <b>Section 8.2.3.3</b> of the EIS report, and summarized in <b>Table 8.2-4</b>. Surface Water predicted maximum Constituents of Potential Concern for the Russell Lake Inlet (LAB-1) are presented in <b>Table 8.2-13</b> of <b>Section 8.2.4.2.4</b>. Cumulative effects are also assessed in <b>Section 8.2.7</b>. Detailed baseline summary data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-3</b>.</p> <p><b><u>Sediment Quality/Chemistry:</u></b> Sediment was sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Sediment grain size results are summarized in <b>Table 8.4-2</b> in <b>Section 8.4.3.2.1</b>, and full data is presented in <b>Appendix 8-D, Table 3-4</b>. Sediment chemistry was summarized in <b>Table 8.4-3</b>, and full data is in <b>Appendix 8-D, Table 3-5</b>.</p> <p><b><u>Fish Habitat, Tissue Chemistry, and Community:</u></b> Russell lake is not clearly indicated in the initial list of sample areas presented in <b>Section 8.3.3</b> or <b>Section 8.5.3</b>; however, habitat information is presented in the Fish Habitat table (<b>Table 8.3-4</b>) of <b>Section 8.3.3.2</b>, and both Russell Lake sample locations (LAB-1 and LAB-2) and their associated fish community data are presented in the fish community map (<b>Figure 8.3-6</b>). Fish community and information is also presented in <b>Table 8.3-4</b>. Baseline fish community information is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-9</b>. Fish chemistry summary data (Mean, Max, Min) for Northern Pike and White Sucker bone and tissue samples is presented in <b>Table 8.5-2</b> of <b>Section 8.5.3</b> of the Draft EIS. Detailed fish tissue data summary is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-10</b>.</p> <p><b><u>Benthic Invertebrate Chemistry and Community:</u></b> Benthic invertebrates were sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Benthic invertebrate endpoints are summarized in <b>Table 8.4-4</b> of <b>Section 8.4.3.2.4</b>, and benthic invertebrate chemistry is summarized in <b>Table 8.4-5</b>. Detailed baseline benthic invertebrate community and chemistry data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-8</b>, and community data in <b>Tables 3-7A to 3-7D</b>.</p> <p>Also, refer to Cumulative Effects sections (Section 8.X.7) within each part of the Aquatic Environment assessment in the draft EIS for a discussion of potential cumulative effects in Russell Lake. (i.e., Section 8.2.7 for surface water quality; Section 8.3.7 for fish and fish habitat, 8.4.7 for sediment quality and benthic invertebrates, and 8.5.7 for fish health).</p>	No updates to the draft EIS are needed based on this IR response.
IR-121	CNSC	Fish and fish habitat	Section 8.3.3.1, Methodology and Metrics	<p><b>Context:</b> In the description of methodology for fish communities and spawning surveys, there's no mention that could be found for an any evaluation of fish condition, other than sexual condition.</p>	Please provide reference to where fish condition is considered or provide a justification for its exclusion.	Field work was conducted by aquatic biologists that are familiar with the identification of fish condition and abnormalities as it pertains to fish sampling protocols and the MDMER EEM guidance and protocols. As such, the lack of record of such gross abnormalities is reflective of fish populations of good condition. Any supplemental baseline surveys or future	No updates to the draft EIS are needed based on this IR response.

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				<b>Rationale:</b> Exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.		environmental effects monitoring will include documentation of fish condition and abnormalities.	
IR-122	CNSC	Fish and fish habitat	Section 8.3.8, Monitoring and Follow-up	<b>Context:</b> Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development."  <b>Rationale:</b> Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.	Please include reference lakes, and if it is provided, please reference where in the EIS these are discussed. If there are no reference lakes, these should be included in the monitoring program.	The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed prior to the commencement of ISR operations that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.	No updates to the draft EIS are needed based on this IR response.
IR-123	ECCC	Change to an environmental component due to radiological contaminants	Section 8.4.3.2.3, Aquatic Environment  Appendix 8-D, Table 3-5	<b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.  <b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.	1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.  2. Provide data on baseline concentrations of mercury in sediment.  3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.	1) Please see Attachment IR-123, Table 1, for a summary of baseline sediment concentrations and their respective screening criteria. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.  2) Mercury was not analyzed specific to sediments within the LSA during the initial baseline data collection period. Analysis of mercury at a low-level in sediment was not considered necessary for two reasons: 1. mercury is not associated with the uranium mining and milling process and 2. water quality sampling within the LSA indicated levels of mercury below detection at an acceptable level of detection (i.e., 0.00001 to 0.0000001 mg/L). Denison will collect background information pertaining to sediment total and methyl mercury from LSA lakes and streams prior to site development.  3) Please see Table 1 of Attachment IR-123 for a summary of baseline sediment concentrations and their respective screening criteria. One sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equaled to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria.  References:  Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.  Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.	No updates to the draft EIS are needed based on this IR response.
IR-124	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment	<b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated: <ol style="list-style-type: none"><li>COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</li><li>COPCs that exceed water quality guidelines in effluent, and,</li><li>COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</li></ol> <b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.	1. Provide the information on baseline exceedances of COPCs in sediment.  2. Provide an assessment of risk for any COPCs that have baseline exceedances of sediment quality thresholds in the receiving environment.  3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.	1) The information on the baseline exceedance of COPCs in sediment are provided as part of Attachment IR-123. The table indicates that only the maximum concentration of cadmium exceeded the CCME ISQG on one occasion when assessing all sediment samples over the course of baseline surveys in the LSA.  2) Only one sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6 within the RSA. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equals to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria. Cadmium was included as one of the constituents identified as a COPC under the non-radiological Ecological Risk Assessment (Appendix 10-A). No significant adverse effect on either aquatic or terrestrial populations or communities, as a result of releases from the Project, are predicted during the Project phases or during the future centuries. All estimated total HQs for all COPCs (arsenic, cadmium, chromium, cobalt, copper, molybdenum, selenium, uranium, zinc, chloride, and sulphate) for all ecological receptors are predicted to remain below the HQ benchmark of 1.  3) Denison has provided an analysis of the parameters that are identified under MDMER Schedule 4 and therefore have specified effluent discharge criteria. Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.	Changes suggested for Table 8.2-13 as consistent with IR-114.
IR-125	CNSC	Fish and fish habitat	Section 8.5, Aquatic Environment and Fish health	<b>Context:</b> Indigenous Knowledge studies and information collected in relation to the Project clearly identified the importance of water quality and fish health to local Indigenous peoples and is discussed throughout the Draft EIS. For example: <ul style="list-style-type: none"><li>“Russell is one lake where I commercially fish. How will this effluent impact the water quality, fish health? Will I be able to sell fish from here? If there is going to water” pollution, I just want to know” (19-LK-ERFNTrip-134.255) ”</li><li>“How are you going to protect the water quality? We are concerned about mercury in fish, other animals, etc. Is there mercury or arsenic in the uranium solution?” (p. 8-53)</li></ul>	One of the many mitigation measures mentioned throughout the aquatic environment section states:  “Denison will work with the associated communities to develop and implement the Project-specific monitoring programs and a framework to share the results for the purpose of assessing the performance of the water management system.” (p.10-32)  Has Denison considered the collection of additional baseline fish tissue species that are of importance to Indigenous Nations and communities and local cabin owners from	Fish tissue chemistry (bone and muscle) was collected for Northern Pike and White Sucker and presented in Table 8.5-2 of Section 8.5.3. Tissue was not collected for Walleye or Lake Whitefish, however, the tissue analysis of Northern Pike and White Sucker would be key indicators for the fish community in Russel Lake. Northern Pike is a piscivorous top predator much like Walleye, which would address concerns of bioaccumulation of mercury and other metals of concern. White Sucker is a generalist bottom feeding species that is often used to assess metal concentrations at a lower trophic level of the food chain. This information provides an initial baseline understanding of the tissue metal concentrations for the fish of Russell Lake.  The outcomes of the impact assessment demonstrated there will be no expected impact to Russell Lake with respect to water quality, sediment quality or fish and fish habitat. As	No updates to the draft EIS are needed based on this IR response.



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				<b>Rationale:</b> Several Indigenous Nations and communities and local resources users have indicated Russell Lake is an important body of water both culturally for traditional use and was used as commercial fishery in the past and from an aquatic ecosystem perspective.	Russell Lake? Assuming the species would be walleye (commercially and recreationally) and lake white whitefish that is traditionally an important species consumed.  Please provide more information on the engagement to date on the development of the Surface Water Management Program and Monitoring program that Denison is developing and engagement to date with interested Indigenous Nations and communities in the region on fish and fish health.	discussed in the response to IR-120 and this IR, historic information from Russell Lake is available, but may require supplementation prior to project development to monitor potential changes to the aquatic environment in the lake. Engagement on licensing requirements, such as the development of the environmental monitoring program and the associated surface water quality and monitoring regime will occur in later in 2023 and 2024.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on monitoring regimes, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.							
IR-126	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	Denison is aware of the ECCC Federal Environmental Quality Guideline for selenium in fish. The ECCC FEQG is for fish tissue egg-ovary and whole-body. Denison selected the US EPA guideline over the ECCC guideline since US EPA provides guidelines for fish tissue muscle as well. The fish assessed in the ERA were large-bodied fish including northern pike and white sucker. A fish tissue muscle TRV is appropriate for assessment of large-bodied fish; therefore, the US EPA selenium fish tissue muscle benchmark was preferred over the whole body value from ECCC.	No updates to the draft EIS are needed based on this IR response.						
IR-127	CNSC	Aquatic environment	Appendix 8-E, Section 1.2.1, Hydrological Inputs	<b>Context:</b> Within this section it states that the 7Q10 low flow rate used in the mixing assessment “was provided verbally to Ecometrix by NewFields Canada during a project meeting on 26 April 2022”  <b>Rationale:</b> The statement that this value was provided verbally is not an infallible method of communicating data, as the value could have been misheard, misremembered, or recorded improperly.	Please verify that the 7Q10 value used in the assessment is the correct value determined by NewFields.	The value used in the assessment (0.616 m³/s) is the correct value determined by NewFields. The value was calculated by NewFields as the inflow from SA-6 to Whitefish Lake and therefore considered representative of the flow in the northern basin of LA-5. This value will be specifically updated in Appendix 8-C (Table 3-3: 7Q10 Estimated Discharge) and Appendix 8-E (Section 1.2.1 to be changed to reference Appendix 8-C, Table 3-3) for clarity.	Appendix 8-C Table 3-3:7Q10 Estimated Discharge will be updated as shown below.  <b>TABLE 3-3: 7Q10 ESTIMATED DISCHARGE</b> <table><tr><th>Assessment Node</th><th>7Q10 Flow Rate (m³/s)</th></tr><tr><td>LA-1</td><td>0.874</td></tr><tr><td>LA-5</td><td>0.616</td></tr></table> <small>Note: m³/s = cubic meters per second</small>	Assessment Node	7Q10 Flow Rate (m³/s)	LA-1	0.874	LA-5	0.616
Assessment Node	7Q10 Flow Rate (m³/s)												
LA-1	0.874												
LA-5	0.616												
IR-128	CNSC	Current use of lands and resources for traditional purposes	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use Section 12 Section 14	<b>Context:</b> The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting with Indigenous Nations and communities and are presented in the EIS.  <b>Rationale:</b> The increased traffic and therefore dispersal of game (moose, woodland caribou) due to increased traffic has been raised as a concern with respect to increased mortality on wildlife and decreased ability to practice traditional rights.	How have the potential residual impacts with respect to increased traffic and noise (due to current and future operations) been communicated to Indigenous Nations and communities who use the road #914 for cultural and traditional activities (such as moose harvesting, berry picking and small game and birds)?  Please provide any additional information on the engagement that has taken place to date with Indigenous Nations and communities with respect to concerns and potential impacts on current use of lands and resources due to increased road traffic, and any mitigation measures proposed by Indigenous Nations and communities to minimize the potential impacts.	The potential residual impacts with respect to increased traffic and noise were communicated to ERFN and KML during engagment and through pre review of the EIS and have documented their regular use of the road. Proposed mitigation measures in relation to vehicle traffic were also communicated. Please see draft EIS, Section 4 record of consultation (ROC) 618, 619 and 620.  The findings in relation to the potential for residual impacts as a result of change in traffic will be shared again in future engagement activities, expected in late September and early October 2023. Any additional input will be integrated into the final EIS, as part of the commitment made under IR-28.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has collaborated with ERFN and KML to develop additional mitigation measures specific to these Communities. These include: 1) Assisting ERFN to provide clear highway identification for the location for the Mawdsley Reserve, where many cultural camp activities occur 2) The same is offered to KML; however, the current km 67 Culture Camp for KML was burned in the May 2023 forest fires, and so this will be executed in the future at such time as KML selects a new location. 3) The commitment by Denison to slow truck traffic down for a minimum of 2.5 km on either side of the culture camp(s) to 40 km/hr, during the months of September and October. 4) To communicate this new slowing protocol to Denison's contractors and other operators in the area, to inspire best practice for other operators in the area.	The EIS will be updated to reflect the additional mitigations to which Denison has committed, per the IR response. Specifically, the following will be added to the text of Section 11.1.5.3 and 12.3.5 within the context of traffic mitigation  <u>Traffic</u> <ul style="list-style-type: none"><li>Assist ERFN to provide clear highway identification for the location for the Mawdsley Reserve.</li><li>If requested, assist KML to provide clear highway identification at the km 67 Culture Camp or other selected location.</li><li>Require Denison truck traffic to slow to 40km/hr for a minimum of 2.5 km on either side of the culture camp(s), during the months of September and October.</li><li>Communicate the slowing protocol to Denison's contractors and other operators in the area, to encourage best practice for other operators in the area.</li></ul>						
IR-129	CNSC	Current use of lands and resources for traditional purposes	Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<b>Context:</b> ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).  Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)  <b>Rationale:</b> The <a href="#">Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012</a> notes: “The views of affected Aboriginal groups on mitigation be considered and included in the EIS. This could assist in ensuring that the environmental effects on the current use of land and resources for traditional purposes are at an acceptable level for the community.”  Sources for indirect moose mortality (e.g., increased hunter access, changes to health due to sensory disturbances, changes to predator-prey dynamics) may result in mortality outside the Wildlife LSA. The	Please provide additional information on the discussions Denison has had with Indigenous Nations and communities on how to mitigate any residual project impacts on their traditional harvesting activities of large game such as moose.  More information is required to determine if Denison has engaged directly with ERFN/KML and other Indigenous Nations who utilize the area to harvest moose to determine current baseline harvest numbers that provide subsistence, continued cultural identity and community well-being, as well as discussions on how the project could potentially impact moose populations and the harvesting of moose for traditional practices.	Potential project related changes to moose are detailed in Section 9 of the EIS, and include potential changes associated with vegetation removal and/or ground disturbance (i.e., loss of habitat), sensory disturbances, and vehicular collisions. Mitigations to minimize these potential effects include minimizing the extent of the Project area and associated disturbances to the extent practicable, standard mitigation measures to minimize air emissions, dust, light and noise, exclusion fencing around waste pads and ponds, and measure to minimize direct mortality through vehicular collisions through driver training and safety practices.  Baseline harvest information was shared by the Indigenous Communities of Interest through Indigenous and traditional knowledge studies which were considered by all discipline leads in the assessment process. Information on moose is specifically documented in: <ul style="list-style-type: none"><li>Wheeler River Project - Summary of Traditional Knowledge Study Results (ERFN and SVS 2022b)</li><li>English River First Nation Country Foods Study Final Report (CanNorth 2017a)</li><li>Land use and occupancy maps shared with Denison by the Kineepik Metis local</li><li>Kineepik Valued Ecosystem Components – KML Pre-statement for Denison (KML 2022)</li></ul> Although Denison understands these documents are not representative of the complete extent of Indigenous moose harvest, recorded harvests proximal to the Project are document	No updates to the draft EIS are needed based on this IR response.						



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				<p>residual effect of change in moose mortality is likely to occur. Although mitigation measures are expected to reduce, but not fully eliminate, the residual effect on moose.</p> <p>The potential residual impact on the moose and other large game populations in the broader regional study area may potentially impact Indigenous treaty rights, culture, and community well-being if the harvesting of moose and large game declines due to increased traffic, noise, and vehicle mortality or increased outside hunting pressure.</p>		<p>in Section 11.1.4.3.1 of the EIS, and further harvest in the local and regional study areas are noted in each. Moose is central to the traditional diets of these communities, and as noted in the English River First Nation Country Foods Study Final Report (CanNorth 2017) were the most commonly consumed species by ERFN citizens. Interest and concerns about the Project’s potential interactions with moose populations are also noted in the engagement record, for example the engagement record notes that, for ERFN, moose is a [hunting and food] mainstay and there is concern for how moose would be impacted.</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e., moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring programing, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.</p>	
JSIR-130	CNSC	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>	<p>Vibration is a sensory disturbance that may affect some species and is inherently accounted for in the effects assessment by way of consideration of the sensory disturbance buffers that are recognized as areas of altered habitat (i.e., zone of influence) that may not be used as a result of the Project.</p> <p>Consideration of Project-related vibrations are considered in the responses to IR-46 within the context of vibrations generated by Low Frequency Noise (LFN). Unlike a conventional mining operation, vibration derived from LFN by the proposed operation is not expected. By extension, vibration related sensory disturbance outside the sensory disturbance buffer for habitat alteration already considered in the assessment would not be expected. Nevertheless, in response to the IR, specific mention of vibration will be added in the EIS where sensory disturbance is defined to provide further context to the assessment.</p> <p>Reptiles were not identified as a VC as part of the initial community consultations when the VCs were selected, and their ranges do not typically extend into northern Saskatchewan, and therefore, were not included in the effects assessment. Also, the potential for occurrence of reptiles within the Project footprint is expected to be low.</p>	<p>In the final EIS, discussion of habitat alteration in Sections 9.3 and 9.4 will be updated to include consideration of vibrations.</p> <p>For example: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, <b>vibrations</b>, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA.”</p>
IR-131	CNSC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): <i>The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</i></p> <p>As per the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> pursuant to the Canadian Environmental Assessment Act, 2012: <i>“The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan”.</i></p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>	<p>Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.</p>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to the IR further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-132	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> ECCC has identified that three species at risk arthropods (yellow banded bumble bee, transverse lady beetle, and nine-spotted lady beetle) have ranges overlapping the Project area and these were not mentioned in the draft EIS.</p>	<p>1. Conduct an effects assessment for arthropod species at risk.</p> <p>2. Explain what mitigation measures will be used to minimize potential effects.</p>	<p>Consideration of the three arthropod species at risk are included in Attachment IR-131.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-133	ECCC		Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> There is potential for some species at risk (e.g., myotis species, barn or bank swallows, common nighthawk) to be attracted to and use mine infrastructure (buildings, roads etc.) once constructed for nesting, roosting, or foraging.</p> <p>Details on mitigation measures and adaptive management with respect to attraction to Project components should be identified to assess residual and cumulative impacts to species at risk.</p>	<p>For all Project phases, describe the mitigation measures and adaptive management to prevent and minimize effects on species at risk that may utilize mine infrastructure.</p>	<p>Specific exclusion measures will be added to the mitigation measures in Sections 9.3.5 and 9.4.5 of the EIS. These measures will be designed and appropriately applied to prevent or reduce access to Project infrastructure for roosting, nesting, and foraging, and are expected to address adverse Project-related effects on myotis species, barn and bank swallows, and common nighthawk.</p> <p>If bird nests (or tree cavities) should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>The results of mitigation measures implemented, and any associated wildlife observations will be considered in an adaptive management process to determine if/when/where additional mitigation measures may be required.</p>	<p>The below exclusion measures will be added to Sections 9.3.5.2.5 and 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>

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IR-134	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The draft EIS states in multiple places that vegetation clearing may occur year-round.</p> <p>In order to correspond with the timing of emergence from hibernation, tree clearing should not be conducted during the bat roosting period. If maternity roost trees are removed after pregnant females have established a roost area, there is a higher likelihood of abortion than there would be otherwise.</p> <p>Species-specific mitigations are required to protect bat SAR.</p>	Provide important roosting dates for bat species at risk in the Project area.	<p>Maternity roosts are used by pregnant females in late spring (April/May) either alone or in small groups. Females and their offspring roost in groups in nursery colonies in late summer/early fall prior to hibernation. Denison will adjust the activity timing windows to include the April/May maternity roosting period and the July/August nursery roosting period, to the extent practicable. Pre-construction surveys will identify all sensitive wildlife habitat features, including potential roosting trees (e.g., hollow trees, trees with defects, trees with cavities, and tree stumps). Should potential roosting trees be detected, consultations with the regulators will be initiated, and appropriate mitigation measures will be designed and implemented.</p> <p>This information above is provided in Attachment IR-131. This new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS.</p>	A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-135	ECCC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The mitigation measures for birds and wildlife presented in the draft EIS are very general. Additional detail is required for a complete assessment of residual and cumulative Project effects to birds and wildlife.</p> <p>The Proponent has committed to providing a number of plans including, a Decommissioning Plan, a Spill Response Plan, a Waste Management Plan, a Surface Water Monitoring Plan, a Remediation and Closure Plan, a Radiation Protection Plan, a Soil and Vegetation Monitoring Plan, a Wildlife Monitoring Plan, and a Woodland Caribou Management Plan. In order to assess potential affects to migratory birds and wildlife from Project related activities, ECCC requires details on species-specific mitigation measures, and monitoring plans.</p>	<p>The following information should be included in the various plans and should be provided for review during the environmental assessment:</p> <ol style="list-style-type: none"> <li>For all Project phases, describe the species-specific mitigation measures and responses to prevent and minimize effects on migratory birds or species at risk (SAR) birds and mammals that may utilize mine infrastructure.</li> <li>Explain how light pollution will be managed and what specific mitigation measures will be used to minimize effects to migratory birds and SAR birds and mammals.</li> <li>Provide details on what methods will be used for erosion control and how they will prevent sediment from entering waters frequented by migratory birds or SAR. Explain what actions will be taken if the erosion control measures are not successful.</li> <li>Provide details on noise and other sensory disturbance monitoring and mitigations if noise levels surpass thresholds.</li> <li>Describe time windows and species- specific mitigations related to maintenance activities such as vegetation management, road or building repair and stream crossing replacements.</li> </ol>	<p>As noted in the draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through a sequential EA and licensing process. The IR refers to “plans” and that these plans should be provided in the environmental assessment for review. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed to, it is Denison’s opinion that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response to the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed and provided during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes that this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p> <ol style="list-style-type: none"> <li>The mitigation measures referenced to in Part 1 of the IR are considered in the response to IR-133 and the reviewer is referred there for additional information. Specific exclusion measures will be added to Sections 9.3.5 and 9.4.5 to prevent or reduce access to Project infrastructure, as noted in the response to IR-133 (and in the adjacent column).</li> <li>Means to manage light pollution and specific mitigation measures to minimize the potential for adverse effects on migratory birds and SAR birds and mammals will be added to Section 9.4.5.2.5 of the EIS as noted in the adjacent column.</li> <li>Erosion control measures have been identified in Section 8, Aquatic Environment, of the draft EIS. These same proven mitigation measures will be effective at mitigating adverse effects on waters frequented by migratory birds or SAR. For completeness, the erosion control measures from Section 8, Aquatic Environment, of the draft EIS will be added to Sections 9.3.5 and 9.4.5 of the draft EIS, as highlighted in the adjacent column.</li> <li>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the draft EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat, and include the following: <ul style="list-style-type: none"> <li>not using the concrete batching plant and crusher during nighttime hours, where possible;</li> <li>locating the concrete batching operation as far away from sensitive wildlife features as possible;</li> <li>directing the generator discharge openings away from sensitive features;</li> <li>making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings); and</li> <li>collecting sound level measurements from the identified sources once they are operating and determining whether the actual effect is lower than that which was modelled.</li> </ul> </li> </ol> <p>Regarding monitoring, as outlined in Section 6.2.8 of the draft EIS, an EMS will be implemented and include noise monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines. Sound levels will be monitored on a continuous basis using calibrated Class 1 sound level meters and data loggers, calibrated to a National Institute of Standards and Technology traceable standard within one year of its use in the program, and field calibrated using a Class 1 acoustic calibrator. Where possible, the sound level meters will utilize the same monitoring locations as were used in the baseline program to allow direct comparison and may be expanded to include the location of the nearest sensitive receptor where access is granted. Should monitoring show noise levels surpass modelled sound levels, Denison will implement corrective action to identify noise sources and reduce sound levels. Details of noise monitoring and an adaptive management process for the Project will be developed to support Project permitting and licensing.</p> <p>5. Information related to timing windows and species as it concerns Project activities has been provided in response to IR-134. As noted in the response to IR-134, Denison will schedule Project activity timing windows to appropriately consider all Valued Components and SAR requirements/sensitivities. For reference, additional information that will be added to the final EIS is described in the response to IR-134.</p>	<p>EIS updates in response to IR-135, part 1 are outlined in EIS Updates for IR-133.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 2 as follows:</p> <p>Proposed mitigation measures related to light pollution will be added to Section 9.4.5.2.5. This includes using low lighting and/or task lighting (e.g., downturned shaded fixtures to prevent sky-lighting or bird disorientation), putting building lighting on sensors or timers, and potentially using a higher lumen/watt ratio on all new buildings or building expansions.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 3 as follows:</p> <p>Erosion control measures that are designed to prevent sediment from entering waters frequented by migratory birds or SAR include (but not limited to) the installation of silt fence, straw wattles, and/or erosion control blankets to prevent erosion and limit sediment transport. Additionally, vegetated barriers will be maintained between Project components and wetland features, as much as practical. Further information on erosion and sediment control measures will be provided in the applicable management plans which will be developed to support Project permitting and licensing. Routine inspections and management would be completed to document the effectiveness of the erosion control measures, and any required /replacement of these structures would be completed as required.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 4 as follows:</p> <p>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat.</p> <p>The proposed monitoring related to noise and sensory disturbance outlines in Section 6.2.8 of the EIS are considered to be adequate and appropriate to monitor changes in sound levels.</p> <p>EIS updates in response to IR-135, part 5 are outlined in EIS Updates for IR-134.</p>
IR-136	CNSC	Soil Salvage Monitoring	Section 9.1.8.2	<p><b>Context:</b> The proponent plans to salvage and stockpile soil and organic matter/peat in order to use it in reclamation activities during decommissioning. Periodic monitoring of the stockpiles is proposed to be conducted to verify that soil and organic matter/peat are delineated, stripped, handled, and stockpiled as recommended, and to evaluate the stability of salvaged soil, e.g., in relation to potential erosion and/or degradation. It is unclear whether monitoring includes soil quality in terms of concentrations of COPCs.</p>	Please clarify if COPC concentrations monitoring is planned to be performed for stockpiled soil and organic matter/peat.	Per the Residual Effects Characterization: "Predicted changes in concentrations of COPCs (i.e., soil quality) associated with open-source dust, process-source dust and process emissions are expected to be within acceptable health and safety guidelines; no threshold exceedances are predicted." Monitoring of COPCs in soil stockpiles during the life of the Project is not presently being considered, but the need for such monitoring could be revisited within the context of monitoring of sources that could contribute to COPCs to stockpiled soil and organic matter/peat. For example, if source monitoring data exceed predictions	No updates to the draft EIS are needed based on this IR response.



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				<p><b>Rationale:</b> It is expected that project-related activities (road and airport traffic, drilling) can result in open-source (i.e., fugitive) dust and process-source dust (incl. radionuclides), which can accumulate and result in changes in soil quality of the stockpiled soil and organic matter/peat as described in Sections 9.1.4.2.2 and 9.1.4.2.3).</p>		<p>presented in the EA that may provide rationale for sampling and analysis of COCPs in stockpiled materials.</p> <p>A soil salvage monitoring program/protocol (or equivalent) is expected to verify soil salvage volumes and reclamation suitability. Denison is proposing to support reclamation trials/research at the Project to inform and refine the revegetation strategy. It is understood that reclamation trials/research will include investigations into soil conditions, preparation techniques and amendment strategies (to the standard of the day). These ancillary investigations may include analysis of COCPs, although this is not expected at this time, but as highlighted above would be considered as may be warranted.</p>	
IR-137	ECCC	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA:</u> The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects. For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p> <p><u>RSA:</u> The Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul>	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"><li>• Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>• Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>• Re-do the assessment with the RSA at the scale of the range</li></ul> <p>See also related IRs: IR-154 and IR-156.</p>	<p>The Project Area was delineated to capture all direct, and most indirect, likely adverse effects on caribou; as this is the zone of influence most likely to affect caribou in the vicinity of the Project (i.e., in the vicinity of human activity, equipment use and vehicle use). The Project Area (169.6 ha) is the direct footprint of proposed Project infrastructure (74.8 ha) with a buffer applied, thereby representing the area of maximum physical disturbance. The Project Area is not VC-specific, but consistent throughout the EIS.</p> <p>The Wildlife LSA was designed to capture the majority of the Project effects. The LSA extends beyond Project Area of the site to include a reasonable estimation of where sensory disturbance from Project-related activities would extend and where effects on wildlife including caribou are most likely to occur. That is the primary rationale for selection of the spatial extent of the LSA – Denison believes this is an appropriate spatial scale that applies broadly to the wildlife VCs as a whole given the perceived mechanism of VC-Project interaction.</p> <p>Importantly, as noted in draft EIS Section 9.3.6.4, in the caribou assessment, the Project Area had a 500 m buffer applied to account for indirect effects/habitat alteration; this area is within the wildlife LSA (refer to Figure 9.3-14 for a map showing the spatial areas). The 500 m buffer for habitat alteration for caribou was selected in accordance with ECCC’s (2020) assessment of disturbed areas, which buffered (500 m) anthropogenic disturbances to evaluate woodland caribou habitat. The alteration of available woodland caribou habitat is quantified in this EIS by applying a buffer of 500 m around the Project Area in which Project effects in the form of sensory disturbance are likely to affect available woodland caribou habitat and make it functionally unavailable for use.</p> <p>Boreal caribou occur as one continuous population across the SK1 range, including within the Terrestrial RSA. It was decided to not use the entire SK1 range as an assessment area (e.g., due to the dilution factor) and instead use the Terrestrial RSA to appropriately and adequately assess residual and cumulative effects in proportion to the Project. It was deemed to be not feasible to use a large area like the SK1 range to assess residual Project effects because this would provide inappropriate context or "dilute" the adverse effects of the Project on the caribou that have a home range that overlaps with the RSA.</p> <p>The cumulative effect assessment of the draft EIS compares the Project-specific habitat effects (i.e., the Project Area plus a 500 m buffer to account for sensory disturbance) at the scale of the SK1 range (as the applicable management unit for portion of the woodland caribou population that uses the Terrestrial RSA). The result showed that the Project is expected to add 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (Section 9.3.7.3.3 of the EIS).</p> <p>References: Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p>	No updates to the draft EIS are needed based on this IR response.

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				<p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada.</p> <p><b>Reference:</b> [1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011).</p>			
IR-138	CNSC	COPC in Lichen	Section 9.2.4.2.2  Appendix 10-A (ERA)	<p><b>Context:</b> A quantitative assessment using modelling dispersion and uptake of COPCs in the environment was completed for the Project as part of the ERA, to support conclusions drawn in the EIS. In Appendix 10-A (ERA), COPCs in plant tissue was estimated for lichen. Table 5-5 of the ERA (p. 5.24) named “Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model” lists the exposure pathway for lichen as direct contact on soil.</p> <p><b>Rationale:</b> Airborne COPC can deposition on lichen and subsequently enter the food chain; therefore, the “contact with air” pathway should be considered. In fact, lichen species are frequently used to monitor the deposition and accumulation of airborne contaminants (e.g., dust, metals). It is also noted that based on sampling results of the 2017 baseline studies, lichen frequently contain higher concentrations of COPC than blueberry (compare Table 9.2-6 and Table 9.2-7 in the EIS), especially at sampling sites with elevated concentrations (e.g., RSV9 and RSV10).</p>	<p>Please include the exposure pathway of direct deposition (dry and wet) of airborne contaminants on lichen in the quantitative ERA, or justify why this exposure pathway was not considered.</p> <p>See also related: IR-189.</p>	<p>Denison agrees that the air to lichen pathway is the primary exposure route for lichen. The ERA (Appendix 10-A) modelled the deposition of air to lichen as an exposure pathway and considered the uptake from soil to lichen as negligible. This will be clarified in Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model. In the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>	<p>Minor change. In Table 5-5 of Appendix 10-A, the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>
IR-139	ECCC	Change to an environmental component due to hazardous contaminants	Section 9.2.5.2.7, Waste and Hazardous Materials Management	<p><b>Context:</b> In this section, the Proponent outlines various measures to mitigate air emissions, including implementation of the air quality programs within the Environmental Management System, regular maintenance and inspection of equipment, and elimination of unnecessary idling of equipment. However, the intention to use industry-standard emission control systems has not been substantiated.</p> <p><b>Rationale:</b> For the protection of air quality, it is important to specify the emission standards that equipment will have (e.g., Tier 3 or Tier 4 engines). Vehicles and equipment with Tier 4 engines have much lower emissions of contaminants than those with Tier 3 engines. If non-Tier 4 engines are used, ECCC recommends that best management practices are followed, including proper maintenance of the engine and anti-idling measures.</p>	<p>Confirm if vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>Denison confirms that vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-140	CNSC	Change in the Areal Extent of Wetlands	Section 9.2.6.4	<p><b>Context:</b> Predicted residual effects on the areal extent of wetlands include the direct effect of loss of wetlands and several indirect effects of alteration of wetlands. As stated in the EIS, wetlands can exhibit low resilience and high susceptibility to disturbance. At the same time, wetlands tend to support a high species diversity, and are considered to have a moderate to high potential to support listed plant species. Lastly, wetlands are rare on the landscape compared to terrestrial ecosites (see Table 9.2-5).</p> <p><b>Rationale:</b> Several wetland ecosites (BS19/24, BS25, BS27) occur only in small areas (&lt; 30 ha) in the RSA but are predicted to experience disturbance of 6-64%, most notably the ecosite BS19/24 where 0.8 of 1.2 ha are predicted to be disturbed. It is noted that wetlands are scattered throughout the landscape as shown in Figure 9.2-8. More information is requested regarding the ecological impact of this disturbance.</p>	<p>1. Please provide a discussion on the ecological impact of disturbance to rare wetland ecosites.</p> <p>2. Please provide information on whether adequate other habitat is available for species impacted in these disturbed sites in close proximity, taking into account the home ranges of susceptible species.</p> <p>3. Please provide additional information on whether wetland connectivity is maintained through the landscape within the LSA/RSA.</p> <p>See also related: IR-141.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison conduct monitoring of species present in wetlands before and after disturbance, with a focus on listed plant species.</p>	<p>1. As described in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not a unique ecosystem and is instead an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. No direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (further described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No listed plant species have historically been observed to be associated with ecosites BS19/24 (graminoid bog/fen), BS25 (open fen), or BS27 (sedge rocky shore). As described in Table 2.4.4 of Appendix 9-B of the EIS, populations of the listed plant Alaskan clubmoss were observed to be associated with open Jack pine stands and transitional areas between upland and wetland/riparian areas. As stated in Section 2.2.2 of Appendix 9-B of the EIS the listed plants angle-leaved sundew and neat spike-rush were not observed in ecosites BS19/24, BS25 or BS27 either (see also the response to IR-175). With regard to wildlife, ecosites BS19/24, BS25, and BS27 are not limiting habitats for ungulates, furbearers, woodland caribou, raptors, or migratory breeding birds (as described in Sections 9.3 and 9.4 of the EIS) in the Terrestrial RSA. In fact, these ecosites were observed to exhibit low species richness and species diversity for breeding and migratory songbirds (Section 9.4.3.2.3). For bird species at risk, ecosites BS19/24 and BS25 are considered to provide suitable habitat for Short-eared Owl, Yellow Rail, and Rusty Blackbird; however, these ecosites are not anticipated to be limiting. Up to 2.9% of available Short-eared Owl habitat and up to 2.4% of Yellow Rail and Rusty</p>	<p>1. Section 9.2.6.4.1 will be updated to include the following: As noted in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not considered a unique ecosystem and is instead an artifact of mapping uncertainty, as it was not possible to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas during the wetland mapping process due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. However, no direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance associated with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to</p>



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						<p>Blackbird habitat within the Terrestrial RSA may be altered or lost as a result of the Project during all Project phases (Section 9.4.6.4.1).</p> <p>3. Surface drainage continuity and hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity. This post-construction surface water management monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change.</p>	<p>cause an adverse effect, and thus maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No updates to EIS required.</p> <p>3. Section 9.2.5.2.3 will be updated to include the following: Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction surface monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. The monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity.</p>
IR-141	ECCC	Wetlands	Section 9.2.6.4.1	<p><b>Context and Rationale:</b> The Proponent states that: “Direct loss of wetlands has been mitigated by reducing the size of the Project Area to the extent practicable during Project design.</p> <p>However, up to 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA are anticipated to be removed from the Project Area during Construction (Table 9.2-16).”</p> <p>Information is not provided on whether wetlands in the terrestrial RSA are considered ecologically, economically or socially important to the region. Information on the regional importance of the wetlands that will be lost is needed in order to assess effects, including a wetland compensation plan if the wetlands are considered regionally important.</p>	<p>1. Provide information that accounts for whether wetlands are considered ecologically, economically and socially important to the region.</p> <p>2. If the above is affirmative provide a wetland compensation plan to offset the loss. Consistent with the Operational Framework For Use of Conservation Allowance [1] a minimum ratio of 2:1 should be the starting point when determining the amount to be offset.</p> <p>[1] Available at : <a href="https://publications.gc.ca/site/eng/9.696852/publication.html">https://publications.gc.ca/site/eng/9.696852/publication.html</a></p> <p>See also related: IR-138.</p>	<p>During engagement activities, no specific comments or concerns were raised that would suggest wetlands near the Project are considered to be particularly ecologically, economically, and socially important to the region. Drainage in the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion is very weakly developed, and with numerous poorly drained wetland areas in lower landscape positions (Acton et al. 1998). This pattern is reflected in the Terrestrial RSA, where wetlands and water bodies are commonly scattered, comprising 16.6% of all mapped ecosystems (Section 9.2.3.3; Figure 9.2-8 of the draft EIS). Wetlands in this region provide ecological, economic, and social functions and values, and Denison has appropriately considered this during Project planning (i.e., avoidance to the extent practical). The Project Area has been reduced to the extent practicable, and the Project footprint has been sited to avoid wetlands to the extent feasible (Figure 9.2-8). Where wetland avoidance was not feasible, mitigation measures have been designed to reduce disturbance and maintain surface water connectivity (Section 9.2.5; see also response to IR-140 and IR-101). A small area of direct wetland disturbance is anticipated (0.5 ha; less than 0.1% of all wetlands within the Terrestrial RSA), predominantly associated with access road development. This area includes 0.4 ha of BS17 (black spruce treed bog), &lt;0.1 ha of BS18 (Labrador tea shrubby bog), and &lt;0.1 ha of BS23 (willow shrubby rich fen). These areas of direct wetland disturbance are small and located adjacent to existing access routes, and mitigation measures to maintain surface water connectivity across access roads will be implemented and monitored (see response to IR-140). The re-establishment of appropriate hydrologic conditions during Decommissioning is expected to lead to the re-establishment of wetland ecosystems within these directly disturbed areas. As such, it is Denison's opinion that a wetland compensation plan is not warranted.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-142	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.3.2.1 Scientific Literature Review – Wolverine Section 9.3.5 Mitigation Measures Section 9.3.6 Residual Effects Evaluation	<p><b>Context:</b> The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens.</p> <p>In Section 9.3.3.2.1, the Proponent states: “Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success. ”</p> <p>In Section 9.3.6, the Proponent states: “In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction.”</p> <p>The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost</p>	<p>1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges.</p> <p>2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project.</p> <p>3. Assess the need for pre- construction/pre-clearing surveys to identify any wolverine denning sites.</p> <p>4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.</p>	<p>1. While wolverine were not observed during baseline studies for the Project, it is assumed that the Project (Project Area, LSA) may overlap with wolverine home ranges. As described in the EIS, wolverine occur in low densities across all forest stand and vegetation types but are generally absent from areas of human development and activities.</p> <p>2. No wolverine dens were identified during any of the baseline studies. It is not anticipated that wolverine denning sites will be lost and/or altered because there are no specific landscape features typically used by wolverine as potential denning sites located in the Project footprint. Further, much of the proposed Project footprint will be developed within previously disturbed areas, including roads and cutlines.</p> <p>3. Pre-construction surveys will be completed to identify all sensitive wildlife habitat features, including wolverine denning sites.</p> <p>4. Most of the Project footprint is already disturbed through previous exploration activities. The total expected direct habitat loss of 169.6 ha includes the already disturbed areas. In the Terrestrial RSA, 8.2% of available wolverine habitat may be altered or lost; this includes 0.5% that will be cleared within the Project Area during Construction, and an additional 7.7% that may be altered through indirect effects (sensory disturbance). The magnitude of this effect was characterized as being "moderate" and the residual effect is not expected to result in a</p>	<p>1. No updates to the draft EIS are needed based on this IR response.</p> <p>2. No updates to the draft EIS are needed based on this IR response.</p> <p>3. Section 9.3.5.2.4 Work Timing Windows (third bullet will be updated to include): Pre-construction wildlife clearance surveys will be conducted within the Project Area in accordance with a wildlife monitoring plan and the draft Caribou Mitigation Plan. This would include surveying for important wildlife features that would include wolverine den sites.</p> <p>4. No updates to the draft EIS are needed based on this IR response.</p>

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				(Table 9.3-20).  <b>Rationale:</b> As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens.  Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features.		change that will alter wolverine habitat integrity to the point where it would not be able to sustain the regional populations of wolverine. This considers that no wolverine were observed during the baseline investigations, the small Project footprint, and the typically large size of a wolverine home range.	
IR-143	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.  Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.	Provide details on the baseline caribou data including: <ul style="list-style-type: none"><li>Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>Description of seasonal use of the LSA, RSA and caribou range.</li><li>Description of Project areas used by caribou.</li><li>Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul> Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).  See also related: IR-152.	The baseline data collection program was not specifically designed to collect seasonal caribou habitat use but to document caribou presence in the Project Area, Wildlife LSA and Terrestrial RSA. Based on this information, the EIS assumed caribou to be present in the study areas throughout all seasons and life stages. It should be noted that discrete calving areas have not been documented for the SK1 range. As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from IK was included in the EIS, including potential calving areas in the Terrestrial RSA.  Additional wildlife camera data have been obtained and analyzed to further describe seasonal use of the Project study areas. Updated Figure 9.3-8 (included in Attachment IR-143) provides the caribou sightings from baseline studies and updated to reflect seasonality of all sightings, where such data are available. There is insufficient information to provide further explanation on how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering)); however, the EA appropriately addressed direct and indirect effects on caribou and their habitat.  Denison’s intent is to develop the specific details related to environmental monitoring in general, and Caribou specifically, as part of licensing. A conceptual framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section (see Section 9.3.9 for terrestrial wildlife). Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.  At this time no aerial surveys are planned. Denison approached the Province with proposals for aerial surveying for the purpose of the baseline program in 2016/2017 but the Province would not provide Denison with permits for aerial surveys. Based on recent discussion with the Province this position has not changed, nor is it Denison’s understanding that it is likely to.	Applicable sections of Section 9.3.3.3 will be updated in the final EIS to include a description of seasonal use of the RSA. This would include:  Wildlife Camera Study Wildlife camera locations were spread across three categories of linear features in mature and regenerating forest types: road (a maintained or seasonally accessible road supporting traffic), trail/rough road (a cleared disturbance over 2 m in width), and hand-cut line (a cleared disturbance under 2 m in width) (Appendix 9-B). Trails/rough roads and roads had the highest frequency of wildlife detection, with woodland caribou being the second most commonly photographed species (after snowshoe hare).  Of the 34 caribou observations that were recorded, most were documented in the winter, with one observation from the spring and one in the summer. Seven data points had no date associated with the observations. Of the winter observations that were documented, seven occurrences were located in the northern portion of the RSA and the remainder located in the eastern portion of the RSA (Figure 9.3-8).  Figure 9.3-8 included in Attachment IR-143 has been updated to include additional camera data on caribou presence and seasonal use and will replace Figure 9.3-8 in the draft EIS  The Conceptual Caribou Mitigation Plan is included with the IR response package (Attachment IR-149). This Plan includes description of ongoing studies to assess linear feature use by caribou and will be included in the final EIS as new Appendix 9-E.
IR-144	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i>  <i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i>	Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.	Refer to the Attachment IR-143 for the updated version of Figure 9.3-8.  Denison acquired data from the Province of Saskatchewan which has been included in Attachment IR-145. As shown in the figure, the data is not available in a format that can be imported for analysis and incorporated into a spatial map. The data does not specify seasonality of the observations. Regardless, this data relates to the information provided by McLoughlin (2019 and 2021) and confirms caribou have been previously documented within the RSA, particularly in the eastern portion.  References:  McLoughlin, P. D. 2021. Associate Professor, University of Saskatchewan, Saskatoon, SK. Personal Communication. January 2021.  McLoughlin, P. D., C. Superbie, K. Stewart, P. Tomchuk, B. Neufeld, D. Barks, T. Perry, R. Greuel, C. Regan, A. Truchon-Savard, S. Hart, J. Henkelman, and J. F. Johnstone. 2019. Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. Final Report. Department of Biology, University of Saskatchewan, Saskatoon. 238 pp.	No updates to the draft EIS are needed based on this IR response.
IR-145	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Woodland Caribou	<b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).  The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.	1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada: <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul>	Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and	The map included in Attachment IR-145 along with supporting text will be added to Section 9.3.3.3 of the final EIS.



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				<p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>	<p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.</p>	<p>species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>The EIS uses "available caribou habitat" as a basis to assess the Project effects. Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.</p> <p>Subsequent to filing of the draft EIS and as committed to ECCC during an April 20, 2023 meeting between Denison and ECCC, Figure 9.3-8 has been updated (included in Attachment IR-143) to address seasonal use by caribou within the terrestrial study areas.</p> <p>In May 2023, Denison received caribou data from the Province of Saskatchewan that included both incidental observations and telemetry point data within the terrestrial study areas. These data were provided to Denison as a figure, and this figure has been included herein as Attachment IR-145. The information made available to Denison by the Province was not broken down to reflect the timing (seasonality) of the reported data and therefore does not specifically contribute to the description of seasonal use of the Project study areas by caribou.</p> <p>For reference, and based on the data that have been made available, the conservative assessment approach utilized in the draft EIS of assuming caribou presence in the terrestrial study areas throughout all seasons will not be changed.</p>	
IR-146	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3.1, Woodland Caribou, Scientific Literature Review - Predation	<p><b>Context and Rationale:</b> The information on impacts of predation and apparent competition for caribou in relation to the proposed Project are insufficient.</p> <p>In the section on caribou predators (9.3.3.3.1), the Proponent provided details on densities of wolves and their overlap with caribou and speaks of apparent competition. The Proponent did not examine other predators, such as black bear.</p> <p>The analysis on impacts of predation and apparent competition is insufficient since known predators have been omitted without explanation from the assessment of effects. ECCC is not able to verify the Proponent’s effects assessment since important species have not been considered in the assessment.</p>	<p>Provide further information and analyses on all potential predators of caribou, including impacts from apparent competition.</p>	<p>Effects from predation as a factor contributing to indirect mortality are discussed and qualitatively assessed in the EIS. Section 9.3.3.3 describes current knowledge of caribou mortality in or around the Project study areas (i.e., the existing studies describe wolf predation and hunting). It is acknowledged that black bear may also prey on caribou; however, this would be expected to follow the same effect pathways and is included in the qualitative indirect mortality assessment. Effects of apparent competition are included in the EIS and are part of the qualitative indirect mortality assessment.</p>	<p>In the final EIS, 9.3.3.3.1 Scientific Literature Review Denison will replace Predation section with the following:</p> <p>Predation McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season; however, mortality could not be confirmed for most of the caribou, with only the fate of 1 of 94 collared caribou confirmed in the four years of the study (which had been harvested by a hunter).</p> <p>Relatively low predator (e.g., wolf and black bear) densities in their study area were documented by McLoughlin et al. (2019), with other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>). While the effect on adult caribou survival by black bear is anticipated to be marginal compared to that by wolves, they may still be a predator of caribou calves and potentially a limiting factor to recruitment (McLoughlin et al. 2019).</p> <p>McLoughlin et al. 2019 noted that there was spatial separation between caribou and wolves as well as black bear, although this was found to be variable amongst individuals. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected</p>

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							<p>for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Black bears also used mixed-wood forests but particularly in the summer and fall they selected for jack pine stands &lt;40 years. (McLoughlin et al. 2019).</p> <p>While predation is believed to be the limiting factor for woodland caribou, Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.</p>
IR-147	ECCC	SAR - Boreal Caribou	<p>Section 9.3.4.2.1, Alteration and/or Loss of Habitat</p> <p>In Section 9.3.4.2.1 the Proponent states that: “Following decommissioning and reclamation, wildlife habitat is expected to recover to baseline conditions.”</p> <p>A more thorough explanation regarding post-decommissioning landscape is required to assess Project impacts.</p>	<p><b>Context and Rationale:</b> The process of in-situ recovery mining will likely create changes to the surface topography and potential ground subsidence as well as changes to groundwater elevations. These changes can affect the plant communities and ecosite types.</p>	<p>1. Provide further rationale and/or analysis regarding the return of wildlife habitat to baseline conditions post-decommissioning. Incorporate other environmental impacts including:</p> <ul style="list-style-type: none"><li>Ground subsidence and impacts on wildlife habitat</li><li>Changes to aquifers and impacts on wildlife habitat</li></ul> <p>2. Describe reclamation activities/measures, including temporal information that will be implemented to help in the recovery to baseline conditions.</p>	<p>1. The risk of ground subsidence has been assessed as part of the draft EIS (see Appendix K to Appendix 7-C). Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21). Overall, the analysis shows there is negligible risk of subsidence and the magnitude of subsidence, if it were to occur, is in the range of millimeters at surface. Further, this potential subsidence would be limited to the footprint directly above the deposit.</p> <p>In consideration of the above, with specific reference to the expected level of ground subsidence, no effects on wildlife habitat nor aquifers that support wildlife habitat are expected. Moreover, Denison does not foresee that ground subsidence would be a risk to the success of wildlife habitat restoration / reclamation during Post-Decommissioning, within the context (potential for adverse effects on wildlife habitat and/or changes to aquifers that may adversely affect wildlife habitat) raised by the IR.</p> <p>As outlined in Section 2.3.3 of the draft EIS, as part of the Conceptual Decommissioning Plan (CDP), reclamation activities, including replanting, will take place once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled. Notwithstanding the execution of major decommissioning activities, Denison will look for opportunities to proactively reclaim inactive areas of the Project site as is possible in a timely manner and without delay. Progressive reclamation is considered in more detail below.</p> <p>Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on the results of these discussions, roads associated with the Project site that are no longer needed will be graded and scarified to promote natural revegetation. Access roads or trails required for post-closure monitoring or deemed useful by Interested Parties may be left to facilitate continued access. Access to the site may be restricted by gates and/or berms for safety. Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during reclamation. Lessons learned from progressive decommissioning and any site-specific reclamation studies will be incorporated into the detailed reclamation design. Additionally, information from other northern Saskatchewan mine sites will be examined to help Denison select the reclamation tools, including revegetation options, that will contribute towards decommissioning success.</p> <p>2. Specific details concerning reclamation activities / measures, including detailed temporal information for restoration will be developed as part of future updates to the decommissioning plan. The CDP included in the draft EIS contains information related to site restoration; see also the Conceptual Caribou Mitigation Plan provided in Attachment IR-149. The CDP contains the appropriate level of detail for this stage of the Project. Briefly, the three main physical decommissioning activities include:</p> <ul style="list-style-type: none"><li>mining area remediation;</li><li>asset removal; and</li><li>decontamination, demolition, and disposal.</li></ul> <p>Physical decommissioning activities are followed by reclamation. The expected duration for decommissioning is 5 years (from year 18 to 23 of the Project).</p> <p>Importantly, during physical decommissioning, the majority of Project components are scheduled to be removed from site which is expected to facilitate reclamation activities. Also, because of the selected mining method, there are no large site aspects, such as waste rock</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>

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						<p>piles or tailings management facilities, for which large scale and potentially complex reclamation strategies are needed.</p> <p>Denison has committed to progressively reclaim areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Reclamation of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed annually. Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native vegetation species and in accordance with the Reclamation and Closure Plan.</p> <p>As described in Section 2.3.3 and outlined above, the details of the decommissioning plan, including site restoration, will evolve and become more specific as the Project advances. The subsequent iteration of the decommissioning plan will be the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning, including site restoration. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan, including site restoration, will evolve over time and the plan will become more refined as the Project advances.</p>	
IR-148	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>1. Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>2. Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>• an account (and GIS file if available) of existing habitat affected, using the following formula: (Project footprint + 500m buffer) - overlapping (permanent alteration(s) + 500m buffer)</li></ul></li><li>3. A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</li><li>4. Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and provide a rationale for the conclusion.</li></ol> <p>See also related: IR-154.</p>	<p>1., 2., and 3.: This calculation (for Project Area + 500 m buffer) is provided for the Project at the SK1 range level in the Cumulative Effects Assessment (see Section 9.3.7.3.3). Project-specific values are provided as they add to the known existing reported anthropogenic disturbance in the SK1 range and the result shows that the Project would be adding 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (refer to response to IR-137). Existing anthropogenic disturbance was mapped at the scale of the Terrestrial RSA (i.e., the assessment area - see Figure 9.3-15); the mapping was not extended to the entire SK1 range because: (1) this was not determined to be the assessment area (explained in response to IR-137) and (2) shapefiles are not publicly available for all developments in the SK1 range.</p> <p>4. The Project is not expected to compromise the ability of the range (i.e., SK1 range) to be restored to the undisturbed habitat threshold. This opinion is based on the small amount of disturbance (i.e., 0.001%) of anthropogenic disturbance and Denison’s commitment to progressive reclamation as well as final reclamation as part of the Decommissioning phase. Also considered was the ecology of the boreal forest which is influenced, primarily by forest fires that continue to “reset” the seral stage of forest, typically at a much larger scale than that of the Project Area. The reclamation efforts will be monitored, and deficiencies noted and addressed appropriately in a timely manner, so that lands are returned to comparable land use capability and habitat (i.e., regenerating forest), that existed prior to the Project. The Project is not expected to adversely affect the habitat within the SK1 range to the extent that the range/habitat is unable to support caribou.</p>	No updates to the draft EIS are needed based on this IR response.
IR-149	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li><li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li></ol>	<p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities</p>	The Conceptual Caribou Mitigation Plan, provided in Attachment IR-149, will be included in the final EIS as a new appendix (Appendix 9-E) to Section 9.



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					<p>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</p> <p>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>	<p>directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>Denison met with ECCC representatives on April 20, 2023, and agreed to provide a conceptual caribou mitigation plan as part of the IR response package, and also include the conceptual plan in the final EIS. As such, the Project’s Conceptual Caribou Mitigation Plan is provided as Attachment IR-149 and will be included in the final EIS.</p> <p>The framework for the Conceptual Caribou Mitigation Plan (the Plan) was developed during discussions between Denison and Saskatchewan Ministry of Environment (ENV) in May and June 2023. The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and ENV. Since the boreal caribou range plan for SK-1 is under development, it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan at this time is in part due to the absence of range plan priorities and reflects Denison’s commitment to continue to work with ENV to meet the management objectives and management strategies for the SK1 range. This approach acknowledges that the responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p>	
IR-150	ECCC	Wildlife and Wildlife habitat	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.	The report titled <i>Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results</i> is included as attachment IR-150.	No EIS updates in response to this IR.
IR-151	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<p><b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.</p>	<p>1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.</p> <p>2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.</p>	<p>To appropriately focus the EA, using an accepted/proven methodology, the EIS considers two effects: (1) alteration and/or loss of habitat and (2) change in mortality.</p> <p>Effects on movement corridors were not assessed specifically as this is not an infrastructure project that is expected to affect movement patterns across the landscape (i.e., landscape connectivity is not expected to be affected). This also considers the life stages and biology of woodland caribou, including their movement patterns. A “wildlife corridor” ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022) was identified by IK that was appropriately considered in the assessment, as this feature overlaps with the Terrestrial RSA. However, this feature was not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects. Further, the effect of habitat alteration does consider changes in species' habitat use, including movement. This approach was appropriate considering the small Project Footprint, the progressive reclamation, the baseline data, the available Indigenous Knowledge and the biology of caribou (e.g., no large-scale movement patterns) potentially using portions of the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response.
IR-152	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4, Appendix 9-B	<p><b>Context:</b> Baseline studies for Woodland caribou include:</p> <ul style="list-style-type: none"><li>Winter Track Count Survey to assess presence, abundance, feeding activity, and ecosite affiliation;</li><li>Pellet Group/Browse Availability Survey to detect presence and abundance of caribou, and frequency of occurrence and abundance of lichen;</li></ul>	<p>Please provide a summary of available baseline data on habitat use during all seasons and life stages, in particular sensitive stages such as calving, and how habitat use during all seasons and life stages was considered in the residual effect analysis.</p> <p>See also IR-145 and IR-143.</p>	Refer to the responses to IR 143 and IR 145.	No updates to the draft EIS are needed based on this IR response.

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				<ul style="list-style-type: none"><li>Covert Camera Survey to determine presence and use of linear features (roads, trails, and hand-cut lines).</li></ul> <p>The Saskatchewan Conservation Strategy for Boreal Woodland caribou [1] states that caribou are very susceptible to predation during the calf-rearing period, and populations are extremely sensitive to even minor changes in mortality rates.</p> <p><b>Rationale:</b> It is unclear if, or how, any data on seasonal and spatial use of habitat was considered in the residual effect analysis, for example summer/winter home ranges, sensitive life stages including calving (e.g., location of calving sites). It should be noted that the English River First Nation have identified caribou calving areas in the vicinity of the project footprint.</p> <p><b>Reference:</b> [1] Saskatchewan Ministry of Environment. 2013. Conservation Strategy For Boreal Woodland Caribou (Rangifer tarandus caribou) in Saskatchewan. Saskatchewan Ministry of Environment. Fish and Wildlife Technical Report 2014.</p>			
IR-153	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4.1	<p><b>Context:</b> According to ECCC (2020), forest fires can directly alter habitat, making it unsuitable for boreal caribou (e.g., through loss of mature conifer stands, loss of lichens and other forage plants, barriers to movement). Boreal caribou generally do not return to burned areas for several decades until the forest is old enough to support lichens and other food sources, although they may make limited use of burned areas to feed on new growth.</p> <p>The residual effects evaluation of alteration and/or habitat loss lists ecosites BS3 and BS7 (regenerating forest types) as available habitat in Table 9.3-22, which represent 43.5% of the Regional Study Area.</p> <p><b>Rationale:</b> It is unclear whether the ecosites BS3 and BS7 (regenerating forest types) represent suitable habitat for Woodland caribou year-round. More information is required on the habitat quality (e.g., time since last forest fire) and suitability for different life stages of caribou.</p> <p>For conservatism, it is recommended to perform a second residual effect analysis not including regenerating forest ecosites.</p>	<p>1. Please provide further information on the suitability of ecosites BS3 and BS7 for Woodland caribou in different life stages.</p> <p>2. Please provide the results of a residual effect analysis not including ecosites BS3 and BS7 for conservatism.</p> <p>3. If 2 leads to habitat fragmentation, consider connectivity of habitat patches in the residual effect analysis.</p>	<p>1. Caribou were observed within these regenerating ecosites (BS3 and BS7) during baseline studies and therefore, to be inclusive of all life stages, they were included in the "available habitat" for woodland caribou.</p> <p>2. The EIS followed a conservative approach by including these ecosites in the available year-round habitat to appropriately inform the effects assessment. No additional analysis related to connectivity of habitat patches is considered to be warranted for the Project, considering the baseline data, available Indigenous Knowledge and the biology of the caribou potentially using portions of the Terrestrial RSA</p> <p>3. Effect on habitat connectivity and fragmentation were considered in the habitat-based effects assessment within the context of habitat loss/alteration. The effects assessment considered that the project footprint had been previously disturbed/fragmented and connectivity altered. The assessment appropriately considered effects on wildlife habitat at the LSA and RSA levels</p>	No updates to the draft EIS are needed based on this IR response.
IR-154	CNSC	Woodland Caribou Alteration and/or Loss of Habitat	Section 9.3.6.4.1	<p><b>Context:</b> Lichen, the primary food source for Woodland caribou (up to 70% of the year-round diet), can be exposed to airborne contaminants and dust deposition at distances of 1–40 km (e.g., increased metal concentrations or dust were detected in lichen at distances of 1–40 km from a mine site [1, 2]).</p> <p><b>Rationale:</b> Further information is requested on how the potential for contamination of the food source “lichen” is reflected in the applied buffers of direct and indirect disturbance for woodland caribou.</p> <p><b>References:</b> [1] Watkinson et al. (2021). Effects of dust deposition from diamond mining on subarctic plant communities and barren-ground caribou forage. Journal of Environmental Quality 50(4): 990-1003. doi: 10.1002/jeq2.20251. [2] Chen et al. (2017). Does dust from arctic mines affect caribou forage? Journal of Environmental Protection 8(3): 258-276. doi: 10.4236/jep.2017.83020.</p>	<p>1. Please provide additional justification for how the potential for contamination of the food source “lichen” is reflected in the applied buffers for sensory disturbance.</p> <p>See also related IRs: IR-137, IR-148 and IR-156.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>COPC in Lichen monitoring is recommended in transects from the Project site to assess COPC concentrations and confirm whether the chosen buffer is conservative.</li></ul>	<p>Potential effects on caribou as the result of exposure to COPCs, including dietary pathways inclusive of lichen, were assessed as part of the Ecological Risk Assessment (ERA) (see draft EIS, Appendix 10-A). Hazard Quotients (HQs) associated with the exposure pathways analyses were below the benchmark of 1 for all COPCs.</p> <p>The reviewer is referred to Appendix 10-A, as well as the responses to IRs 138 and 189 for additional information.</p>	No updates to the draft EIS are needed based on this IR response.
IR-155	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou Habitat in the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine available habitat based on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>	<p>Available woodland caribou habitat was identified in the draft EIS to comprise the ecosites with observations of caribou and caribou sign during the baseline studies. This was done without seasonal differentiation because it was assumed that caribou may use these ecosites during all seasons and life stages. Section 9.3.6.4.1 of the draft EIS describes these habitat types. A reference to Appendix H of the 2020 Amended Recovery Strategy and important biophysical features will be added to Section 9.3.6.4.1. in the final EIS.</p> <p>Please see the response to IR-145 related to the acquisition of data received from the Province of Saskatchewan.</p>	Per the IR response, Section 9.3.6.4.1 in the final EIS will be updated to add: “To be conservative, the environmental assessment assumed caribou use of all habitat types during all seasons, as appropriate. This is expected to appropriately address all of the biophysical features outlined in Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020.”
IR-156	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>	<p>The EA appropriately assessed the residual effects and the cumulative effects within the RSA, as per standard, accepted EA methodology.</p> <p>As described in Section 9.3.7.3.3 of the draft EIS, ECCC identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in that range should not exceed 5% with</p>	No updates to the draft EIS are needed based on this IR response.

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				<p>significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p> <p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p> <p>The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.</p>		<p>55% being attributed to natural disturbance. In 2020, approximately 58% of the SK1 Boreal Shield range were affected by past forest fires and 3% of the range were affected by anthropogenic disturbances (i.e., 61% of the range were disturbed mostly due to fires).</p> <p>As described in the Cumulative Effects Assessment (Section 9.3.7.3.3 of the draft EIS), the Project-related (i.e., anthropogenic) disturbance was predicted to add 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. Refer to the response to IR-137 for a rationale of the assessment area for the effects assessment (i.e., the Terrestrial RSA).</p> <p>Please also refer to IR-149 and the attached Conceptual Caribou Mitigation Plan (the Plan), specifically Section 5.1 of the Plan. A mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020). Based on the analysis in Section 5.1 of the Plan using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.</p>	
IR-157	ECCC	Wildlife and Wildlife habitat	Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets.</p> <p>ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary</p>	Refer to response to IR-145.	No updates to the draft EIS are needed based on this IR response.



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					approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.		
IR-158	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p>ECCC advises the Proponent to identify additional focal species that have the ability to represent anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects (e.g., species at elevated risk of collision with vehicle traffic).</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	<p>The habitat-based assessment presented in the draft EIS appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA.</p> <p>Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds were considered as species guilds themselves, and appropriately identified as Key Indicators of the Migratory Breeding Birds Valued Component and were adequately assessed separately (i.e., at the Key Indicator level) for each Project effect and only rolled up to the Valued Component level for the significance determination. This approach was identified as the appropriate assessment method to identify Project effects on migratory breeding birds and to focus the assessment. The potential effects were identified and described for those species (within the Key Indicator group) that are most affected, and was then applied to all Key Indicator species, including those that may be less affected (e.g., risk of vehicle collisions, risk of entrapment) using a conservative, inclusive approach that considered the baseline data and the habitat. Further selection of focal species within each of these species guilds is not anticipated to affect the outcome of the assessment results or the conclusions</p>	No updates to the draft EIS are needed based on this IR response
IR-159	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	<p>The baseline data presented in the draft EIS are sufficient for the intended purpose – that is the data are sufficient, in conjunction with regionally available data, to identify potential project effects. The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site.</p> <p>As described in the EIS, pre-construction surveys will be conducted prior to the commencement of any vegetation clearing or soil disturbance. Avian species will also be routinely monitored throughout the life of the Project. Results from the surveys and monitoring activities are expected to inform the adaptive management process to update Project design and identify the need for additional mitigation measures, if required. Note: Section 9.4.3.3 of the draft EIS includes all available information from the HABISask database at the time of the assessment. While recent surveys from Environment and Climate Change Canada and the Saskatchewan Breeding Bird Atlas have expanded surveys into the northern boreal forest, these data are not yet publicly available or published to make inferences on population trends for migratory songbirds that could use the available habitat in the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response
IR-160	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p>Results from baseline studies as well as other supplemental information as per IR-159 should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>	<p>The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment.</p> <p>The EIS provides a discussion and subsequent quantitative assessment of the habitat types lost and/or altered based on the Valued Components and Key Indicator species. Species richness and diversity (as evaluated in the baseline report) were included as part of the selection of "available habitat" (e.g., for migratory songbirds, ecosites with low richness and diversity were excluded; refer to the response to IR-169 for a description of these ecosites). This approach provided an appropriate assessment of the Project effects on available habitat as it relates to the direct and indirect effects on the avian community.</p>	No updates to the draft EIS are needed based on this IR response
IR-161	CNSC	Bird Species at Risk	Section 9.4.3.3  Appendix 10-A (ERA)	<p><b>Context:</b> For the assessment of effects on Bird Species at Risk (SAR), in the EIS it was decided to use representative species for certain SAR birds:</p> <ul style="list-style-type: none"><li>Olive-sided Flycatcher and Common Nighthawk were selected to represent Barn Swallow.</li><li>Yellow Rail and Rusty Blackbird were selected as substitutes for Horned Grebe.</li></ul> <p>No further rationale is provided to demonstrate that the identified surrogate species are representative of the Barn Swallow and Horned Grebe in the EIS. For example, do they share a common diet?</p> <p>Moreover, in the residual effects assessment, limited discussion is provided on the conservatism of chosen suitable habitat types for both surrogate and represented species, in the calculation of habitat loss and alteration, as well as change in mortality. For example, how does habitat for Common Nighthawk and Barn Swallow overlap (do they use identical habitat types?) and how does this affect the calculation of habitat loss and alteration used to evaluate the magnitude of residual effect?</p> <p>Finally, in the ERA, Lesser Scaup is the surrogate for Horned Grebe. Yellow Rail is also represented by Lesser Scaup but Rusty Blackbird is represented by Olive-sided Flycatcher.</p> <p><b>Rationale:</b> It is unclear what criteria were applied to select surrogate species for Barn Swallow and Horned Grebe, and how the chosen</p>	<p>1. Please provide additional information to justify the selection of surrogate species for Barn Swallow and Horned Grebe in the EIS. This should include a description of the similarity of SAR and associated surrogate species and any relevant uncertainties.</p> <p>2. Please provide conservative estimates of habitat loss and alteration for the represented and not directly assessed species (Barn Swallow, Horned Grebe).</p> <p>3. Please provide clarity as to why different surrogate species are used for Horned Grebe between the EIS and ERA.</p> <p>See also related IRs: IR-160 and IR-162.</p>	<p>1.a. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment. As described in the EIS, the Common Nighthawk (similar to the Barn Swallow) is an aerial insectivore that uses a variety of habitats, including anthropogenically disturbed and cleared areas (Section 9.4.3.3.1). As such, effects on these anthropogenically disturbed areas were appropriately assessed in the habitat-based EA methodology. Since Barn Swallows nest almost exclusively on human-made structures, specific Barn Swallow exclusion methods will be added as mitigation measures to the EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities would be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>1.b. To focus the effects assessment on key species, it was decided to use the provincially listed Yellow Rail (and Rusty Blackbird) as surrogates for Horned Grebe. Horned Grebe use similar wetland habitat types for nesting, foraging and protective cover as Yellow Rail. As such, potential effects on these habitat types were assessed appropriately.</p> <p>2. The habitat-based approach for the assessment supports the use of surrogates that are known to utilize the same habitat types. Habitat loss and alteration were assessed for the Key Indicator species included in this Valued Component. A conservative approach of identifying available habitat for these species was chosen to include habitat for those species not directly assessed (i.e., Barn Swallow through Common Nighthawk habitat and Horned Grebe through Yellow Rail and Rusty Blackbird habitat).</p> <p>Please refer to the response to IR-131. A new species at risk appendix has been included with the IR response package and will become Appendix 9-D to the final EIS. This new final EIS appendix lists all avian species at risk (under Schedule 1 of the <i>Species at Risk Act</i>), their conservation status in Saskatchewan, and references to species-specific mitigation measures.</p>	<p>The below barn swallow exclusion methods will be added to Section 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>

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				surrogates relate to Barn Swallow and Horned Grebe in terms of habitat type and range, nesting, and feeding requirements etc.  There is also inconsistency with respect to the use of surrogate species for the Horned Grebe between the EIS and ERA supporting document.		3. The rationale for the use of the surrogates in the ERA was provided in the draft EIS Appendix 10-A, Section 5.1.1 Receptor Selection. The summary of species at risk and associated surrogates was provided in the draft EIS Appendix 10-A, Table 5-2. In the ERA, Lesser Scaup was selected as the surrogate for other omnivore ducks and gulls (e.g., Bufflehead, Mew Gull, Herring Gull, Bonaparte’s Gull, Horned Grebe, and Yellow Rail). These riparian bird species would all experience exposure to aquatic release through water, food (invertebrates), and sediment. As such, in the ERA, Lesser Scaup is expected appropriately address the assessment and protection of a number of other riparian bird species, including Horned Grebe and Yellow Rail.	
IR-162	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.  In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow ( <i>Hirundo rustica</i> ) and Horned Grebe ( <i>Podiceps auratus</i> ) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”  Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.	1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.  2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.  3. Assess individually each SAR that overlaps with the Project and is likely to be affected.  See also related IRs: IR-160 and IR-161.	1. It is acknowledged that Barn Swallows (unlike Common Nighthawks) nest almost exclusively on human-made structures; therefore, specific Barn Swallow exclusion methods will be added as mitigation measures to the final EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.  2. Horned Grebe nesting requirements will be addressed by implementing appropriate activity-restriction setback distances. While the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS) do not specify measures for Horned Grebe, the setback distances for Yellow Rail will be followed: the SARGSS specify setback distances between 150 and 350 m around nesting birds for medium and high disturbance categories, respectively, between May 1 and July 15.  3. The environmental assessment approach was chosen to focus the habitat-based effects assessment; mitigation measures will be updated to include species-specific approaches as determined through the adaptive management process. Note that additional text and a new table will be added to a new Species at Risk appendix to Section 9, listing all avian species at risk (under Schedule 1 of the Species at Risk Act), their conservation status in Saskatchewan, and links to species-specific mitigation measures as they relate to the potential adverse effects on wildlife.	1. The following Barn Swallow exclusion methods will be added to Sections 9.4.5.2.4 in the final EIS: Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.  2. The species at risk new EIS appendix (Appendix 9-D; refer to IR-131) includes the following specific mitigation measure for Horned Grebe: Active and/or suspected breeding and roosting locations identified during the pre-clearing wildlife surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for Horned Grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).  3. A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-163	ECCC	Migratory birds	Section 9.4.3.3.3, Baseline Studies – Avian species at risk VCs	<b>Context and Rationale:</b> The baseline studies and data analysis for species at risk (SAR) birds is insufficient to accurately predict Project effects.  ECCC recommends the use of predictive modeling in relation to survey data and habitat attributes to produce distribution and density maps. Sites within the study area that support particularly high densities or diversity of an individual species, based on direct observation and, where appropriate, distribution or occupancy models, would greatly improve confidence in Project impact predictions.  Additional information on specific habitat use or models of habitat used by SAR would facilitate a more complete analysis of Project effects.	Provide additional information, including mapping/modelling of specific habitat requirements for each avian species at risk or provide a justification of models used in the draft EIS.	Denison is of the professional opinion that the data presented and analysis provided in the draft EIS is sufficient given the local / regional environment and the level of interaction with SAR birds that is expected. The habitat-based EIS approach did not include more detailed mapping/modelling because of the small Project footprint and the location (i.e., bird densities are not expected to be limited by habitat regionally).  The habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties. The VCs and KIs appropriately focused the EA; no additional modelling or assessment is considered to be required. In addition, further modeling is not expected to affect or change the findings and conclusions of the EIS. Based on the results of the baseline studies, supplemented by available additional data sources (e.g., HABISask), most avian species were conservatively assumed to be present and breeding in the Project study areas. Species-specific mitigation measures have been included and additional measures will be added (e.g., Barn Swallow exclusion measures; refer to IR-131 and IR-163). Pre-clearing surveys, ongoing monitoring during all Project phases, adaptive management (refer to the response to IR-159), and accepted, species-specific mitigation measures have been designed and will be implemented to avoid and minimize the potential for adverse Project effects.  In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.	No updates to the draft EIS are needed based on this IR response.
IR-164	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).  As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.	1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.  2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.	1. Refer to the response to IR-158.  2. Section 9.4.3.2.3 Baseline Studies provides an overview of the avian species identified within the various habitat types that were surveyed. No important wildlife or wildlife habitat features have been identified. The effects assessment included appropriate consideration of habitat loss and/or alteration related to migratory birds (regardless of different guilds).	No updates to the draft EIS are needed based on this IR response.
IR-165	CNSC ECCC	Birds (all species)	Section 9.4.4.2.2 Section 9.4.5.2.4, Avian Deterrence	<b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:	The response to this IR is provided in Attachment IR-165.	No updates to the draft EIS are needed based on this IR response.



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			and Prevention of Entrapment  Appendix 10-A (ERA)	<p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>		
IR-166	ECCC	Migratory birds	Section 9.4.5.2 Additional Avian Species-specific Mitigation Measures	<p><b>Context and Rationale:</b> Avian species-specific mitigation measures are not presented in the draft EIS. The Proponent has committed to providing a variety of environmental management plans.</p> <p>Section 9.4.5.2 reads: “Additional mitigation measures specific to the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs, in accordance with the Migratory Birds Convention Act, and tailored to Project features will be incorporated into various Project management and monitoring plans such as the, erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.”</p> <p>Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear; this is known as incidental take. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoiding Harm to Migratory Birds website at: <a href="https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html">https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html</a></p> <p>In order to assess the effectiveness of species-specific mitigations and need for additional mitigations ECCC requires details on the species-specific mitigation measures proposed, and the monitoring plans.</p>	<p>Provide details on species-specific mitigations for species at risk (SAR) and other avian species that will include:</p> <ul style="list-style-type: none"><li>• details on what activity restrictions will be implemented for migratory birds and SAR and when they will be applied;</li><li>• details on mitigations used during regular maintenance activities such as vegetation management (e.g., mowing), access road repair (e.g., aggregate stockpiles), and infrastructure repair;</li><li>• details on methods used to detect species listed on Schedule 1 of the <i>Migratory Birds Convention Act</i> (e.g., Pileated Woodpecker) and mitigations/setback distances and timing to reduce risk to these species.</li></ul>	<p>In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all wildlife SAR potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. Species-specific timing windows and setback distances from the SARGGS were included in the species-specific sections of the draft EIS (see Section 9.4.3 in the draft EIS). Refer to 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk in Attachment IR-131. This section provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.</p> <p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>Please also refer to response to IR-133, IR-135, and IR-167.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p> <p>Final EIS updates related to wildlife SAR, including new species-specific mitigation measures, are outlined in response to IR-131 and exclusion methods are provided in response to IR-135.</p>
IR-167	ECCC	Migratory birds	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p><b>Context and Rationale:</b> The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: “Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered:</p> <ol style="list-style-type: none"><li>1. Most migratory birds: - Nests are protected only when they are in use or when live eggs or chicks are present.</li><li>2. Migratory birds listed in MBR 2022 Schedule 1: - For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned.</li><li>3. Migratory birds listed under SARA: - For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but</li></ol>	<p>Provide the following information:</p> <ul style="list-style-type: none"><li>• details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR).</li><li>• the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR</li></ul>	<p>Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>

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				are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.			
IR-168	ECCC	Migratory birds	Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment	<p><b>Context and Rationale:</b> The Proponent mentions that avian deterrents will be used on power transmission lines, buildings and other Project infrastructure. However, the Proponent does not mention any deterrents that will be used for deterring birds from the water or waste management facilities.</p> <p>Details on deterrents for all Project components should be identified to assess residual and cumulative impacts to migratory birds.</p>	<p>1. Provide information on avian deterrents to be used to prevent birds or other wildlife entering water or waste management ponds.</p> <p>2. Explain how proposed timing of use of deterrents will reduce risk of migratory birds making contact with treatment waters outside of the nesting season (i.e., during migration and stop overuse).</p> <p>3. Explain which deterrents will be used, which deterrents were considered, and what alternative, adaptive measures will be considered if deterrents are unsuccessful for any Project components.</p>	<p>Refer to response to IR-165 for a discussion on the need for additional avian deterrents at water management and treatment facilities.</p> <p>The following is an excerpt from IR-165:</p> <p>Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:</p> <ul style="list-style-type: none"><li>• Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.</li><li>• Employees and contractors will be educated on waste management policies that limit human-avian interactions.</li><li>• Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.</li><li>• Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.</li><li>• Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.</li><li>• Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.</li></ul> <p>Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. . If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:</p> <ul style="list-style-type: none"><li>• Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.</li><li>• Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006), as birds can habituate to a timely, consistent firing/noise event.</li></ul> <p>References: Exeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.</p> <p>Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.</p> <p>Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119</p>	No updates to the draft EIS are needed based on this IR response.
IR-169	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds, Table 9.4-15 and Map 9.4-11	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density and diversity, it is expected that all ecosites provide migratory songbird habitat.</p>	<p>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</p> <p>2. Explain why other habitat types were not considered as available habitat for migratory songbirds.</p>	<p>1. As per accepted methodology, to appropriately focus the habitat-based effects assessment, as per accepted EA methodology, the most frequently used habitat types (i.e., the ecosites experiencing the highest species richness, highest mean number of breeding songbird pairs, and highest species diversity) within the Project study areas were included as "available habitat" as shown in draft EIS Table 9.4-15 Summary of Available Habitat for Migratory Songbirds in the Project Study Areas and Figure 9.4-11 Available Habitat for Migratory Songbirds.</p> <p>For all three indicators (i.e., highest species richness, highest mean number of breeding songbird pairs, and highest species diversity), the three ecosites with the lowest representation were BS25 (open fen), BS19 (graminoid bog), and BS24 (graminoid fen). These three ecosites were excluded from the description of available habitat for migratory songbirds, as their use/suitability is expected to be low.</p> <p>Denison is confident that this approach is appropriate. Additionally, inclusion of these “low quality” habitat types would not be expected to alter the analysis of the residual effect nor the conclusions of the EA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).</p>	No updates to the draft EIS are needed based on this IR response



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						2. Although the habitat types excluded from the assessment are “available” to migratory birds, their low “suitability” to the KI species selected to focus the EA, resulted in these habitat types not included in the assessment. In Denison’s opinion, including these low suitability habitat types to the analysis would provide no additional value to the EA process, and would not alter the findings of the analysis nor the conclusions contained in the draft EIA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).	
IR-170	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p>Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>1. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA; no updated table or map is considered to be required. In addition, further mapping is not expected to affect or change the findings and conclusions of the draft EIS.</p> <p>2. Common Nighthawk were observed in the Project study areas during the baseline studies and are considered to be present and breeding. Rocky outcrops were not reported during the baseline studies (see Section 9.2.3). Pre-clearing surveys will be conducted, set-back buffers implemented, and pre-clearing survey and monitoring results will be used for adaptive management purposes (see also response to IR-159). Species-specific mitigation appropriate for Common Nighthawk is largely related to loss and/or alteration of habitat (including both direct and indirect effects).</p>	No updates to the draft EIS are needed based on this IR response.
IR-171	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation	<p><b>Context and Rationale:</b> Section 9.4.6.4 Residual Effects Evaluation for Bird SAR – Common Nighthawk reads: “Progressive reclamation is anticipated to begin during Construction. However, a conservative approach is used, with Common Nighthawk (CONI) habitat in the Project Area considered to be unavailable for the duration of the Project, only becoming available as habitat following Post-Decommissioning (i.e., during the regeneration of vegetation following Decommissioning).”</p> <p>CONI may nest on the roadsides of access roads within the Project area. As such, the Project area should still be considered available habitat for the duration of the Project and appropriate mitigations and adaptive management should be discussed for this species.</p>	Develop mitigation plans appropriate for avoiding collisions of common nighthawks with vehicles, when and where nighthawks are observed foraging near or roosting on gravel roads. Demonstrate how the planned mitigation activities will result in reduced residual effects from this pathway.	<p>Project design measures and species-specific mitigation measures outlined in draft EIS are expected to be appropriate to avoid or limit the risk of Project effects on Common Nighthawks. The cited text in the IR context and rationale from Section 9.4.6.4 refers to the anticipated duration of the Project effect.</p> <p>As described in the EIS, a Road and Traffic Management Plan will be implemented and mitigation measures (also described in Section 9.4.5.2.6) will include reduction of traffic volume, implementation of speed limits, installing visible signage at locations with potential for wildlife crossings (including avian species), communication (and reporting) of wildlife collisions, and maintenance of ditches and culverts. This mitigation is expected to reduce/limit potential for interactions between the Project activities and Common Nighthawk and their habitat, thereby limiting the risk of a potential adverse effect.</p>	No updates to the draft EIS are needed based on this IR response.
IR-172	CNSC	Birds (all species)	Section 9.4.6.4.2	<p><b>Context:</b> Populations of listed species may be less resilient to changes in mortality.</p> <p>CSA N288.6:22 Clause 7.2.4.3 states that effects on a few individuals of endangered, threatened, or vulnerable species would not be acceptable.</p> <p>The residual effects assessment for “Change in Mortality” for bird species at risk states that Project mitigation measures identified in Section 9.4.5 are expected to limit interactions between bird species at risk and potential sources of direct and indirect mortality. However, the mitigation measures are not discussed with respect to their effectiveness to limit interactions, specifically for bird species at risk.</p> <p><b>Rationale:</b> It is unclear if the proposed mitigation measures are effective in preventing mortality in bird species at risk for which even only a few deaths could negatively impact the population.</p>	Please provide a discussion on mitigation measures with respect to their effectiveness in minimizing mortality for bird species at risk, for which effects on a few individuals would not be acceptable.	Mitigation measures provided in the EIS were selected in consideration of their proven effectiveness and applicability to the Project, including the habitat types and species that could be adversely affected. A component of the effectiveness of the proposed mitigation is appropriately addressed in the discussion on “Confidence” for each of the residual effect assessment in the EIS. The new Species at Risk appendix that will be added to the final EIS (see IR-131) includes discussions of the effectiveness of mitigation measures that Denison is proposing to implement to avoid or reduce mortality of Bird Species at Risk.	The new Species at Risk appendix that will be Appendix 9-D to Section 9 of the final EIS has been included in this IR response package (Attachment IR-131). This new EIS appendix includes the species-specific, proven, mitigation measures and their effectiveness, that Denison is proposing to implement during the Project to mitigate adverse effects on bird species at risk.
IR-173	ECCC	Migratory birds	Section 9.4.8 Monitoring and Follow-up	<p><b>Context and Rationale:</b> Monitoring and follow up programs are part of adaptive management and implementation of additional mitigations.</p> <p>In Section 9.4.8 the Proponent states: “Considering the Project planning, baseline survey results, and proposed mitigation measures, no follow-up programs are considered to be warranted at this time.”</p> <p>Project impacts related to mortality of birds, such as collisions with the transmission line, mortality along roads and use of waste and water management facilities should be monitored during all phases of the Project and adaptively managed.</p>	<p>Provide details on the follow-up program to monitor impacts to avian mortality. The follow-up plan should include:</p> <ul style="list-style-type: none"> <li>Monitoring of avian use of waste and water facilities</li> <li>Monitoring of mortality along access roads</li> <li>Monitoring of mortality related to transmission lines</li> <li>Monitoring of effectiveness of avian deterrents.</li> </ul>	<p>As described in the draft EIS, a wildlife monitoring plan will be developed to support permitting and licensing and implemented as the Project proceeds. The wildlife monitoring plan will provide details on the monitoring and follow-up programs outlined in Section 9.4.8 of the EIS. In Section 9.4.8 of the draft EIS, Denison has outlined the following as part of monitoring programs:</p> <p>“Avian movements across the Project study areas may bring species or individuals into contact with Project components (e.g., buildings, power transmission lines, waste ponds and waste pads) and activities (i.e., vehicle and aircraft traffic), which can result in mortalities and changes to habitat use. Project design and mitigation measures (Section 9.4.5) have been identified that are expected to minimize the likelihood of adverse Project effects. However, changes in avian habitat and habitat use over the life of the Project require an adaptive management process to update Project design and additional mitigation measures, if required. The potential for these changes will require appropriate monitoring for changes in avian mortality or encounters to determine, in a timely manner, whether changes are warranted through the adaptive management process.”</p> <p>Specifically, as it concerns monitoring avian mortality the following is noted and will serve as the basis of the framework for this component of the wildlife monitoring plan. The objective of this component of the plan would be to (1) document and mitigate potential effects of Project activities on avian mortality; and, (2) reduce interactions between wildlife (in this case birds) and people. Avian mortalities observed by Denison staff would be reported immediately to the Environment Department, and an inspection by Environment staff will be made to determine the probable cause of death. Obvious injuries, the position of the animal, and anything considered unusual would be photographed and recorded. Further information such as time, date, location, estimated time of death, and any sightings of other wildlife in the area would also be recorded. A procedure would be developed for carcass removal to prevent attraction of carnivores and other scavengers to the Project site. Wildlife mortality monitoring would be undertaken as required, continuously throughout the life of the Project. All mortalities would require follow-up to determine if anything can be done to prevent</p>	Section 9.4.8 of the final EIS will be updated to note that Denison is committed to monitoring avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines as documented in the IR response. It will be further noted that such mortalities will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison.

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						<p>similar mortalities from occurring in the future. Data related to avian mortalities would be compiled to identify trends over time and to determine the cause of mortalities and identify any further mitigation would be appropriate.</p> <p>Further, it is noted that avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison. Further, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on developing scope of monitoring regimes, which could include monitoring programs and the reporting on wildlife-vehicle mortality.</p> <p>Additionally, as noted in draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through sequential EA and licensing process. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed it is believed that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p>	
IR-174	ECCC	SAR - Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context and Rationale:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (<i>Myotis lucifugus</i>) and northern myotis (<i>Myotis septentrionalis</i>). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p>Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<ol style="list-style-type: none"><li>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</li><li>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</li><li>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</li><li>4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</li></ol>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to a variety of IRs, including this IR, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. This new EIS appendix provides information on little brown myotis and northern myotis. We note Denison’s commitment to pre-construction surveys to identify potential for maternity and nursery roosting habitat. Refer to response to IR-134 for the timing of clearing activities outside of roosting periods. Results from pre-construction surveys and continuous monitoring (described in Section 9.3.8) will be used in the adaptive management process to update Project design and additional mitigation measures, if required.</p>	No updates to the draft EIS are needed based on this IR response.
IR-175	CNSC	Provincially Listed Species	Appendix 9-B; section 2.2.2	<p><b>Context:</b> Vegetation and wildlife habitat characterization field surveys were completed in 2017, based on which ecosite factsheets were prepared. The factsheets list observations of two provincially listed plant species with a rank of S3 (vulnerable/rare to uncommon; Table 2.4-2) according to the Saskatchewan Conservation Data Centre, which are not discussed in the main EIS document:</p> <ul style="list-style-type: none"><li>• Angle-leaved sundew (<i>Drosera anglica</i>) observed in ecosites BS19, BS20, BS22, BS25</li><li>• Neat Spike-rush (<i>Eleocharis nitida</i>) observed in ecosite BS25</li></ul> <p>Table 9.2-12 in section 9.2.6.2.1 of the EIS indicates that there may be indirect disturbance to some of these ecosites (BS19, BS20, BS25). In section 9.2.6.3.1 it is discussed that listed plant species are not likely to return once lost from a specific location.</p> <p><b>Rationale:</b> Given that not all areas in the revised Project footprint were surveyed for listed plant species in baseline studies, there is uncertainty as to whether any species were missed, in particular those that have been observed in ecosites present in the LSA/RSA (e.g., <i>Drosera anglica</i> and <i>Eleocharis nitida</i>, see also Appendix 2 Table of Appendix 9-B). It should also be noted that rare plant surveys were completed in summer 2017 only (section 2.4.2 of Appendix 9-B), which may underestimate annual rare species that may be dormant in the seed bank in some years due to specific seed emergence requirements.</p> <p>It is acknowledged that the proponent committed to pre-construction listed plant surveys targeted on ecosites encountered in the Project Area but not previously surveyed, as well as ecosites within the Project Area with high potential to support listed plants.</p> <p>More information is requested on the potential indirect effects on rare plant species as well as the planned pre-construction surveys.</p>	<ol style="list-style-type: none"><li>1. Please provide a discussion on the potential risks from indirect effects on ecosites with observed rare plant species</li><li>2. Please provide additional information on the ecosites included in the planned pre-construction listed plant surveys</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends focusing monitoring on ecosites that have known observations of listed plant species outside of the Project Area (e.g., BS19, BS20, BS22, BS25).</p>	<p>1) As described in Sections 9.2.4.2.1 and 9.2.6.3.1 of the EIS, listed plants may be affected indirectly by the introduction and/or proliferation of invasive plants, dust deposition, edge effects, and changes to water quantity and quality. Mitigation measures planned to address these potential effects are described in Section 9.2.5, and include developing the Project footprint within previously disturbed areas to the extent practical (reducing edge effects); reducing dust deposition on vegetation by directing processing plant exhaust through a scrubber prior to release, appropriate stack height design for optimal dispersion, controlling property access, providing a wash bay, undertaking road watering and traffic controls, and monitoring dust during Construction and Operation; maintaining surface water flow (see response to IR-140); and undertaking invasive plant management. The specific risks of residual indirect effects on a given listed plant population are dependent on a suite of site-specific factors, including (but not limited to) the life requisites of the listed plant species, the species’ resilience to disturbance, the size of the population, and the location of the population in relation to Project activities. As described in Section 9.2.8.1, pre-construction listed plant surveys will be undertaken within the Project Area within ecosites that were not encountered during the 2017 surveys, as well as within selected areas of the Project Area with the potential to support listed plants (e.g., transitional habitats favoured by Alaskan clubmoss). Surveys will be undertaken to verify EA predictions and identify mitigation measures to protect Listed Plant Species, as appropriate. Should Listed Plant Species be identified within the Project Area, site- and species-specific mitigation measures will be developed by a qualified vegetation ecologist to avoid and/or minimize potential Project effects.</p> <p>2) Ecosites planned to be included during pre-construction listed plant surveys include all ecosites with the potential to support listed plants that may be directly or indirectly affected by the Project (i.e., ecosites located within the Terrestrial LSA). This includes ecosites where Alaskan clubmoss were historically observed (BS3/BS7, BS4, BS23); ecosites within the Project Area that were not previously surveyed (BS7, BS9, BS23, Waterbody); and ecosystems known to support angle-leaved sundew and neat spike-rush populations (BS19, BS20, BS25). It is noted that ecosite BS22 has not been mapped within the Terrestrial LSA and is not expected to experience direct or indirect Project effects; as such, it is not planned to be included within pre-construction listed plant surveys.</p>	No updates to the draft EIS are needed based on this IR response.



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IR-176	CNSC	Human Health with respect to radiation exposure	Section 10.1.4.2.1 Section 10.1.6.1.4  Appendix 10-A (ERA)	<p><b>Context:</b> In section 10.1.4.2.1, the proponent provides an evaluation of air quality constituents of potential concern to human health. It states: “A screening value for radon gas of 200 becquerels per cubic metre (Bq/m3) was available from Health Canada, which applies to total radon including background sources (Health Canada 2009). The radon concentrations which were predicted are incremental concentrations (i.e., above background) and were therefore compared to the applicable incremental screening value of 60 Bq/m3 for indoor air established by the Canadian Nuclear Safety Commission (CNSC) (Health Canada 2010a; Radiation Protection Regulations. SOR/2000-203).”</p> <p>The 60 Bq/m3 radon concentration value also appears in section 7.1.2 of Appendix 10-A (ERA).</p> <p>Further in section 10.1.6.1.4, it is stated: “Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 Bq/m3.”</p> <p>The Radiation Protection Regulations do not stipulate a limit for radon above background for sites licensed by the CNSC. The effective dose limits for Nuclear Energy Workers (NEWs) and persons that are not NEWs are listed in section 13 of these regulations, and in subsection 1(3) of these regulations for the general public.</p> <p>The annual effective dose from all sources associated with the licensed activities and within the scope of the Nuclear Safety Control Act and Regulations must be compared to the applicable effective dose limit. For members of the public this limit is 1 mSv per calendar year.</p> <p>In Section 4.2.5.3 of Appendix 10-A (ERA), there appears to be no reference mentioned for the radon equilibrium factors. These factors are a significant input into the dose calculations for radon.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>1. Removing the reference to a 60 Bq/m3 limit.</li><li>2. Reporting the assessment results as the total dose, from all radionuclides combined including radon progeny, and by comparing this annual effective dose to the effective dose limit.</li></ol> <p>Provide a summary of the conservative assumptions that have been included in the dose calculations.</p> <p>Provide a reference that shows how the radon equilibrium factors were determined.</p>	<p>1. While 60 Bq/m<sup>3</sup> (incremental) has been used in CNSC Oversight reports for uranium mines and mills, and referenced by Health Canada, it seems to be no longer used based on the updated Radiation Protection Regulations. Denison will remove any reference to 60 Bq/m<sup>3</sup> from the EIS and Appendix 10-A.</p> <p>2. The predicted radon concentrations will be compared to 200 Bq/m<sup>3</sup> (total) and total effective dose including radon and U-238 decay chain radionuclides will be compared to the 1 mSv/a dose limit. The total dose to the camp worker from radon (1.3E-01 mSv/a) and U-238 decay chain radionuclides (2E-02 mSv/a) is predicted to be 1.5E-01 mSv/a which is below the dose limit for a non-NEW of 1 mSv/a. This will be included in Section 4.4.1.3 of the ERA.</p> <p><u>Conservative Assumptions:</u></p> <ul style="list-style-type: none"><li>- For calculation of radon dose it was conservatively assumed that the camp worker spends 100% of their time indoors when on site (section 4.2.5.3 of ERA).</li><li>- Receptors are exposed to the maximum exposure concentrations at their location for each model scenario and Project phase (section 4.2.6 of ERA).</li><li>- For radionuclides in the U-238 decay chain (other than radon), the camp worker is also exposed through ingestion (water and food) pathways resulting in a conservative dose when also factoring in the dose from radon indoors.</li></ul> <p>The radon equilibrium factors were calculated as described in section 2.4.3 of the IMPACT Model Report, which is Appendix A of the ERA (Appendix 10-A). The equilibrium factors calculated are shown in Table 4-11 of Appendix 10-A.</p>	Per the IR response any reference to 60 Bq/m <sup>3</sup> from the EIS and Appendix 10-A and Section 4.1.1.3 will be revised as indicated.
IR-177	HC	Change to an environmental component due to radiological contaminants	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	<p><b>Context:</b> Section 10.1.4.2.1 states that, “Screening values for radionuclide concentrations in ambient air were not available. All relevant radionuclides were assessed in the HHRA in terms of their contribution to the total radiological dose to human and ecological receptors” (p. 10-22).</p> <p>Section 10 Appendix 10-A (ERA) states that, “No formal screening was conducted for radionuclides. However, since radiation dose to human receptors is of public and regulatory interest, the radionuclides in the uranium-238 decay series are carried forward as COPCs for further assessment” (Appendix 10-A (ERA): Appendix B Ref. 19-2638).</p> <p>Table 6.1-1 lists radionuclides as a key indicator for air quality, but only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.</p> <p><b>Rationale:</b> Health Canada recommends using screening values that are available for radionuclides if they are appropriate for the dose and if the screening values have listed assumptions (such as particulate size and worker exposure time that can be adapted to in Denison’s models). Two examples are ICRP 96, which CNSC uses in their regulatory reports to derive reference air quality values for Pb-210, Ra-226, and Th-230 (CNSC: Regulatory Oversight Report for Uranium Mines and Mills in Canada 2019); and Health Canada’s Guidelines for Management of NORM (Health Canada: Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials, 2011).</p>	<ol style="list-style-type: none"><li>1. Assess predicted radionuclides in Section 10 Appendix 10-A (ERA) using appropriate available screening values. Alternatively, provide a justification for why a screening wasn’t conducted for radionuclides despite the availability of screening values (e.g., ICRP 96 and NORM Guidelines, 2011).</li><li>2. Clarify if uranium progenies in air are considered in the atmospheric transport and air quality modelling and are simply not reported, or if they are not included in the models because no screening criteria are available.</li></ol>	<p>1. The methodology used in the ERA was to carry all radionuclides in the U-238 decay chain forward for quantitative dose calculations. As such, a formal screening was not conducted. No radionuclides were removed from the process, but rather all were considered constituents of potential concern (COPCs). Clause 7.2.5.4.3 of CSA N288.6-22 states “Certain COPCs may be carried forward into the EcoRA for reasons of public perception, even if screening benchmarks are not exceeded. For example, the most important radionuclides may be carried forward to demonstrate acceptable risk based on expressed public concern rather than exceedance of screening criteria.”</p> <p>2. Section 3.2 of Appendix 10-A (ERA) states that based on the ISR process the main source is yellowcake (uranium oxide) and not uranium ore. As such, at the point of release, the uranium mass is almost entirely uranium-238, and on an activity basis the uranium-238 and uranium-234 are equal. Ingrowth of progenies including Th-230, Ra-226 and Pb-210 were not considered in air since compared to the life of the Project ingrowth in air would be minimal. This was confirmed using the WISE Uranium Calculator (<a href="https://www.wise-uranium.org/rccu.html">https://www.wise-uranium.org/rccu.html</a>). Ingrowth of other radionuclides including Th-230 and Ra-226 is included in the air deposition to soil model. Ingrowth of Pb-210 and Po-210 in soil was considered negligible. The human dose results include the soil internal and external exposure pathways and are provided in the ERA results (see Appendix B, Table B.9).</p>	No updates to the draft EIS are needed based on this IR response.
IR-178	HC	Change to an environmental component due to hazardous contaminants	Section 10.1.4.2.1 (p. 10-22)  Section 6.1.4.2, Potential Project Related Effects (p. 6-31)	<p>The Baseline + Project scenario was not provided for radon levels.</p> <p><b>Context:</b> Section 6.1.4.2 states that the predicted levels for radon were not added to the respective baseline air quality levels (p. 6-31), and further explains that “In all modelled phases of the Project, annual average radon concentrations at receptors beyond the Property Boundary are expected to be indiscernible from background levels.”</p> <p>In Section 10.1.6.1.4, a different approach to evaluating predicted radon levels is mentioned: “the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m3“(p. 10-44).</p> <p><b>Rationale:</b> Without a rationale as to why baseline levels of radon were not included in the assessment, HC cannot fully evaluate the appropriateness of the air quality assessment. While Health Canada is of the opinion that using background radon levels as a screening value</p>	<ol style="list-style-type: none"><li>1. Provide further information on whether and how baseline radon concentrations in air were determined.</li><li>2. Include baseline radon concentrations in the predicted total concentrations when comparing to existing guidelines; alternatively, provide a rationale for why baseline concentrations of radon were not included.</li><li>3. Discuss the potential health implications of the project-only increment-over-baseline radon levels</li></ol>	<p>1: The baseline range of &lt;7.4-25 Bq/m<sup>3</sup> referenced in the air quality assessment is discussed in Section 6.1.1.2.3 of the draft EIS and comes from the CNSC document “The Regulatory Oversight Report for Uranium Mines and Mills in Canada” (2018). Measured baseline values presented and discussed in Section 6.1.3.2.3 of the EIS also fall within this range.</p> <p>2. The rationale for not adding baseline to modelled incremental radon concentrations in the air quality assessment is presented in Section 6.1.1.2.3. This approach was discussed and confirmed with the CNSC during a technical meeting on Sep. 17, 2021.</p> <p>3. As discussed in the response to IR 176, the total incremental dose to the camp worker from radon and U-238 decay chain radionuclides is below the dose limit for a non-NEW of 1 mSv/a.</p>	No updates to the draft EIS are needed based on this IR response

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				is appropriate in this case from a health perspective, different approaches to screening predicted radon levels in different sections appear to be used (i.e., background radon levels vs. CNSC incremental concentration).			
IR-179	CNSC	Groundwater quality decommissioning objectives.	Section 10.1.4.2.2, Release of Treated Effluent to Whitefish Lake During Decommissioning	<p><b>Context:</b> It is stated that “This process would continue until the recovered water meets acceptable groundwater quality decommissioning objectives”.</p> <p><b>Rationale:</b> The information provided does not include groundwater quality decommissioning objectives nor a reference to these objectives.</p>	Please provide groundwater quality decommissioning objectives or a reference to the information.	<p>The “groundwater quality decommissioning objectives” referred to in Section 10.1.4.2.2 of the draft EIS are the mining area decommissioning objectives provided in Table 2.3.3 of Section 2.3.3.1.1 in the draft EIS. The mining area decommissioning objectives have been developed through groundwater modelling work and are achievable based on metallurgical testing. Groundwater modelling and metallurgical testing are described in Section 7.6.2.1 of the EIS and in Appendix 7C of the EIS.</p> <p>For clarity, Section 10.1.4.2.2 will be modified in the final EIS to state: “This process would continue until the recovered water is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives (Section 2.3.3.1.1, Table 2.3-3).”</p>	Section 10.1.4.2.2 in the final EIS will be modified as follows: This process would continue until the recovered water <b>is demonstrated to be stabilized (maintained) at</b> meets acceptable <del>groundwater quality</del> <b>mining area</b> decommissioning objectives ( <b>Section 2.3.3.1.1, Table 2.3-3</b> ).
IR-180	CNSC	Human health with respect to hazardous contaminants	Section 10.1.6.1.1, Human Receptors Selection and Characterization	<p><b>Context:</b> Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.</p> <p><b>Rationale:</b> While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.</p> <p>In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?</p>	<p>Please provide justification for excluding a receptor from occupancy at lakes closer to the project during operation (McGowan, Whitefish). Alternatively, conduct a risk assessment to a receptor at these lakes during operation to determine if there is a predicted risk that may require monitoring or mitigation.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>Assessment of a receptor located closer to the point of effluent release may need to be considered to ensure there are negligible risks</li><li>If Se is expected to exceed hazard quotients further upstream, selenium removal technology may be required as part of the effluent treatment process as a mitigation measure. Other COPC’s exceeding an HQ of 1 may also be identified under this process that could require specific monitoring or mitigation measures.</li></ul>	<p>The traditional land use activities closest to the Project site are reported to occur in the Russell Lake area. However, a potential recreational lease has been identified in the McGowan Lake area. As such, a human receptor (Recreational Fisher/Hunter) was assessed at McGowan Lake in Appendix 10-A (ERA). The Fisher/Trapper was included at Russell Lake based on engagement with a local fisher/trapper (Bobby John), who had a cabin at Russell Lake. Overall, based on Indigenous and Local Knowledge, use of the area near Whitefish Lake for fishing, hunting, gathering is limited. As such the closest human receptor assessed during the Project phases was at McGowan Lake.</p> <p>No unacceptable risk was identified for the human receptor (Recreational Fisher/Hunter) at McGowan Lake due to releases from the Project. The ingestion rates for the receptor at McGowan Lake are more reflective of the average country foods diet and consumptions rates expected for human receptors in the area (based on the ERFN country foods study) than the diet of the Fisher/Trapper which would represent a higher consumption of traditional foods. As indicated in Section 4.4.1.1 of the ERA, the annual fish consumption based on engagement with a local fisher/trapper from ERFN was assumed to be 183 kg/yr (approximately 1 to 2 servings per day), which is conservative compared to an annual fish consumption of 27 kg/yr (2 servings per week) from the ERFN’s Country Food Study (CanNorth, 2017) and 88 kg/yr (approximately 1 serving per day) for the high consumer for the Boreal Shield in the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al., 2018).</p> <p><u>References:</u> CanNorth, 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p> <p>Chan, L., Receveur, O., Sadik, T., Schwartz, H., Ing, A., Fediuk, K., Tikhonov, C., 2018. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Saskatchewan (2015). University of Ottawa, Ottawa.</p>	No updates to the draft EIS are needed based on this IR response
IR-181	CNSC	Human Health with respect to radiation exposure	Section 10.1.6.1.4	<p><b>Context:</b> In section 10.1.6.1.4, it is stated: “The maximum incremental radon concentration at the camp worker site during Operation was predicted to be 12.4 Bq/m3, which is below the CNSC limit of 60 Bq/m3 for incremental radon.”</p> <p>As per IR-176, there is no such CNSC limit for incremental radon.</p> <p>The camp worker would be considered a person who is not a nuclear energy worker (NEW) and subject to the dose limits of section 13 and 14 of the Radiation Protection Regulations, not the dose limit for the general public as per subsection 1(3) of the Radiation Protection Regulations. The CNSC has regulatory requirements for the ascertainment and recording of doses of radiation as per section 5 of the Radiation Protection Regulations. Every licensee must ascertain and record the magnitude of exposure to radon progeny, the effective dose and equivalent dose received by and committed to a person who performs duties in connection with any activity that is authorized by the Nuclear Safety and Control Act or is present at a place where that activity is carried on.</p> <p>The camp worker performs duties in connection with the licensed activity and is present at the location where the activity is carried out. Hence, they are not considered to be a member of the general public (who has no connection with the activity)</p> <p>Further, the proponent indicates that the maximum incremental radon dose to the camp worker was estimated to be 0.13 mSv/year during Operation. The assessment assumes that the camp worker spends 100% of the time indoors. Table 10.1-11 shows the maximum total incremental dose for the camp worker to be 0.02 mSv/year. This appears to be a discrepancy.</p> <p>Table 5.2 in Appendix 10-C provides internal annual dose from radon inhalation. The radon doses to some NEW workers (9.44E-02 mSv/a Driller 1 and 1.03E-01 mSv/a Wellfield Operator 1, 2) here appear less than the radon dose (0.13 mSv/year from section 10.1.6.1.4) to the camp worker, who is a non-nuclear energy worker.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>Removing the reference to a 60 Bq/m3 limit for incremental radon.</li><li>Revising all references to the ‘public dose limit’ applied to camp workers (non-NEWs) to align with section 13 and 14 of the Radiation Protection Regulations.</li></ol> <p>The proponent should explain why the radon dose for the camp worker appears as 0.13 mSv/year in one instance and 0.02 mSv/year in another.</p> <p>The proponent is also asked to provide the rationale as to why a non-NEW has a higher radon dose than a NEW.</p>	<p>1. The reference level of 60 Bq/m³ for incremental radon will be removed from the EIS and Appendix 10-A (ERA). The health impact will instead be interpreted based on dose. The incremental radon dose to the camp worker is 0.13 mSv/year during Operations, which is below the dose limit for a non-NEW of 1 mSv/year. The ERA text will be updated.</p> <p>2. The ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW. Note that the same dose limit of 1 mSv/year is applied. Section 10.1.6.1.4 will be modified to state: "Incremental radiation doses due to radionuclides in the uranium-238 decay series were compared to the regulatory public dose limit <b>and dose limit for a non-NEW</b> of 1 mSv/yr as described in the Radiation Protection Regulations under the <i>Nuclear Safety and Control Act</i>."</p> <p>The radon dose to the camp worker is predicted to be 0.13 mSv/year during operations and 0.02 mSv/year during Construction. See Table 4-12: Predicted Radon Dose to Camp Worker during all Project Phases in Appendix 10-A (ERA). No changes to the appendix are required.</p> <p>The radon dose to a NEW is presented in Appendix 10-C (Worker Dose Assessment). The radon dose to a NEW is higher in most instances than to a non-NEW at the camp. As indicated in Section 5.2 of Appendix 10-C, the dose from radon to NEWs in the ISR plant area is predicted to range from 0.53 to 2.27 mSv/year. Radon dose to NEWs from the core shack is expected to be 2.3 mSv/year. Radon dose to the Driller 1 and Wellfield Operator 1, 2 is based on exposure to radon outdoors where exposure is much lower than exposure to radon indoors for the camp worker.</p>	Per the IR response any reference to 60 Bq/m³ from the EIS and Appendix 10-A and the ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				consistency with the Radiation Protection Regulations and the environmental impact statement.			
IR-182	HC	Change to an environmental component due to radiological contaminants	Section 10.1.6.1.4, (p. 10-44)	<p><b>Context:</b> Section 10.1.6.1.4 states, "The limit is incremental and is exclusive of natural background, such as natural levels of radon and medical exposures. A dose constraint of 0.3mSv/yr was established for the public from all radionuclides and all pathways for the Project, as recommended by Health Canada (2010a). The dose constraint represents a dose lower than the public dose limit that ensures the combined dose from multiple sources does not result in exceedance of the public dose limit. Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m<sup>3</sup>" (p. 10-44).</p> <p><b>Rationale:</b> Calculating radon separately from all radionuclides may underestimate the health risks by not considering combined doses from multiple sources when comparing to the public dose limit constraint of 0.3 mSv/yr recommended by Health Canada (2010a).</p>	1. Provide clarification on how combined doses from all sources would be accounted for in respecting the public dose limit of 0.3 mSV/yr if radon concentrations are being calculated separately.	<p>Health Canada guidance recommends reporting the dose from radon separately. See HC PQRA(rad) document in Section 5.8 Total Dose "In general, it is appropriate to compare the combined dose from external and internal radiation to a dose limit or a reference dose and to compare radon to its own criterion."</p> <p>The existing tables will be kept the same for total dose without radon and a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Note that total dose for the camp worker with radon included would be 0.15 mSv/year which is lower than the defined dose constraint of 0.3 mSv/yr. Additionally, the following text will be added to Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".</p>	Per the IR response a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS will be updated to include the following statement, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".
IR-183	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C	<p><b>Context:</b> Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.	Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. As noted in responses to IRs 185, 186, and 187, some revisions to Appendix A are detailed in Attachment IR-183 to 187.	Changes to Appendix 10-C of the EIS, including example calculations in Appendix A of Appendix 10-C, are as described in response to IRs 185, 186 and 187 (see Attachment IR-183 to 187).
IR-184	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C, 2.0	<p><b>Context:</b> It is stated in Appendix 10-C, section 2.0 that: "In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers."</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p> <p><b>Rationale:</b> The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.	The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation. See Attachment IR-183 to 187.	Per the IR response, in Section 2.0, p.2-1, of Appendix 10-C of the final EIS the following text will be deleted: <del>In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.</del>
IR-185	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2  Appendix 10-C Table 3.10-3.12	<p><b>Context:</b> The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.	The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3 and have changed inputs for drying and packaging in response to IR-186, a revised table is provided here (see Table A.3 in Attachment IR-183 to 187) that will replace Table A.3 in Appendix A of Appendix 10-C.	Per the IR response, revised Table A.3 from the memo will replace Table A.3 in Appendix A of final EIS Appendix 10-C. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same small changes in external dose (see Attachment IR-183 to 187).
IR-186	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6 Section 10.2.4  Appendix 10-C, Section 3.2	<p><b>Context:</b> In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.</p> <p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: "For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA."</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: <i>No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</i></p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p><b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the</p>	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>	<p>A very conservative dust level in drying and packaging areas had been used (representing equipment sources of dust to the exhaust system). While the dust hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for the drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 in Attachment IR-183 to 187).</p>	Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of EIS Appendix 10-C will be revised to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to reliance on PAPR as an exposure control will be removed from text throughout the EIS.

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				radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i> .			
IR-187	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6  Appendix 10-C, Section 3.3, 6.0	<p><b>Context:</b> The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p> <p><b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p>	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>	As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 provided in Attachment IR-183 to 187). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.	Per the IR response Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to routine use of PAPR as an exposure control will be removed from text throughout the EIS. Mitigation measures will be described as per the hierarchy of controls.
IR-188	CNSC	Human Health with respect to radiation exposure	Section 10.2.4	<p><b>Context:</b> The following is stated in section 10.2.4: “Dust inhalation is also a potentially substantial component of worker dose at the core shack. At this location, PAPR will not be required; however, N95 masks will be used, and dust levels will be monitored here...It may be possible to increase air exchange in the core shack, above the planned six exchanges per hour, should this be necessary. This would also reduce radon exposure in the core shack.”</p> <p>If it is possible to increase air exchanges in the core shack, it is not clear why this was not assessed and incorporated in the design of the core shack.</p> <p><b>Rationale:</b> It appears that a control measure (e.g., air exchange protocols in the core shack) to reduce the exposure to workers has been identified. However, it is not certain if it has been formally documented to ensure that it is incorporated in the engineered design of the core shack.</p>	Provide details on how the control measures to reduce the exposure to both workers through the air exchange protocols in the core shack have been formally documented to ensure that it is incorporated in the engineered design of the core shack.	Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. The engineering design of the core shack including control measures to reduce core shack worker exposure will be included in the detailed design and the core shack HVAC design criteria will be provided to the CNSC during Project licensing. The design mitigation measures in the EIS (Appendix 10-C) include: - Ventilation (assumed as 6 room changes per hour) - Monitoring of dust and radon, and worker doses (assumed 3 cores in shack, calculated radon level as 1.18E+3 Bq/m <sup>3</sup> , and assumed dust level as 0.0675 mg/m <sup>3</sup> ) - Managing worker exposure time and dose (time assumed as 120 d/a, 11 h/d) Although use of N95 masks was mentioned, masks were not factored into the exposure estimation.  As described in Section 10.2.4 Mitigation Measures, worker health is managed under the Radiation Protection Program (RPP), which is a worker health and safety plan specifically for radiation exposures. The RPP designates the roles and responsibilities of Denison and contractors, specifies the radiation dose limits, action levels and administrative levels, describes procedures to monitor and manage worker exposures (dust and radon monitoring, personal dose monitoring), and describes the processes for training and record-keeping. The successful implementation of the RPP, in conjunction with in-design measures described for the various project activities, is key to maintaining acceptably low doses of radiation exposure to workers during all phases of the Project.	No updates to the draft EIS are needed based on this IR response.
IR-189	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<p><b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”</p> <p>In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”</p> <p><b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.</p>	<p>Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70% lichen in the diet.</p> <p>See also related: IR-138.</p>	A second woodland caribou with a diet of 70% lichen, 20% browse, and 10% macrophytes was modelled for comparison to the existing woodland caribou with a diet comprised of 50% browse, 20% lichen and 30% macrophytes. Compared with the woodland caribou with the lower lichen diet (50% browse, 20% lichen and 30% macrophytes), the predicted total radiological dose for the woodland caribou with the higher (70%) lichen diet increased 65% to 0.0118 mGy/d, which is below the 2.4 mGy/d radiation dose benchmark for terrestrial biota. The predicted maximum hazard quotient (HQ) for the woodland caribou with higher (70%) lichen diet would generally increase by 5 to 81% with the exception of copper and molybdenum where the HQ decrease due to the copper and molybdenum concentration in lichen being lower than in browse. However, all HQs for both the woodland caribou with the lower and higher lichen diet are below the benchmark of 1 for all COPCs.	No updates to the draft EIS are needed based on this IR response
IR-190	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)  Appendix 6, Table 5 (p. 16)	<p>NO2 criteria is not being consistently compared.</p> <p><b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.</p> <p>Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.</p> <p><b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.</p>	<p>1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.</p>	The CAAQCs are applicable to measured ambient air concentrations over a three-year period and are not applicable to modelled results from a single facility. In technical meetings between Denison and ENV, the province agreed to the approach of utilizing 1-year of site-specific meteorological data. Use of the CAAQCs would require a three-year site specific data set. Denison agrees to using the 2025 CAAQCs for NO2 in future mitigation and follow-up plans.	No updates to the draft EIS are needed based on this IR response
IR-191	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-9 (p. 3.36) and Table 3-10 (p. 3.46)	<p>Non-threshold substances are not included in screening and monitoring plans.</p> <p><b>Context:</b> Fine particulate matter (PM2.5) is not being considered further in secondary air quality screening for short and long-term exposure at human and ecological receptors because it is not predicted to exceed the screening values of the Ontario Ambient Air</p>	<p>1. Include PM2.5 and PM10 in the secondary air quality screening for short and long- term exposure at human receptors.</p> <p>2. Include PM10 and PM2.5 in the air quality monitoring plan as they are non- threshold substances.</p>	1. PM2.5 and PM10 baseline (background) concentrations were compared to the Project AQ Criteria in Appendix 6-A, Table 5: Model Predicted COPC Concentrations for the Construction Scenario. PM2.5 and PM10 background concentrations were found to be below the Project AQ Criteria. Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5. As noted by the reviewer, PM2.5 was not included for the secondary air quality screening because the predicted maximum concentrations (which includes background air concentrations) did not	Per the IR response, Section 3.2 in Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5.  The commitment to include PM10 and PM2.5 to the air quality monitoring plan during



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			Section 6.1.8 (p. 6-44)	<p>Quality Criteria (OAAQC) or the Canadian Ambient Air Quality Standards (CAAQS) for both annual and 24-hour average periods (Tables 3-9 and 3-10). Furthermore, it is not compared against the baseline for analysis.</p> <p>Table 3-9 indicates that coarse PM (PM10) is predicted to exceed the 24-hour CAAQS during all phases of the project. However, Appendix 10-A p. 3.46 states that, “There were no exceedances of PM2.5 which is generally considered to be a more reliable indicator of potential health effects. However, health effects would be infrequent and reversible, subsiding after exposure; therefore, PM10 was not considered for further quantitative assessment in the ERA.”</p> <p>PM10 and PM2.5 were not included in the air quality monitoring plan (Section 6.1.8).</p> <p><b>Rationale:</b> Particulate matter and NO2 are considered non- threshold pollutants, meaning that health effects can occur at any level of exposure, The CAAQS for PM2.5 PM.10, and NO2 recognize that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). The CAAQS values should not be construed as limits to which polluting up to is allowed. In addition, based on the principles of keeping clean areas clean and continuous improvement, proposed mitigation measures should not be confined to meeting the standards but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>Furthermore, although health risks associated with PM2.5 are higher than those associated with PM10, both fractions are considered non-threshold pollutants and identified by IARC (2013) as causes of cancer.</p> <p><b>Reference:</b> [1] International Agency for Research on Cancer (IARC). 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. Lyon: International Agency for Research on Cancer.</p>	<p>3. Provide a discussion of the significance of predicted exceedances of health- based standards.</p> <p>4. Identify additional mitigation measures to reduce concentrations of non- threshold air contaminants associated with the project.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the <a href="#">2025 CAAQS Management Levels</a> to develop mitigation measures that reduce project contributions of non-threshold pollutants (e.g., PM2.5, NO2).</p>	<p>exceed the Project AQ Criteria. This is considered an appropriate approach as PM2.5 is not exceeding an acceptable risk level for PM 2.5. In the case of PM10, this constituent was included in the secondary air quality screening as it exceeded its Project AQ Criteria.</p> <p>2. Denison agrees to include PM10 and PM2.5 as part of the air quality monitoring plan during construction and determine based on adaptive management if monitoring during future phases is required.</p> <p>3. PM10 and PM2.5 are associated with adverse human health effects because these particulate sizes can be inhaled and entrained within the respiratory system (WHO, 2006). Although there are a broad number of health effects associated with the inhalation of PM10 and PM2.5, the effects target primarily the respiratory and cardiovascular systems. Epidemiological studies indicate that the adverse effects of PM are evident for both short-term and long-term exposures of PM, with the risk for adverse health effects increasing with increased exposure duration (WHO, 2006). As such, the exceedances of PM10 health-based standards, as noted in Appendix 10-A, Section 3.2.1.3.2.2, is the potential for unacceptable adverse effects associated with respiratory symptoms such as coughing or difficulty breathing, or asthma symptoms and chronic bronchitis, with effects being reversible and subsiding after exposure.</p> <p>4. The results of the air quality assessment and ERA do not warrant additional mitigation measures for air quality. However, Denison agrees to using the 2025 CAAQCs in future mitigation and follow-up plans.</p> <p>References: World Health Organization (WHO). 2006. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide Global update 2005, Summary of risk assessment.</p>	construction will be added to Section 6.1.8 and Section 16 in the EIS.
IR-192	CNSC	Human Health with respect to radiation exposure	Appendix 10-A (ERA), Section 3.1.1.2, including Tables 3-1 and 3-2	<p><b>Context:</b> Section 3.1.1.2 in Appendix 10-A (ERA) provides the method of how select constituents including cadmium, chromium, selenium and lead-210 were determined. This section does not mention how the other constituents as listed in Tables 3-1 and 3-2 are determined.</p> <p>The values for Th-230 and U-238 in Table 3-1 are unexpected. Typically, these values should be at equilibrium.</p> <p><b>Rationale:</b> The technical basis for the selection of constituents of concern is required as part of the environmental and human health risk assessments.</p>	<p>1. Provide the methodology of how all listed constituents are determined.</p> <p>2. Provide the rationale as to why Th-230 and U-238 are not in equilibrium.</p>	<p>1. In the first paragraph of Section 3.1.1.2 of the ERA (Appendix 10-A), the text explains that for most constituents the effluent values were based on the results from lab tests conducted by Denison, with a safety factor of three included. Cadmium, chromium, and selenium were singled out because the effluent quality for those constituents were determined based on the back-calculated concentration from a water quality guideline. As stated in the response to IR-117, the ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>2. The effluent quality for Th-230 and U-238 were based on lab results from Denison with a safety factor of 3. U-238 and Th-230 are not expected to be in secular equilibrium in the effluent as they have come out of a chemical process in which uranium and thorium partition differently. The effluent quality will continue to be refined through the licensing process based on continued testing conducted by Denison. No changes to the EIS.</p>	Per the IR response, a minor edit, same as response to IR-117. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".
IR-193	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.1.2  Section 8.2.4.2.3	<p><b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>1. Provide acute and chronic water quality thresholds for all required COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>1. The application of acute water quality thresholds will be added to Section 8.2.4.2.3 and will be used to refine the effluent quality during the licensing phase (see the response to IR 114 for the updated mixing zone model results). The effluent presented in Table 8.2-9 is based on maximum effluent concentrations; however, Denison is committed to ensuring all effluent released will be below MDMER limits as well as short-term CCME guidelines for protection of aquatic life.</p> <p>2. Water quality thresholds have been applied appropriately in the draft EIS and fit for purpose. Water quality thresholds in Section 3.1.1.2 of the ERA (Appendix 10-A) were based on site-specific hardness of 5.26 mg/L (95th percentile of LA-5 and LA-6). This was to provide a conservative screening for COPCs to be carried forward for further quantitative assessment in the ERA. Water quality thresholds in Section 8.2.4.2.3 are based on Project induced hardness which is assumed to be 250 mg/L. This results in known discrepancies for some water quality parameters that are hardness induced such as cadmium, copper, zinc, and sulphate.</p>	Per the response the application of acute water quality thresholds will be added to Section 8.2.4.2.3 and where applicable are presented in Attachment: IR-114.
IR-194	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li></ol>	<p>1. As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</p> <p>2. Provide the information on predicted maximum receiving</p>	<p>1. See response to IR-114. No revisions to Appendix 10-A, ERA are needed based on the response.</p> <p>2. See response to IR-114 for the predicted maximum receiving environment surface water concentrations for constituents regulated under Schedule 4 of MDMER. As indicated in Section 3.1.1 of the ERA in Appendix 10-A a long list of constituents was initially identified for</p>	No EIS updates are anticipated to address this IR.

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				<p>2. Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</p> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided.</p>	<p>environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</p> <p>3. Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</p> <p>4. Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment.</p>	<p>consideration in the ERA based on they are known to be present in treated effluent, have existing water quality guidelines or were identified in MDMER (with the exception of cyanide). The focus of the MDMER constituents were those regulated under Schedule 4. Denison will monitor for all MDMER constituents with required monitoring in the environment. This will be included as part of Denison's Effluent and Emissions Plan to support licensing.</p> <p>3. As indicated in Section 3.1.1.1 of the ERA in Appendix 10-A the long list of constituents was reduced further based on potential for exceedance of a water quality guideline (for both protection of human health and aquatic life). Any MDMER constituent that was identified as exceeding a water quality guideline was considered a COPC and assessed further in the ERA (see Table 3-1 in the ERA). For example, effluent quality for arsenic, copper, and zinc which are all Schedule 4 constituent were identified as COPCs in the ERA based on exceeding a water quality guideline.</p> <p>4. The ERA followed the guidance in CSA N288.6-22 which does not require COPCs with elevated baseline concentrations to be considered COPCs for further quantitative assessment in the ERA. Clause 6.2.5.9 indicates that constituents with naturally elevated concentrations should be excluded from further consideration as a COPC. As indicated in Section 8.2.3.3 of the EIS constituents in baseline water quality that exceeded water quality guidelines included aluminum, and occasional exceedances for cadmium, iron, and lead. All of these constituents were considered in the ERA screening; however, were not identified for further assessment (other than cadmium) since based on a conservative screening of effluent quality water quality guidelines would not be exceeded. Section 8.4.3.2.3 of the EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines. Section 3.1.2.3 of the ERA in Appendix 10-A provides the predicted maximum sediment quality in Whitefish Lake for a list of constituents. These concentrations included background concentrations and are screened against sediment quality guidelines. The only constituents that exceed sediment quality guidelines are molybdenum and selenium; however, other COPCs are assessed further in the ERA (see Table 3-14 in the ERA in Appendix 10-A) even though sediment quality guidelines are not anticipated to be exceeded.</p>	
IR-195	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>	<p>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</p> <p>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</p> <p>3. Update ERA figures and conclusions as needed.</p>	<p>1. Per the draft EIS effluent is conservatively assumed to be discharged to the Whitefish Lake Middle during the operations (15 years) and decommissioning (5 years) phases at the same constant discharge rate of 36.5 m³/hr (10.1 L/s) with the same stable effluent quality as shown in Table 3-2. Therefore, the modelled maximum COPC concentrations in water are the same for operations and decommissioning phases (which is considered conservative), the same peak concentrations appear annually due to the variation of the monthly local inflow. Since COPCs are accumulated in sediment, the modelled maximum COPC concentrations in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning in Figure 3-3.</p> <p>2. The predicted effluent quality during the Project decommissioning phase is expected to be the same as those during the operations. Effluent was set to be released during operations but not during the decommissioning phase in the current model.</p> <p>3. The model has been updated to include effluent discharge during the decommissioning phase, and the ERA figures and result tables will be updated in the next submission accordingly. <b>See attachment IR-195 for the updated Table 3-3 and Figure 3-2.</b></p>	Per the IR response, edits will be made to Table 3-3 and Figure 3-2 in Appendix 10-A. These edits are provided in Attachment IR-195.
IR-196	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.3	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>	<p>1. Provide further information and justification for the selection of less stringent thresholds.</p> <p>2. Update the ERA as needed.</p>	<p>1. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the selection of the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.</p> <p>2. The guidelines for copper, lead, and vanadium from Burnett-Seidel and Liber (2013) were inadvertently excluded from Table 3-6 in Appendix 10-A which results in changes to selected screening values for copper (9.1 mg/kg dw), lead (16.3 mg/kg dw), and vanadium (35.1 mg/kg dw). The predicted sediment quality for copper, lead, and vanadium are still below the sediment quality guidelines; therefore, no changes to the table are needed other than changes to the sediment quality guidelines identified above. The updated Table 3-6 is provided in Attachment IR-196 – red text indicates a change from the existing table in the draft EIS, Appendix 10-A.</p> <p><u>References:</u></p> <p>Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.</p> <p>Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.</p>	Per the IR response edits to Appendix 10-A, Table 3-6, as shown in Attachment IR-196, will be made in the final EIS.
IR-197	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<p><b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.</p> <p><b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that</p>	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in	Per the IR response, the following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from



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				are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.		the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible." References: Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I	the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."
IR-198	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.  Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.  <b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.	The response to IR-198 is provided in Attachment IR-198.	No updates to the draft EIS are needed based on this IR response.
IR-199	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.  <b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.	1. Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.  2. Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).	1. Model calibrated concentration inputs of COPCs were preferable over measured baseline concentrations because of the interrelation of metals and radionuclides between water and sediment. In all cases the measured baseline concentrations were used to verify that the modelled relationship between water and sediment for each constituent was considered valid. The geometric mean values of the measured baseline data were preferentially used as the baseline inputs for COPCs that had a good amount of measured data over the detection limit, which is the case for most of the COPCs in Figure 3-2 (where the modelled values overlap with the measured geometric mean values in the plots). In the case of COPCs for which most or all measured values in water were under the detection limit (i.e., 140 out of 142 measured selenium concentrations are below its detection limit), but their sediment concentration measurements were over the detection limit, the baseline water concentration was calculated from the geometric mean of the sediment measurements using the regional water-to-sediment partitioning coefficients (Kd).  2. The "poor" agreement between calibrated and measured concentrations for selenium, uranium and lead-210 is the result of more than 95% of the measured concentrations in water being reported as less then the detection limit for selenium (140 out of 142), uranium (141 out of 142) and lead-210 (136 out of 142). It's unlikely that these three COPCs are under-predicted in water.  Poor agreement between modelled and measured concentrations in sediment for arsenic and radium-226 may be a result of only one sampling campaign being available for sediment. The modelled sediment concentrations can be refined in the future when more measured sediment data are available as the Project progresses. Even though arsenic and radium-226 are conservatively over-predicted in sediment, no significant adverse effect on either aquatic or terrestrial populations or communities are predicted during the Project phases or during the future centuries.	No updates to the draft EIS are needed based on this IR response.

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IR-200	HC	Indigenous Peoples' health / Socio-economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)	<p>Indigenous consultation should be included in the Country Foods analysis.</p> <p><b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following</i>: “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p>1. Evaluate the suitability of using the 2017 EFRN survey results and consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.</p> <p>2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>	The 2017 report was authored by ERFN and as such there is no need for Denison to ask ERFN to validate their own report.	No updates to the draft EIS are needed based on this IR response.
IR-201	ECCC	Aquatic species	Appendix 10-A (ERA), Section 5.0	<p><b>Context:</b> For the ERA methodology the Proponent followed CSA N288.6-12 for the assessment of risk to aquatic biota from radionuclide and non-radionuclide COPCs. This is the 2012 version, and a more recent 2022 version was publicly released.</p> <p><b>Rationale:</b> The Proponent should review the most up-to-date version of the standard to ensure no changes to the methodology of the COPC exposure assessment are required for the ERA.</p>	Update the COPC exposure assessment methodology in the ERA using the most recent CSA N288.6-22 standard, as needed.	Denison confirms that the updated CSA N288.6-22 was reviewed and that no changes to the ERA methodology are required. Denison confirms that the ERA is also compliant with CSA N288.6-22. The EIS and ERA (Appendix 10-A) will be updated to reference the most recent 2022 version of the standard, CSA N288.6-22.	Per the IR response all references to N288.6-12 will be replaced with N288.6-22 in the EIS and Appendix 10-A.
IR-202	CNSC	QA/QC	Appendix 10-A (ERA), Section 6.0-Quality Assurance	<p><b>Context:</b> This section provides only Quality Assurance (QA) of the ERA, including planning and preparation of the ERA.</p> <p><b>Rational:</b> The Quality Control (QC) aspects are not included. Both QA and QC aspects provide confidence that ERA results are defensible and fit for use in decision-making.</p> <p>The N288.6 (Clause 10.2) requires that “Appropriate QA/QC requirements shall exist for all aspects of the ERA and should be specified prior to conducting the ERA”.</p>	Please include appropriate QC aspects, as per a Clause 10.2 of the N288.6.	<p>The ERA (Appendix 10-A) was completed in alignment with CSA N288.6-22 including the specific QA/QC requirements in Clause 10.2 and 10.3 of the standard. The ERA following the Ecometrix Quality Management System for review and verification ensuring that modelling results were correct and accurate. The ERA report as well went through a thorough review and verification by senior technical staff. The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered fit for use in the ERA.</p> <p>Another layer of review included Denison's review of the ERA. Final acceptance and submission of the ERA with the EIS package indicated Denison's acceptance of the final product. Section 6.1 of the ERA in Appendix 10-A will be updated to include some additional discussion of QA/QC activities. Specifically, the following will be added. "The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements</p> <p>Denison provides inputs to the ERA based on metallurgical test work that has been conducted under the QA/QC protocols of the Saskatchewan Research Council. The metallurgical test plan and test results are validated by a third-party Qualified Person. Once Denison provides the input values to be utilized in the ERA, Ecometrix summarises the data and provides the summary to Denison for acceptance by a Professional Engineer or a Professional Geologist prior to running the ERA model.</p>	<p>Section 6.1 pf Appendix 10-A will be updated to include the following statement:</p> <p>"The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements."</p>
IR-203	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<p><b>Context:</b> This section of the ERA states “if treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p>	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the maximum upper bound discharge rate scenario.	<p>As part of the sensitivity analysis, if treated effluent is released at the maximum upper bound discharge rate, the modelled vanadium concentration in sediment is expected to be below the Severe Effect Level (SEL) of 160 mg/kg but exceed the Lowest Effect Level (LEL) of 35.2 mg/kg in Whitefish Lake Middle/South. The SEL and LEL values are defined by Thompson et al. (2005).</p> <p>The cadmium concentration in Whitefish Lake Middle/South is expected to be over the CCME sediment quality guideline of 0.6 mg/kg dw for the maximum upper bound discharge rate scenario.</p>	Per the IR response, Section 6.2 of Appendix 10-A will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "

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				<b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.		The plots in Figure 6-2 are correct. The statement in Section 6.2 will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "	
IR-204	CNSC	Human health with respect to hazardous contaminants	Appendix 10-A (ERA), 7.1.1, Non-radiological Human Health Risk Assessment	<b>Context:</b> In the human health risk assessment of the non-radiological COPCs, it was determined that the project incremental HQ was predicted to remain below 0.2 for all non-carcinogens and all pathways during all phases of the project, except for selenium for the fisher/trapper at Russell Lake from the fish ingestion pathway.  <b>Rationale:</b> Given that the fisher/trapper receptor will likely be exposed to higher concentrations of selenium from the consumption of fish at Russell Lake, there is an elevated risk of selenosis in exposed individuals. This potential for selenosis would be further exacerbated in individuals who consume fish taken from other lakes closer to the mining operation. There is, however, no discussion of mitigation of these risks to exposed individuals.	Please provide a discussion of measures that could be applied to mitigate the risk of selenosis in exposed individuals who consume fish from Russell Lake and other waterbodies closer to the mining operation.  <b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following: <ul style="list-style-type: none"><li>Selenium abatement technologies may be considered to eliminate or reduce selenium in effluent entering the lake system.</li><li>If HQs continue to exceed 0.2, then it may be necessary to post fish consumption advisories, in consultation with the Medical Officer of Health for the jurisdiction where the project is located.</li></ul>	Health Canada (2017) conducted a screening assessment of selenium and its compounds under the Canadian Environmental Protection Act. Selenium is an essential element for humans; however, there may be potential human health risks at elevated exposure levels. Selenosis (also known as chronic selenium toxicity), is considered by Health Canada as the critical health effect for selenium. The symptoms of selenosis may include: intestinal upset, hair loss, nail loss, changes in nail morphology, excessive decay and discolouration of teeth, garlic odour in breath, nervous system abnormalities, and fatigue. The BC MOE (2014) identified 7.3 mg/kg dw of selenium in fish as an appropriate limit for subsistence fishing. This would equate to 1.8 mg/kg fw, assuming a dry weight to fresh weight ratio of 0.25 from CSA N288.1-20 for fish. The maximum selenium concentration in Whitefish Lake (LA-5) is predicted to be 1.57 mg/kg fw for northern pike and 2.29 mg/kg fw for white sucker (see Table B.5 in Appendix 10-A). The maximum predicted selenium concentrations in McGown Lake for northern pike and white sucker are 1.02 mg/kg fw and 1.39 mg/kg fw, respectively. The maximum predicted selenium concentrations in Russell Lake for northern pike and white sucker are 0.81 mg/kg fw and 1.06 mg/kg fw, respectively. As such, based on current predictions in lakes where fish consumption is assumed to occur (McGowan Lake and Russell Lake), fish tissue concentrations for selenium are expected to be below the BC MOE limit, indicating people eating fish from these lakes would likely be protected from selenosis.  Any further selenium abatement technologies will be considered through the BATEA process during licensing.  <b>References:</b> British Columbia Ministry of Environment, Beatty JM, Russo GA. 2014. Ambient Water Quality Guidelines for Selenium. Technical Report Update. Water Protection and Sustainability Branch. Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment. 270 pp Health Canada. 2017. Screening Assessment: Selenium and its compounds. December. <a href="https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71">https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71</a>	No updates to the draft EIS are needed based on this IR response.
IR-205	CNSC	Geology and Groundwater	Section 7, appendix H	<b>Context:</b> In this appendix the analytical concentration of various groundwater samples taken from monitoring wells is reported.  <b>Rationale:</b> There is one sample labeled as “Tracer Tank” with no definition available in the current report. It is difficult to judge whether the results presented are relevant to the EIS and how it may impact the findings therein.	Please clarify the definition of “tracer tank”.	The 'Tracer Tank' label referred to the predetermined KCl tracer concentration of 15% (75,000 to 85,000 ppm Cl and K) utilized for injection as part of the 2021 Tracer Test. This clarification will be added to Appendix 7-A, Appendix H.	Per the IR response the clarification will be made as indicated in Appendix 7-A, Appendix H.
IR-206	ISRD	Current use of lands and resources for traditional purposes	Section 11 Section 12 Section 15 Section 16	<b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.  <b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEEA 2012.	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find solutions or continue discussions with the potentially impacted Indigenous Nations and communities.	Refer to response to IR-28.	Refer to IR-28.
IR-207	CNSC	Current use of lands and resources for traditional purposes	Section 11, Perceived Risks to Lands and Resources	<b>Context:</b> The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are “ <i>perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well-being</i> ” (ERFN and SVS 2022a).” (p. 11-11)  Resource harvesters may experience Project-related disturbances and, depending on how these changes are perceived, it may cause some resource harvesters to avoid the Project Area.  Reductions in harvests may occur based on fear or uncertainty about the ongoing quality of country foods. For example, “ <i>People stopped picking berries in this area when Key Lake mine was established because of concerns about health impacts</i> ” (ERFN and SVS 2022b).  <b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEEA 2012). For the mitigation measures intended to address the effects of changes to the	How does Denison plan to work directly with Indigenous Nations and communities who currently use the potentially impacted areas, including the RSA, to mitigate and monitor the perceived risks and/changes to the RSA?  Has Denison had discussions with the potential impacted Indigenous Nations and communities on how fear and avoidance behaviors and related impacts on traditional land use will be mitigated, especially within the RSA?  Additional information is needed to determine if Denison has engaged directly with the Indigenous Nations and communities to develop potential mitigation measures to address fear and avoidance impacts, such as a community monitoring program, which could help to reduce the perceived risk to lands and resource use through education, collaboration, and long-term monitoring with Indigenous Nations, in order to build trust.  <b>Suggestions for mitigation and follow-up measures:</b> It is recommended that Denison consider engaging with potentially impacted Indigenous Nations and communities on the collaborative development and implementation of a monitoring program to help address concerns about potential impacts on lands and resources as a result of the	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, and in part due to their continued efforts to engage meaningfully with Indigenous communities relative to the Project which support continued relationship and trust building. Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time. Denison expects that important country foods harvested for food and cultural purposes (i.e. moose, fish, etc.), surface water quality, and other areas of interest will form part of this monitoring program. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.  The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are	No updates to the draft EIS are needed based on this IR response.

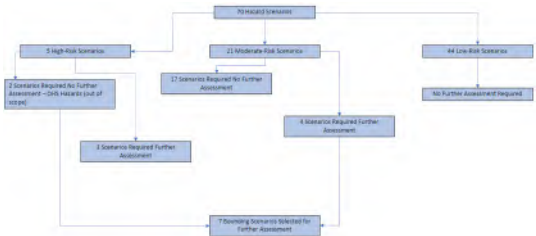


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				environment for Indigenous peoples, the proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.”  These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.	project. The program(s) could help to monitor changes over time related the potential perceived risk of contamination of the land from Project activities and subsequent effects on the quality of fish, vegetation, and wildlife resources, which in turn could affect the safety of traditional foods and human health, and impacts on culture practices, and overall community well-being that travel to region yearly.	currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).	
IR-208	CNSC	Indigenous physical and cultural heritage	Tables 11.1-3, 11.1-4 and 11.1-5  Section 11.1.3.2.6	<b>Context:</b> Black bear is listed as a species hunted by several Indigenous nations, including Pinehouse residents. CNSC participated in an in-person engagement with Pinehouse residents in October 2022 and bears eating waste was identified as a concern for hunting and consumption.  <b>Rationale:</b> Perceived risk of eating animals that are contaminated by hazardous or radiological wastes could deter community members from harvesting animals that are normally part of their traditional diet. Fencing for waste was specified as a deterrent for human trespassers, not animals.	Please specify measures that Denison will take to ensure bears and other animals do not scavenge from waste facilities.	Denison has proposed a number of Project design measures and wildlife-specific mitigation measures that will limit wildlife scavenging activities. Project design measures include waste characterization and segregation, and fencing the domestic and industrial landfills (refer to Section 2.8 Project Design Features and 9.3.5.1 Project Design Measures). Importantly, Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the landfill generating odours. For the wildlife-specific mitigation measures, refer to Section 9.3.5.2.5 Wildlife Deterrence and Prevention of Wildlife Entrapment and Section 9.3.5.2.8 Waste and Hazardous Materials Management.	No updates to the draft EIS are needed based on this IR response.
IR-209	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).  <b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)	Please provide detailed proposed mitigation measure for KML’s concerns related to loss of cultural knowledge and language should they work for Denison.	Denison respects the concern raised by KML regarding language and culture related to working at an industrial operation. Denison and KML will be working on specific items of interest to mitigate these types of concerns through private contractual arrangements, which may include specific mitigation and accommodation measures in this respect.  Mitigation measures associated with potential effects to cultural continuity (including knowledge transfer and language) are described in Section 12.1.5 and include: - working with Indigenous COIs to understand culturally important periods relative to harvest times and cultural camps to facilitate Indigenous employees taking time off to participate in such activities; - implementation of Denison's Indigenous Peoples Policy and advancement of reconciliation - Using a commuter rotation system has also shown to be effective in allowing Indigenous employees continued opportunities to spend time on the land, and important factor in the transmission of knowledge and language (see Section 11 for a description of potential effects to land use).  In discussions with Indigenous Communities of Interest since the filing of the draft EIS, it has become apparent that Denison should add additional commitment / mitigation measure in relation to this area of interest, as follows: - Encouragement to speak languages of choice while at site, except during safety sensitive situations	Section 12.1.5 of the final EIS will be updated to include the additional commitment / mitigation measure in relation to culture and language, as follows:  - Encouragement to speak languages of choice while at site, except during safety sensitive situations.
IR-210	CNSC	Current use of lands and resources for traditional purposes	Section 12.1.4.2.2, Potential Effect 2: Change in Traditional Diet, Perceived Suitability of Country Foods (p. 12-26)	<b>Context:</b> The EIS states: “Project activities could change the perceived suitability of country foods. An ecological risk assessment (ERA) was conducted to consider both radiological and toxicological risks to ecological receptors such as terrestrial and aquatic invertebrates, terrestrial and aquatic vegetation, fish, and terrestrial and aquatic mammals and birds. Results for the radiological assessment predicted no exceedances of the radiation dose benchmark for the ecological receptors. For non-radiological COPCs, no exceedances were predicted except for selenium in fish from Russell Lake, based on a conservative dietary assumption for one resource user. The traditional foods diet for the fisher/trapper is conservative as it assumes that their annual fish consumption (183 kg of fish per year) would be obtained from Russell Lake, meaning the exceedance of the benchmark for selenium from fish would only occur if fish were only sourced from this one lake. This one exceedance could potentially change the perceived safety of country foods for community members and make country foods a less desirable part of a traditional diet.  <u>Experience from other uranium operations in northern Saskatchewan suggests that resource use will continue despite the potential selenium exceedance. An examination of members of the Hatchet Lake Denesutliné First Nation who live in Wollaston Lake near the Rabbit Lake operation found that over years of being active on the landscape both with and without the presence of the uranium industry, members had developed their own culturally appropriate practice of risk assessment and management based on their relationship with the land. Hatchet Lake Denesutliné First Nation members appear to be more concerned with the direct effects of uranium mining on the local environment and less concerned about uranium mining’s effects on their health through consumption of plants and animals. This is likely due to their high level of confidence in recognizing affected plants and wildlife and avoiding them (Elias et al. 1997).</u>  The usage patterns of the ERFN Trapper have similarly allowed for continued use and access to areas proximal to other uranium operations. The ERFN Trapper had a positive relationship with other uranium operations in the ILRU LSA. He also continued to trap (i.e., used his trapline in Fur Block N-18), fish, and opportunistically pick berries, and consumed those resources during operations (KPI Program 2021). Good relationships between Denison and a new trapper who eventually	Given concerns with psycho-social impacts and the influence of perception discussed by ERFN earlier on in the EIS, does Denison have information on the perspectives from Indigenous Nations and communities to validate this conclusion is applicable?	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, combined with the fact that ERFN, KML, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.  See also response to IR-212.	No updates to the draft EIS are needed based on this IR response.

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				takes over the trapline from the ERFN Trapper would promote continued use.” (p. 12-26)  <b>Rationale:</b> The underlined reference suggests that negative perceptions may not prevent traditional resource users from continuing to consume, due to adaptation to potential risks in the environment.			
IR-211	CNSC	Accidents and Malfunctions	Section 14.6.1, Bounding Scenario 1, Vehicle Accident and Aquatic Release of Radioactivity	<b>Context:</b> Scenario 1 describes a spill of uranium concentrate into the lake. It’s not clear how the ecological risk assessment was performed. It is stated that sediment concentrations in post-remediation conditions are expected to exceed the benthic invertebrate benchmark and that these results indicate that a spill of uranium concentrate could potentially affect benthic invertebrate populations following a spill, but the spatial extent would be limited. For water, it is stated that when evaluating the potential effect, a comparison was made between the results of the estimated short-term water quality 1,892 µg/L (1.892 mg/kg) and the guideline (33 µg/L). This indicates that there may be some aquatic species that could be affected, but the effects are expected to be transient as the water concentration quickly drops to a long-term level of 0.19 µg/L. However, when looking at dose to other receptors, the results of the ecological risk assessment indicated short-term ingestion of contaminated water resulting from an accident would not result in potential risks to grouse, vole, or deer, however rationale for how these receptors were chosen is not provided.  <b>Rationale:</b> It’s not clear from the EIS, why the receptors grouse, vole, and deer were chosen to evaluate ecological effects from a potential spill, and why they differ from receptors in the ERA. It is also not clear if the pathway from sediment ingestion/contact was considered for semi-aquatic receptors as they could be exposed to the increased concentrations post-spill. It is also not clear if SARA species exposure to sediment and water post-spill was considered.	Please clarify why grouse, vole, and deer were chosen as receptors for the ecological risk assessment performed for accidents and malfunctions scenario 1 and clarify if the sediment pathway to receptors post-spill was considered, as well as if SARA species were considered.	The indicated species were utilized to ensure representation of a variety of both aquatic and terrestrial species that could be affected by the release scenario to ensure relevant potential contaminant pathways were considered in the assessment, understanding however that exposure of local aquatic species was the most direct exposure pathway since Bounding Scenario 1 was a release to the aquatic environment.  To clarify, the sediment pathway to receptors post-release was consider in the assessment.  Also to clarify, specific SAR were not considered in the assessment; however as noted, representative aquatic and terrestrial receptors were considered that include the exposure pathways to which SAR species would also be subject and therefore the assessment and its results can be more broadly applied.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-212	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.  <b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).  The commitment regarding monitoring and follow-up activities appears limited to “ <i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i> ” (p. 14).  <b>Rationale:</b> Country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the predictions.	1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.  2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and the direct involvement of communities in monitoring, surveillance, and risk communication activities.	We refer the reviewer to the following sections of the draft EIS, which are more applicable as it concerns engagement activities within the context of information sharing related to follow-up and monitoring compared to the sections listed in the <i>Reference to EIS, appendices, or supporting documentation</i> column of the IR: <ul style="list-style-type: none"><li>- Draft EIS Section 1 Project Introduction and Overview. Refer to Section 1.7.5 Licensing and Permitting for text describing that the Project is proceeding through sequential EA and licensing process. While a preview of the permits, approvals, and licences required after the EA process is complete is important to consider and provides valuable context, detailed information needed to support licensing and permitting has not be included in the EIS.</li><li>- Draft EIS Section 2 Project Description. Section 2.9 outlines the timing and framework for the Project’s management system.</li><li>- Draft EIS Section 4 Engagement. Section 4.2 outlines Denison’s engagement approach. Section 4.7 outlines future engagement activities.</li><li>- Section 11 Land and Resource Use provides a fulsome assessment of both Indigenous (Section 11.1) and other (Section 11.2) land and resource use. These assessments include the Key Indicator of <i>perceived suitability of lands and resources therein</i>.</li></ul> 1. The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. Engagement on licensing requirements, such as the environmental monitoring program and the associated surface water quality and monitoring regime will occur later in 2023 and into 2024. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).  Denison’s plans are in line with Health Canada’s recommendations to go beyond passive dissemination of information and the intent is to solicit involvement of the Interested Parties during follow-up program development and subsequently execution.  Denison is committed to sharing information with Indigenous Communities of Interest (COIs) in a mutually agreed-upon fashion. Overall, the approach that will be utilized with respect to Indigenous community engagement will be aligned with Denison’s Indigenous Peoples Policy. Denison’s Indigenous Peoples Policy commits the company to respecting Indigenous knowledge and values regarding environmental stewardship and Indigenous peoples’ connection to the land. The relevant monitoring plans for the species/resources that support a traditional diet will reflect and incorporate these values, and will be reflective of the Indigenous COIs priorities. The monitoring plans when drafted will include more detail about	No updates to the draft EIS are needed based on this IR response.

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						<p>communication methods and their effectiveness would be assessed through ongoing engagement with communities.</p> <p>Denison will solicit input and involvement in program development and execution from Indigenous COIs. Environmental monitoring results will be presented in an accessible way including a focus on country food if relevant to Indigenous COIs. As the COIs with reserves and residential communities most proximal to the Project, Denison will be collaborating with English River First Nation and Kineepik Metis Local on a community-specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that surface water management and monitoring will form part of this information-sharing process. It is expected that fish species that will be monitored will be those species that have been identified as important by ERFN in their 2017 Country Foods Study, as well as using the KML Land and Occupancy Map and associated information. These programs may be adjusted based on community feedback throughout the life of the Project.</p> <p>Regulators will be involved with setting specific requirements for follow-up and monitoring, as well as reporting, through licence conditions (CNSC) and provincial approvals. A number of monitoring and reporting requirements will be generated through the completion of the environmental assessment process. Denison and its lifecycle regulators will be in regular communication throughout the life of the Project as part of routine reporting, site inspections, licence and permit renewals. Denison is committed to ongoing engagement with regulators and recognizes that this will include information sharing related to follow-up and monitoring results and any needed adaptive management plans.</p> <p>It is also noted for further reference that there are existing, non-Denison monitoring programs such as the CNSC's Independent Environmental Monitoring Program (<a href="https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm">https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm</a>), and the Eastern Athabasca Regional Monitoring Program (<a href="http://www.earmp.ca/">www.earmp.ca/</a>). Results from these programs provide relevant information and can complement Denison's Project-specific monitoring program. One forum for discussion of monitoring results is the Northern Saskatchewan Environmental Quality Committee (<a href="https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee">https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee</a>).</p> <p>2. The relevant focus for country food intake are changes in COPC concentrations. These are integrated into the CSA N288.6 framework with ongoing updates to the ERA with new monitoring results. There are very few parameters with intake guidelines where advisories would be implemented. Adaptive management triggers and conceptual triggers will be developed as the Project advances.</p>	
IR-213	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A	<p><b>Context:</b> The proponent states that the assessment of accidents and malfunctions began with the initial identification of hazard scenarios. Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components.</p> <p>The hazard identification was conducted to identify a comprehensive list of potential project-related accident and malfunction scenarios associated with the key project components and activities with further details provided in Appendix 14-A. The initial hazards were then screened qualitatively based on likelihood and consequence to determine overall risk level using a risk matrix approach. Bounding scenarios were then selected from this initial list of hazard scenarios.</p> <p>The results of numerical analyses (RESPEC, 2021) of detailed strip model suggest that the deformation imposed on the cemented steel casing from downward movement of the rock mass may exceed the assumed casing-strain yield limits and the failure limit locally after extracting the uranium ore. However, this potential hazard is not identified in the hazard identification.</p> <p><b>Rationale:</b> Exceedance of steel casing yield limits and failure limit would either compromise the steel casing integrity or damage the steel casing and result in the leakage of injected solution, which could impact on mine operation and contaminate the surrounding groundwater.</p>	Please include the hazard of steel casing yield or damage in the table of hazard identification evaluation and conduct an initial risk screening and further detailed assessment as required.	<p>Table 3-2 of Appendix A in the A&amp;M technical supporting document (Appendix 14-A) includes a hazard scenario "piping failure in the well field" that was characterized as a "low" likelihood scenario (Score 2) with "moderate" consequence (score 3) for an overall risk ranking of "low". This scenario is thought to generally be consistent with and cover off the scenario envisioned by the IR; nevertheless, and as recommended a new hazard scenario will be added to the hazard identification evaluation to specifically reflect the FIRT review comment.</p> <p>The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as Scenario 2.4 Well Casing Yield and/or Damage (refer to Attachment: IR-213 for the updated table). For reference, and based on hazard screening analysis, this scenario is evaluated to be a low likelihood scenario (2) with moderate consequence (score 3) for an overall risk ranking of low. The scenario is viewed as a low likelihood scenario due to the proposed multilayer design of the injection / recovery well design. Further, and contrary to the comment, we do not believe the RESPEC (2021) analysis shows an increased likelihood of subsidence that could be an initiating event to a pipe casing failure; rather, anything more than very minor ground subsidence in the well field is interpreted as a very low probability event. Potential subsidence and the analysis thereof is discussed in more detail in response to IR-21 and the reviewer is referred to that response for further information.</p> <p>The scenario is viewed as one having moderate consequence. Despite the fact the scenario would result in a temporary loss of control of mining solution associated with one or a limited number of injection/recovery wells the volume of solution would be limited to the volume of solution in the pipe(s) and the release would occur within the freeze wall where it would be contained limiting the spatial extent of effects and increasing the likelihood of success of recovery.</p> <p>Overall, and based on the screening methodology used for the hazard identification / screening process this scenario has been ranked as having a moderate level of risk and as a result would not be passed on for more detailed analyses in the accidents and malfunctions analysis.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>With respect to Appendix 14-A the following is noted. The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as shown in Attachment: IR-213. In addition, editorial changes to the report reflecting the increase of one additional hazard scenario being evaluated will be made (Section 4.0; " ... a total of 69 70 hazard scenarios were identified and evaluated.") and indicating an increase of one further scenario being characterized as having low overall risk (Section 4.0; "The balance of the scenarios evaluated, 41 42, were characterized as low-risk scenarios, ...").</p> <p>With respect to the EIS, editorial changes will be made in Section 14.5.5 to reflect the editorial changes highlighted above.</p>
IR-214	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A, section 3.2.3	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <ul style="list-style-type: none"><li>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is</li></ul>	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.	<p>The clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency.</p> <p>For reference, the proposed revisions to Appendix 14-A are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for transparency. Comments include rationale for likelihood or consequence scoring where requested by the IR.</p> <p>It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>As noted, the clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. The proposed revisions are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for clarity to support IR response review.</p>



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				<p>denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</p> <p>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</p> <p>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</p> <p>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</p> <p>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</p> <p>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</p> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>			<p>Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency. Specifically, the revisions identified in the tables will be reflected in changes to the text of Section 14.5.5 of the EIS describing the outcome of the screening process (including revision to Figure 14.5-3). Section 14.5.5 of the EIS will read as follows:</p> <p>“A summary outlining the results of the initial risk screening of accident and malfunction scenarios is provided in this subsection and summarized in Figure 14.5 3.</p> <p>Three of the hazard scenarios characterized as high risk were recommended for further assessment. An additional four moderate/ALARP-moderate scenarios were identified as requiring further detailed assessment for more accurate characterization of risk.</p> <p>Twenty-one of the scenarios evaluated were characterized as moderate-risk scenarios. Generally, the moderate-risk scenarios were deemed to represent a tolerable level of risk in consideration of proposed safeguards and design features that reduce the risk level to ALARP. As previously mentioned, four moderate/ALARP-moderate scenarios require additional detailed assessment for more accurate characterization of risk. The four moderate-risk scenarios that are subsequently assessed in more detail are associated with a contaminant release to the environment, which may have potential effects that are more far reaching than can adequately be assessed by the screening assessment. As such, a more quantitative evaluation was deemed appropriate.</p> <p>The remaining scenarios evaluated (44) were characterized as low-risk scenarios based on low likelihood of occurrence and/or low consequence in consideration of planned existing safeguards and design features. Low-risk scenarios were not carried forward for more detailed analysis as they were considered to be adequately characterized by the screening process.</p>  <p>Figure 14.5-3: Summary – Initial Screening of Accident and Malfunction Scenarios”</p>
IR-215	CNSC	Human health with respect to hazardous contaminants	Section 14.6	<p><b>Context:</b> One of the potential risks of a uranium mine and mill is a spill of untreated effluent.</p> <p><b>Rationale:</b> In the EIS, it doesn’t appear that the scenario of a spill of untreated effluent to the environment has been considered.</p> <p>A failure of the piping containing the untreated effluent could result in an uncontrolled release to the environment and could affect the groundwater, soil quality, and terrestrial biota.</p>	Please evaluate and provide the results for a bounding scenario of a spill of untreated effluent or provide justification for its exclusion.	The scenario envisioned in the IR has in fact been considered in the hazard screening process (Appendix 14-A) and based on that process the scenario was not passed on for more detailed analysis as a Bounding Scenario. More specifically, Table 3-12, Appendix 14-A, considers accident and malfunction scenarios associated with the wastewater treatment system, including equipment and piping failures, effluent clarifier overflows and equipment and control system failures. The overall risk ranking associated with these scenarios were ALARP-moderate, ALARP-moderate and low, respectively, in consideration of likelihood and consequence and design safeguards and features (i.e., mitigations). Per the evaluation methodology outlined in Appendix 14-A and EIS Section 14, these scenarios were not carried forward for further detailed assessment as they do not meet the threshold for such detailed analyses.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-216	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether the expected doses meet the dose limits set out in the Radiation Protection Regulations.</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.	<p>While it is understood that potential radiological doses to human receptors are an important consideration for operations such as that proposed by the Project, issues related to worker health are beyond the scope of the Accident and Malfunctions Assessment (Appendix 14-A), which focuses on environmental receptors. Worker health, including the issue raised by the review comment, will be addressed independently and part of the licensing process as required. This is why chemical toxicity was selected as the basis for the assessment of risk in this case.</p> <p>With specific regard to public risk the following is noted. Radiological risk was not considered an appropriate pathway of exposure in these scenarios since there is little chance of exposure to members of the public. As noted above, chemical toxicity was selected as the basis for the assessment of risk in this case since it is the relevant exposure pathway for these scenarios.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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IR-217	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.	<p>As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. This information is provided in a technical memorandum that accompanies this IR response/disposition table (please see Attachment IR-217). For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. The information in the technical memorandum will be added to Appendix 14-A during preparation of the Final EIS.</p> <p>As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.</p>	Based on the response, revisions to Appendix 14-A are needed. Specifically, the technical memorandum provided as Attachment IR-217 will be added in its entirety as an appendix (Appendix B) to technical supporting document Appendix 14-A.
IR-218	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.	Acknowledged. The transcription errors identified will be corrected in the final EIS as recommended. Refer to Attachment IR-218 for revised Table 14.6-5 and Table 8-5.	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the transcription errors noted will be provided, as follows:</p> <p><u>Revisions to Section 14:</u></p> <ul style="list-style-type: none"><li>- The last two rows of Table 14.6-3 will be removed.</li><li>- From Section 14.6.4.1, second to last sentence in first paragraph, “The flow rates considered for this assessment were 5<sup>th</sup> percentile annual flows of 10.9 m<sup>3</sup>/s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m<sup>3</sup>/s (average flow), and the 95<sup>th</sup> percentile annual flow of 24.67 m<sup>3</sup>/s (maximum flow).”</li><li>- Table 14.6-5 to be revised as shown in Attachment IR-218.</li></ul> <p><u>Revisions to Appendix 14-A:</u></p> <ul style="list-style-type: none"><li>- From Section 8.1, second to last sentence in first paragraph, “The rivers flows considered for this assessment are 5th percentile annual flow of 10.9 m<sup>3</sup>/s (minimum flow), the average annual flow of 24.3 m<sup>3</sup>/s (average flow), and the 95th percentile annual flow of 24.67 m<sup>3</sup>/s (maximum flow).”</li><li>- Table 8-5 to be revised shown in Attachment IR-218.</li></ul>
IR-219	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.	<p>The rationale for the 95% recovery is explored in Section 8.1 of Appendix 14-A where the hypothetical uranium concentrate release is examined. The density of uranium concentrate particles is high (8.3 g/cm<sup>3</sup>) and settling of these particles in the aquatic environment is expected to be rapid (USDOE 2001). As such the concentrate is not expected to be transported far from the incident/release location. Figure 8-2 from Appendix 14-A shows the modeled distribution of deposited uranium concentrate from the release location under different flow scenarios and is reproduced below for reference. As can be seen in the figure most (&gt;95%) of the mass of the uranium concentrate would settle within a short distance of the release, even under high flow conditions. This indicates that the hypothetical release would be confined to a small area.</p> <p>Given the relatively small area affected it is reasonable to assume that the affected area can be successfully remediated and that there would be a very high level of uranium recovery.</p> <p>For these reasons, it is believed the 95% recovery rate is a reasonable assumption.</p> <p><u>Reference</u> USDOE (United States Department of Energy). 2001. Characteristics of Uranium and Its Compounds. U.S. Department of Energy, Office of Environmental Management, Depleted Uranium Hexafluoride Management Program, Fall 2001. <a href="https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF">https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF</a></p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-220	CNSC	Accidents and Malfunctions	Section 14.6.1.1.1  Appendix 14-A, Section 5.1.1	<p><b>Context:</b> The proponent states that based on drum deformations performed in a previous analysis (McSweeney et al. 2004), if a drum experienced a crush force of 100,000 lbs., then the deformation of the drum would cause the lid to detach from the drum. Using this drum failure mechanism, and assuming the drums weigh 450 kg and are arranged four across in the truck, at a speed of 48 km/h, the front 25% of the drums would fail, at 60 km/h to 97 km/h 55% would fail, at 145 km/h 75% would fail, and at ≥193 km/h all would fail. Given that the</p>	Please provide information and/or rationale as to whether drum stacking would impact drum failure at different speeds and confirm whether 55% drum fail for such an accident is still valid.	<p>While the review comment correctly indicates that drum stacking would impact drum failure, Denison will not stack drums for shipment and the analysis has been completed based on that assumption. The assumption is supported given that the trucks that will be used for transport are 26 ft long by 10 ft wide and can accommodate 13 rows of drums with 5 drums per row for 2 ft diameter drums. As noted in the draft EIS and Appendix 14-A it is anticipated that 40 drums would be shipped from the site per day.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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				<p>speed of the truck is likely between 60 km/h to 97 km/h, it was concluded that less than 55% of the drums would fail upon a traffic accident scenario.</p> <p>It is assumed to be 40 drums per shipment, so some stacking or rows of drums should be expected in this scenario. The drums stacked above could be at greater risk of deformation in a traffic accident. It is not clear whether drums stacking was considered in the previous study cited by the proponent and whether less than 55% fail is still an adequate percentage of drum failures in such traffic accident scenarios if drums stacking is needed.</p> <p><b>Rationale:</b> Drum failure percentage will impact the release quantity of uranium in such an accident scenario and then impact the consequence assessment. Therefore, the drum failure should be adequately assessed and supported with sufficient information and justification.</p>		<p>For further reference, the following is also noted with respect to the McSweeney et al. (2004) document on which the drum failure mode is based. The document discusses the most common failure mode of the top of the drum coming off - that is, for the scenario assessed in the A&amp;M evaluation 55% of the drum lids are assumed to fail (come off) at truck speeds between 60 and 97 km/h. Conservatively the analysis assumed that all of the contents of these drums would be released to the environment, though this is not likely to be the case.</p> <p>References: McSweeney, T. I., S. J. Maheras, and S. B. Ross. 2004. Radioactive Materials Transport Accident Analysis. Proceedings of 14th International Symposium on the Packaging and Transportation of Radioactive Materials (PATRAM 2004). Berlin, Germany, September 20–24, 2004. Paper #274.</p>	
IR-221	CNSC	Accidents and Malfunctions	Section 14.6.1.3, Appendix 14-A, Section 7.1	<p><b>Context:</b> It is projected that there would be about 100 drums packaged per mill operating day. One trip per day for 330 days per year is assumed for the probability evaluation. This means 100 drums per trip, which is inconsistent with description in section 14.6.1.1.1 where assuming 40 drums in one shipment per day.</p> <p><b>Rationale:</b> Shipments per day will impact the probability evaluation, and number of drums per trip will impact the release of uranium during an accident.</p>	Please clarify the number of shipments per day and number of drums per shipment that are expected and re-calculate the probability as necessary.	<p>In Section 7.1 of Appendix 14-A and Section 14.6.1.3 its states that there would be approximately 100 drums packaged per mill operating day. This was incorrectly stated in both Appendix 14-A and Section 14 of the draft EIS.</p> <p>As noted elsewhere in Project documentation there will be 40 drums packaged per day and Denison has confirmed this number.</p> <p>The 40 drums per day can be transported in one shipment per day and therefore the calculation of probability that has assumed one trip per day is correct and need not be revised.</p> <p>The text of Appendix 14-A and the EIS will be revised accordingly.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the number of drums of uranium concentrate that will be package per day (40 and not 100) will be provided.</p> <p>The revision to Appendix 14-A, Section 7.1 would be as follows: "In the case of the accident scenario envisioned, calcined uranium concentrate would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be about 40 <del>100</del> drums packaged per mill operating day (Wheeler River project description documentation). It was also assumed that a traffic accident on the bridge or within 40 m from either side of the bridge has the potential for release to the Wheeler River.</p> <p>The revision to the Section 14.6.1.3 of the EIS would be as follows: "In the case of the accident scenario envisioned, UOC would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be approximately 40 <del>100</del> drums packaged per mill operating day (Denison 2019). It was also assumed that a traffic accident on the bridge, or within 40 m of either side of the bridge, would have the potential for release to the Wheeler River."</p>
IR-222	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<p><b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.</p> <p><b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.</p>	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.	<p>Strictly speaking the review comment is correct in that the release of organic chemicals, including fuel does not bound the non-organic chemicals such as acids or bases and this will be clarified for context in the final EIS as well as Appendix 14-A for clarity.</p> <p>The following is noted however and provides rationale the release of fuel (diesel) was carried forward for more detailed analysis. Through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the choice to carry the diesel releases as opposed to the release of acid will be provided. The following will be added to Section 8.2 of Appendix 14-A, <i>"For the purpose of assessing the potential effects on the aquatic environment from a release of fuels and hazardous chemicals, as described in Section 5.2, the release of diesel fuel was chosen as a representative scenario, rather than other chemical such as acids and bases. Through the hazard identification screening process (see Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the scenario screening assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP."</i></p>
IR-223	CNSC	Accidents and Malfunctions	Section 14.6.4.1	<p><b>Context:</b> The EIS states that the 3D strip numerical model predicted that stresses and displacements did not show instability in the altered</p>	Please provide information on the stresses and displacements/deformation of the area northeast of the	Additional conservative modelling scenarios were run which determined that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable	No updates to the EIS in response to this IR.



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			Appendix 7-A, Appendix K	<p>sandstone or basement rock at the location where a freeze wall would be placed around the Phoenix Deposit boundary (RESPEC 2021). The potential damage to the freeze wall due to mine-induced stresses and displacements under this scenario is excluded.</p> <p><b>Rationale:</b> One outer section of the freeze wall (i.e., north-east freeze wall of the phase 4 mining area) and some internal cross walls are located in the desilicified zone. The RESPEC 2021 report (i.e., Appendix K of Appendix 7-A) appears not to have included the desilicified zone in the geomechanical modeling, nor is provided the stresses and the displacements/deformation of the area northeast of the phase 4 ore body where a significant extent of the desilicified zone exists.</p>	<p>phase 4 ore body from the geomechanical studies to demonstrate the resulted stresses and displacements will not impact on the freeze wall integrity after IRs for geomechanical studies for ore extraction are addressed.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>(1.0 &lt; factor of safety [FS] &lt; 1.25), and no-failure conditions are apparent (RESPEC 2023; included here as Attachment: IR-21). The predicted surface displacement is negligible at approximately 2.4 to 2.8 mm. For desilicified sandstone properties, failure conditions are predicted in 12.6 % of the modeled desilicified sandstone volume, which is located within 20 – 35 meters of the ore zone. The updated results are considered negligible by the author. Notable observations from modelling include that based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone.</p> <p>Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan ground freezing is used to support the sinking of deep potash mine shafts which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5m thick which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because there is no mechanism in the ISR process to create a zero stress “atmospheric” state on the ore side of the freeze wall. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. NGL is very familiar with both projects as the author of this memorandum was the responsible engineer for the initial freeze designs and oversight at both mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several meters in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it is located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.</p>	
IR-224	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 5 (Process System and Piping Failure), doses to receptors at distances of 100 and 500 metres (0.25 and 0.01 mSv respectively) are predicted. The assessment also indicated that the dose to the unprotected worker staying inside the processing plant during the spill could exceed the 50 mSv dose limit specified by CNSC if workers did not leave the area quickly after the spill.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	<p>Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 5 (Process System and Piping Failure).</p>	<p>As noted in Appendix 14-A (see Section 5.5, 8.5) and the draft EIS (see Section 14.6.5) the dose calculations presented for Bounding Scenario 5 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009). In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of radon from failed or leaked thickener. The assessment assumed 20% of the contents of the thickener was released inside the processing building (US NRC 2009). Typical radon concentrations in circulating lixiviant range from 300 to 7,000 Bq/L (Brown 2008). The GEIS used a concentration of approximately 4,000 Bq/L for its assessment and this is in the range of activity of radon that is expected in lixiviant before entering the processing building.</p> <p>For transparency, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium In Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (United States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	<p>Based on the response no revisions to the EIS, nor to the A&amp;M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p>
IR-225	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	<p>Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.</p>	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 5 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 5.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for the chemical spill emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Building ventilation to maintain the workplace air quality.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above, such documentation is in the process of being developed as part of Project-related licensing and would be available for review and acceptance by the CNSC as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li></ul>	<p>Based on the response no revisions to the EIS, nor to the A&amp;M technical supporting document (Appendix 14-A) are needed.</p>

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						<ul style="list-style-type: none"><li>Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including: <b>Eliminate</b> – Remove hazardous materials, processes and activities. <b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items. <b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous. <b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed. <b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p>	
IR-226	CNSC	Accidents and Malfunctions	Sections 14.6.6.1 and 14.6.6.4	<p><b>Context:</b> It is stated that in the case of the accident and for a release amount of 1 kg inside the processing plant, the dose to offsite receptors at 200 m from the project site was calculated to be less than the CNSC public dose limit of 1 mSv. The analysis also indicated that the dose to a worker in a full-face-piece powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p><b>Rationale:</b> Section 14.6.6.1 indicates that 2 kg of uranium concentrate could be released in case of the accident. No rationale is provided why 1 kg rather than 2 kg uranium concentrate is used for dose calculation. If 2 kg is used as the source term, the dose to offsite receptors at 200m and workers in the area would be higher.</p>	Please provide the rationale for using a source term of 1 kg rather than 2 kg of uranium concentrate for the dose calculation to offsite receptors and workers. If sufficient rationale cannot be provided, the doses to offsite receptors and workers should be recalculated using 2 kg uranium concentrate, and the results provide.	The rationale for the 1 kg source term is provided in Section 5.6 of Appendix 14-A. The 2 kg source term was calculated but as noted was thought to be an overly conservative value based on the conservatism layered upon conservatism. The professional decision was made to use the source term of 1 kg consistent with the referenced 2009 US NRC study as a more realistic but still conservative value.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-227	CNSC	Accidents and Malfunctions	Section 14.6.6.1.1	<p><b>Context:</b> Bounding Scenario 6 involves a fire and/or explosion within the processing plant, resulting in the release of a large amount uranium to the atmosphere. The airborne source term for this scenario is estimated with equation developed by the United States Department of Energy (USDOE), where the respirable faction is assumed to only include particles of 10 mm and smaller.</p> <p><b>Rationale:</b> No rationale was provided to support the consideration of only 10 mm and smaller particles. As provided in Table 14.6-3, the particle size of uranium &lt;15 mm is less than 20%. Majority of the uranium particle size is larger than 10 mm. The airborne source term is an important factor for the effects assessment and should be calculated with transparent and justified information/data.</p>	Provide rationale for only considering 10 mm and smaller particles for the respirable fraction.	<p>Note that the assessment in Appendix 14-A assumed a particle size of 10 µm, not 10 mm as stated by the reviewer.</p> <p>As noted in Appendix 14-A (Section 5.6) a 10 micron diameter particle size (or smaller) is a commonly assumed size fraction as a respirable/inhalable particle and is referenced by various organizations as such US EPA (see <a href="https://www.epa.gov/pm-pollution/particulate-matter-pm-basics">https://www.epa.gov/pm-pollution/particulate-matter-pm-basics</a>).</p> <p>Uranium particles emitted from the fire would be secondary particles or aerosols that are formed during the fire. In most cases these aerosols are sub-micron in size. In consideration of this, the 10 micron diameter assumption is conservative assumption since it essentially contemplates that that all the particles are therefore respirable. Moreover, as noted in Section 5.6 of Appendix 14-A the value “1” has been used for the respirable fraction (RF) to develop the exposure source term. This again is conservative because it assumes that all the uranium content formed as particles are respirable.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-228	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4 Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 6 (Facility Fire and/or Explosion), the predicted dose is less than 1 mSv to a member of the public 200 metres away from the project site. The analysis also indicated that the dose to a worker in a full-face powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 6 (Facility Fire and/or Explosion).	<p>As noted in Appendix 14-A (see Section 5.6, 8.6) and the draft EIS (see Section 14.6.6) the dose calculations presented for Bounding Scenario 6 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009) and the dose calculations are presented therein. In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of yellow cake inside the processing plant due to an explosion in the dryer. The scenario considered a release of 1 kg and conservatively assumed the fraction respirable was 100 percent.</p> <p>For transparency, and details related to the analysis, a hyperlink to the US NRC document is as follows:</p> <p><a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a></p> <p>The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium in Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (United States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.

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IR-229	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 6 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 6.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for fire and explosion related emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Fire safety plan and firefighting systems to ensure fire safety and effective fire fighting system to ensure the damage from the fire is limited.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above such documentation is in the process of being developed as part of project-related licensing and would be available for review and consideration as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li><li>• Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including:</p> <p><b>Eliminate</b> – Remove hazardous materials, processes and activities.</p> <p><b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items.</p> <p><b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous.</p> <p><b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed.</p> <p><b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>• manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>• process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p> <p>Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 6 such as ventilation will be included in the detailed design and will be provided to the CNSC during Project licensing.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-230	CNSC	Accidents and Malfunctions	Section 14.6.7.4	<p><b>Context:</b> It is stated that a conservative penetration time of 15 min was applied in the assessment. Based on this assumption, the maximum depth of contamination could be 90 cm (for penetration rate of 0.1 cm/s). It is not clear why the penetration time of 15 minutes is considered conservative as the penetration time would depend on the time needed for the emergency response team to respond.</p> <p>It is also stated that the wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from 0.15 m to 100 m. It is not clear how the groundwater travel distance of 0.15m and 100m is calculated.</p> <p><b>Rationale:</b> The penetration time will influence the penetration depth of the released materials, which in turn, considering the groundwater travel distance, will impact the potential areas and volumes of contaminated soils and shallow groundwater.</p>	Please provide justification for applying 15 minutes of penetration time, and why it is considered conservative. In addition, please provide information on how the groundwater travel distance of 0.15 m and 100 m was obtained.	<p>The calculations showed that the release of 30 m<sup>3</sup> partially saturates soil to the depths less than 1 m. Contamination deeper than 1 m is not expected due to released diesel availability and volume.</p> <p>If the penetration rate is slower than what was used in calculations, the released hydrocarbon would stay on the surface and the depth of contamination would be less. Therefore, 15 minutes is a conservative assumption that produces the maximum depth of contamination for the volume of hydrocarbon released.</p> <p>Eventually the depth of the contamination is more dependent on the volume of release than the time of the penetration. If the penetration is faster, the contamination would occur faster but would be limited by volume so would not penetrate deeper.</p> <p>With respect to the groundwater travel distance the distances provided in the Section 14.6.7.4 of the draft EIS the following are noted. The values provided are the upper and lower bound values associated calculated from the range of input parameters in the report. The calculations are based on the attenuation / degradation of diesel at the release site which is expected to occur within 75 days (Berry and Burton, 1997; Ledezma-Villanueva et al., 2015). In review of the text of Section 14.6.7.4 in preparation of this response a typo was noted and therefore to address the typo and provide some further clarity with respect to the groundwater travel distance the following revision will be made. The third from the last paragraph of Section 14.6.7.4 will be changed as follows (proposed ne text in bolded for reference):</p> <p><i>“The wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. <b>Studies by Ledezma-Villanueva et al. (2015) and Berry and Burton (1997) show that residual contamination in soil and groundwater is degraded within 75</b></i></p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Section 14.6.7.4 in the EIS would be revised per the IR response. A similar revision would be made to Appendix 14-A.



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						<p><i><b>days.</b> The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from <del>0.15 m</del> 0.03 m to 100 m.</i></p> <p>• <b>Dmax = 1.5 × 10-5 m/s x 75 days x 24 x 3600 ~ 100 m</b> • <b>Dmin = 4.4 × 10-9 m/s x 75 days x 24 x 3600 ~ 0.03 m</b></p> <p><i><b>As highlighted by the calculation,</b> <del>and</del> during this time period, no major migration of groundwater is expected. Thus, the contamination of soil and shallow groundwater is expected to be limited to a small area near the release location, <b>given that release site remediation would occur well within the 75 day window.”</b></i></p> <p>References Berry, K.A.T. and D/L. Burton. 1997. Natural attenuation of diesel fuel in heavy clay soil. Can. J. Soil. Sci. 77: 469–477. Ledezma-Villanueva, A. J. M. Adame-Rodríguez, I.A. O’Connor-Sánchez, J.F. Villarreal-Chiu and E.T. Aréchiga-Carvajal. Biodegradation kinetic rates of diesel-contaminated sandy soil samples by two different microbial consortia. Ann. Microbiol. (2016) 66:197–206.</p>	
IR-231	CNSC	Accidents and Malfunctions	Sections 14.6.6.4 and 14.6.6.5	<p><b>Context:</b> The EIS states that in the unlikely event of an unmitigated accidental release of uranium due to a dryer explosion, doses to the workers are expected to have a moderate effect, while doses to members of the public are expected to have a minor effect. Based on this evaluation, the severity of the consequences of this accident and malfunction scenario is predicted to be moderate. In consideration of both probability and consequences, the overall risk related to Bounding Scenario 6 is predicted to be low.</p> <p><b>Rationale:</b> When there is an explosion within the process plant, it is likely there will have worker fatality. The severity of the consequences of an explosion would be catastrophic and the risk of Bounding Scenario 6 would be higher.</p>	Please re-evaluate the consequence and the risk of Bounding Scenario 6 by considering the potential worker fatality resulted from an explosion.	<p>There was no attempt to minimize the consequence of the explosion scenario with respect to a potential fatality of a worker in the draft EIS. The hazard screening evaluation for this scenario that was presented in Appendix 14-A did acknowledge worker fatality as a potential consequence on an explosion; however, the more detailed evaluation of the scenario as presented in Bounding Scenario 6 focused on the release, for which we believe the consequence ratings were appropriate. Protections afforded to workers are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.</p> <p>It is acknowledged that the text could have been more explicit as to the above and additional text will be added to the text of the EIS and to Appendix 14-A.</p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the decision to carry the exposure scenario forward for further analysis, rather than the potential fatality aspect of the explosion will be provided. The following text will be added to Section 5.6 of Appendix 14-A, <i>“For reference it is acknowledged that this accident scenario could result in significant worker injuries and/ore fatalities and therefore this the reason that it was rated as “catastrophic” from a consequence perspective in the hazard identification screening evaluation (see Appendix A). The more detailed evaluation of the scenario as presented herein as Bounding Scenario 6 focuses on the release of uranium to the atmosphere. Protections afforded to workers in the processing plant are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.”</i>
IR-232	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 14-A, Table 3-7, ID# 7.1  Appendix 14-A, Table 5-5	<p><b>Context:</b> The Proponent indicates in Appendix 14-A, Table 3-7 that a release of sulfuric acid is a low consequence event therefore would not require further assessment. However, according to a Safety Datasheet on high concentrated sulfuric acid (ICSC 0362 - SULFURIC ACID, concentrated (&gt; 51% and &lt; 100%) (ilo.org)), the substance is incompatible with certain materials and can give off toxic fumes. Furthermore, it reacts with various metals to produce hydrogen gas, which is explosive.</p> <p>The Proponent provides estimates of chemicals, including sulfuric acid, to be transported to site in Appendix 14-A, Table 5-5. The annual consumption of sulfuric acid is estimated at 15,417 m3, in 617 trucks per year, but the concentration is not stated.</p> <p><b>Rationale:</b> Given the high reactivity and inherent corrosive nature of sulfuric acid combined with the volume and concentration that may be stored on site, ECCC requests that the Proponent provide a detailed risk assessment related to a terrestrial spill of sulfuric acid, specifically at the processing plant.</p>	<p>1. Provide the volume and the concentration of sulfuric acid that will be stored on site.</p> <p>2. Provide a detailed risk assessment of the fate and behavior of sulfuric acid during a release into the environment.</p>	<p>In response to Question 1 the following is noted. It is expected that a maximum of 143 m<sup>3</sup> of 93% sulfuric acid will be stored on site at any given time. Per Section 2.2.7.6.3 of the draft EIS, bulk storage tanks for chemicals that will be used for mining, processing, and water treatment, including sulfuric acid, will be located inside the processing plant, in a separate contained space away from the processing equipment. The storage tanks will sit inside appropriately designed and sized concrete secondary containment basins. The secondary containment basin for each applicable chemical system will be physically separated from the containment basins for other chemical systems.</p> <p>In response to Question 2 the following is provided. We do not feel a detailed risk assessment of the fate and behaviour of a sulfuric acid release to the environment is warranted at this time. The A&amp;M assessment has considered the transport and use on site of sulfuric acid and in neither case did the screening assessment conclude that additional more detailed assessment was needed. As noted in response to IR 222, through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology that scenario was not carried forward further evaluation. It was reasoned that released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, and the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p> <p>As noted above sulfuric acid will be stored in a dedicated area with secondary containment provided. There is no pathway from storage to the environment on which to assess risk and therefore consideration of such risks are not warranted.</p> <p>The hazard identification process considered use of sulfuric on site and its release in the process plant through a piping failure and concluded a low overall risk. It was specifically considered a low consequence event because the release would be contained in the process plant and there was no plausible pathway for the acid to the environment outside the plant.</p> <p>Overall, the risks of transport, storage and use sulfuric acid are well understood and characterized, and risks from sulfuric acid resulting from the Project to workers and the environment will be mitigated to ALARP.</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.
IR-233	HC	Human health with respect to hazardous contaminants	Appendix 14-A, Section 8.7 (p. 8.10)	<p>An effects assessment for a transportation accident scenario involving radioactive materials was not included.</p> <p><b>Context:</b> The proponent provided an effects assessment relating to a diesel spill on the ground (Section 14 Appendix 14-A, Section 8.7). However, no information was provided regarding the potential human health effects of a uranium concentrate release at the two locations considered (Section 14 Appendix 14-A p. 8.10).</p>	<p>1. Assess and describe the potential health effects (chemical and radiological) of a transportation accident involving a uranium concentrate spill at the following locations:</p> <p>a) km 160 of Hwy 914, which is the location of a cultural camp that has been established by the ERFN.</p> <p>b) km 67 of Hwy 914, which is a gathering location for the Kineepik Métis Local associated with the Northern Village of Pinehouse.</p>	<p>Such a release as envisioned by the Information Request was considered in the A&amp;M assessment (Appendix 14-A) and summarized in the draft EIS. The assessment focused generically on hazardous chemicals and utilized the release of diesel fuel to ground as a means to describe the potential spatial extent of effects and resulting consequences.</p> <p>A release of uranium concentrate to ground as the result of a transportation accident was not directly quantitatively evaluated for two primary reasons. Firstly, given the relative importance of such an event it is assumed that containment and removal would be high priorities within the emergency response and spill response plans. Response and isolation of</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.

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				<b>Rationale:</b> An accident involving radioactive material may have an impact on human receptors, based on the proximity of receptors and the proposed response protocols.	c) All other potential sites of importance for the public and Indigenous peoples.	<p>the material is expected to be rapid, and clean-up is expected to be timely, efficient and complete. Secondly, the spatial extent of effects is expected to be small in size and essentially limited to the immediate vicinity of the accident location given the small size of the gamma field that would be associated with the uranium concentrate. In these regards exposure to members of the public is expected to be mitigated and based on the A&amp;M assessment methodology did not warrant consideration from a detailed perspective beyond initial screening.</p> <p>As noted in the review comment, the release to ground accident scenario focused on the two locations of interest along Hwy 914. The locations were developed with the Denison team and reflected the result of and input from Denison’s Interested Party engagement activities. These locations can serve more broadly to represent release to ground scenarios at additional locations along the transportation corridor. Since the outcomes of the accident scenarios are specifically tied to conditions at the release location as the are to the nature of the release it would not be practical to conduct such an assessment at all points of interest as suggested by the review comment. The use of representative locations, such as was done in the current A&amp;M assessment, is consistent with past practice on similar project proposals.</p>	
IR-234	CNSC	Effect of Environment	Section 15.2.2	<b>Context:</b> Effects of seismic events on the uranium extraction and post decommissioning are not assessed.  <b>Rationale:</b> Seismic events could further exacerbate the stability of the voids induced by the uranium extraction, which will result in extra stresses and displacements/deformation in the overlying rock formations. These extra stresses and displacements/deformation could impact on the mine operation and post decommissioning groundwater flow and contaminant transport.	Please provide an assessment of seismic events on the mine-induced voids stability and the resulted effects on the mine operation and post decommissioning.  <b>Technical Discussion Required:</b> Yes	<p>See response to IR-64 that concerns potential for ground subsidence.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains will be a honeycomb texture with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No EIS updates are anticipated to address this IR.
IR-235	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”  RCP4.5 represents predicted climate conditions of a moderate carbon future.  RCP8.5 represents predicted climate conditions under a high carbon future.  The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.  <b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.  ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a>  ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a>  The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.  These values do not match the averages shown in Tables 15.5-1 and 15.5-2.	<p>1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.</p> <p>2. Provide detailed calculations for the following average values:</p> <ul style="list-style-type: none"><li>25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li><li>25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li></ul> <p>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</p> <p>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</p> <p>5. Compare model derived data against:</p> <ol style="list-style-type: none"><li>Natural variability of the observed data.</li><li>Variability in the statistics generated via observation based time series.</li></ol> <p><b>Technical Discussion Required:</b> Yes</p>	<p>As a preamble to this IR response, Denison notes that ECCC used a different spatial scale (Geike River is a ‘large grid’ area) in the Climate Atlas compared to what was presented in Section 15 of the EIS for Tomblin Lake (which is a ‘small grid’ area). Although Tomblin Lake region is within the Geike River region, this difference in spatial scale explains the discrepancies noted by ECCC in their IR context and rationale and explains why ECCC was unable to duplicate the results.</p> <p>1. The links to the Tomblin Lake regional grid unit are as follows.</p> <p>Tomblin Lake 4.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line</a></p> <p>Tomblin Lake 8.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line</a></p> <p>The Tomblin Lake chart data were downloaded from the Climate Atlas for each scenario.</p> <p>2. We used average function in excel to calculate mean values from the chart data.</p> <p>Historical Mean = Average of annual mean historical values from 1976 to 2005. As shown in Table 15.5-1, the historical mean for the Max 1-Day Precipitation was 24.1 mm.</p> <p>Ensemble mean – Near term = Average of predicted annual mean values from 2021 to 2050. As shown in Table 15.5-1, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP8.5 scenario.</p> <p>Ensemble mean – Far term = Average of predicted annual mean values from 2051 to 2080 As shown in Table 15.5-1, the far term mean for the Max 1-Day Precipitation was 26.7 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the far term mean for the Max 1-Day Precipitation was 27.5 mm under the RCP8.5 scenario.</p> <p>3. The information in Section 15 was not used in Section 8. Section 8 PMP was conservative to account for any changes in future precipitation.</p> <p>4. The ensemble model is made up of many different models (compilation). The variability is depicted for each model, and the ensemble model predicted data are presented as the annual mean and include the 10th and 90th percentiles for each annual mean.</p> <p>5. The data in Section 15 was not used in other assessments and the PMP used in Section 8 is conservative.</p>	No EIS updates are anticipated to address this IR.
IR-236	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”  As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.  <b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.  It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>1. In the draft EIS Tables 15.5-1 and 15.5-2, the maximum 1-day precipitation values were obtained from the chart data file downloaded from the Climate Atlas for the Tomblin Lake regional grid (refer to IR-235 for links to the datasets on Climate Atlas). The Historical Mean value was calculated as the average of annual mean historical values from 1976 to 2005 = 24.1 mm.</p> <p>2. The values provided in Section 15 for the maximum 1-day precipitation are correctly referenced and summarized from the Climate Atlas and have been used appropriately in the assessment. The discrepancy in spatial scale and how it effects the representation of the data between Geike River and Tomblin Lake is described in IR-235. See also response to AD-15.</p> <p>As discussed during the April 19, 2023 meeting between Denison and ECCC, the final EIS will be updated to include new tables comparing precipitation estimates for existing and future climate toas context for the Project design PMP. These have been included here as Attachment IR-236; Attachment IR-236 will be appended to Appendix 6-C of the final EIS.</p>	<p>The information in Attachment IR-236 will be added as Appendix D Summary of Precipitation Values Presented in the EIS to Appendix 6-C in the final EIS.</p> <p>The following sentence will be added to Section 15.5.2 in the final EIS:</p> <p>“Please refer to Appendix D to Appendix 6-C for a summary of precipitation values presented in the EIS.”</p>



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				highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.			
IR-237	CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>	Please see response in Attachment IR-237.	Section 16-C in the final EIS will be updated to reflect the final summary of monitoring and follow-up programs. Compared to the version contained in the draft EIS, it will be updated to include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project’s Commitment Report which will be provided as part of the final EIS documentation. Refer to Attachment IR-237 where <b><u>bold underlined</u></b> text indicates where Denison commits to revising or adding information into the final EIS.
IR-238	CNSC	Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	<p>Denison provided ERFN, KML, and the YNLR with the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR).</p> <p>Mitigation and monitoring was part of an in-person engagement tour undertaken in 2022 with the Indigenous and non-Indigenous Communities of Interest. Further, information about mitigation and monitoring measures were mailed out in booklets, and will be topics revisited in engagement activities set to occur in fall 2023.</p> <p>As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.</p> <p>See also response to IR-28, IR-125, IR-128, IR-129 and IR-212.</p>	No EIS updates are anticipated to address this IR.

<sup>1</sup> **Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation**  
Health Canada, Water and Air Quality Bureau, October 2022

Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m3 increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:

$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \text{ }\mu\text{g}/\text{m}^3$$

$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = 1.127$$

$$\beta \times 10 \text{ }\mu\text{g}/\text{m}^3 = \ln 1.127$$

$$\beta = (\ln 1.127)/(10 \text{ }\mu\text{g}/\text{m}^3)$$

$$\beta = 0.01196$$

The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

ALCM = additional lung cancer mortality cases per 100,000 population

β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))

Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)

Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation

Years = years of project or project phase

Sample calculation:

Project estimates an exposure from relevant source(s) of 0.067 µg/m3 over 50 years of operation

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

$$ALCM = \left[ \left( e^{0.01196 \cdot 0.067} - 1 \right) / e^{0.01196 \cdot 0.067} \right] \cdot 45.5 \cdot 50$$

ALCM = 1.8 additional lung cancer mortality cases per 100,000

**References:**

- [1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: [cancer.ca/Canadian-Cancer-Statistics-2021-EN](https://cancer.ca/Canadian-Cancer-Statistics-2021-EN)
- [2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <https://doi.org/10.1186/s12889-020-08771-w>
- [3] Health Canada. Lung cancer and ambient PM2.5 in Canada: a systematic review and meta-analysis.
- [4] Health Canada, 2022. Available online at: <https://publications.gc.ca/site/eng/9.907038/publication.html>

## Attachment: IR-06

Number	IR-06
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4, Wellfield for In Situ Recovery Mining
Context and Rationale	<p>Context: This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p>Rationale: Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted . This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p>References:</p>

	<p>[1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p.</p> <p>[2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p.</p> <p>[3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>
Information Requirement	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery . This information should include:</p> <ul style="list-style-type: none"> <li>• feasibility of meeting remediation targets.</li> <li>• groundwater flow conditions and validation of flow models.</li> <li>• mobilization of contaminants (e.g., Al, Se or V).</li> <li>• potential for free gas evolution/two-phase flow.</li> <li>• identifying composition of lixiviant and production solutions.</li> <li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A).</li> <li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li> </ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>



### **Response to IR-06 Part 1**

Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.

During the operation phase, and under normal operational conditions there is no interaction between the mining area and surface or down gradient environment, and the assessment focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions.

Denison provided the FIRT team with a presentation and summary of the test work completed to date on June 16, 2023, to address IR-06. Summaries of relevant field and lab tests including the 2021 Tracer Test, 2022 Feasibility Field Test (FFT), and various site-specific lab tests are provided as part of this IR response and additional details will be provided to support licence applications.

#### **Tracer test**

An ion tracer test was completed in 2021 and the key results are summarized as follows:

- The test achieved the commercial-scale production flowrate assumed in the 2018 Pre-Feasibility Study (SRK 2018).
- The test demonstrated hydraulic control of injected solution. No elevated values of the tracer were observed in the monitoring wells surrounding the commercial-scale test pattern.
- The test established breakthrough times between injection and recovery wells, spaced 5 to 10 meters apart, that were consistent with previous proof of concept hydrogeological modelling conducted by Petrotek Corporation.
- The clean-up phase completed after the conclusion of the tracer test demonstrated the ability to remediate the test pattern. The clean-up phase was successful; the tracer concentrations were reduced to as low as 4% of peak test levels within eight days of remediation.

#### **Feasibility Field Test (FFT)**

The purpose of the FFT was to validate previous field and laboratory testing and determine the feasibility of the ISR mining methodology. The leaching and neutralization phases of the FFT were completed in 2022. The leaching phase was designed to assess the effectiveness of the ISR mining method. This phase included controlled injection of an acidic solution into the mineralized zone with recovery of the solution through existing test wells. The neutralization phase involved the injection of a mild alkaline (basic) solution into the leaching zone to neutralize the area and verify the groundwater in the area is returned to acceptable, permitted conditions.

The FFT provided the following results:

*Leaching Phase:*

- Recovered approximately 14,400 lbs U3O8 over ten days of active leaching following completion of initial acidification of the Leaching Area.
- Returned maximum uranium head grade of recovered solution of 43 g/L when the leaching phase of the FFT was completed, with grades still rising (indicative of the ramp-up segment of a well production profile).
- Achieved suitable acidification for ISR mining within 7 days post initial injection at 5 metre well spacing (GWR-41) and within 17 days for 10 metre well spacing (GWR-38).
- Demonstrated ability to achieve and maintain uranium mass flow rate consistent with the assumptions in the 2018 Pre-Feasibility Study (SRK 2018).
- Further demonstrated hydraulic control of injected solution during the FFT, reporting no responses in the monitoring wells outside of the designed FFT test area.
- Confirmed breakthrough times between injection and recovery wells, consistent with the Project's hydrogeological model and the previously completed tracer test.

*Neutralization Phase:*

Sampling of groundwater monitoring wells around the FFT site has confirmed the successful restoration of the leaching zone to environmentally acceptable pH conditions, as outlined in the applicable regulatory approvals for the FFT and summarized in Table IR-06-1 below.

**Table IR-06-1: Feasibility Field Test Leaching Zone Remediation Targets compared to Interim (December 2022) Groundwater Well Monitoring Results**

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
pH	pH units	3.5	6.24
Aluminum (Al)	mg/L	9.1	3.3
Arsenic (As)	mg/L	0.7	0.05
Barium (Ba)	mg/L	0.2	0.07
Calcium (Ca)	mg/L	535	203
Cadmium (Cd)	mg/L	0.3	0.00001
Cobalt (Co)	mg/L	0.24	0.0001
Chromium (Cr)	mg/L	0.38	< 0.0005
Copper (Cu)	mg/L	0.19	0.001
Iron (Fe)	mg/L	390	144
Potassium (K)	mg/L	45	185
Magnesium (Mg)	mg/L	8.92	22.6
Molybdenum (Mo)	mg/L	0.16	0.04
Sodium (Na)	mg/L	628	193
Nickel (Ni)	mg/L	1.17	0.02
Lead (Pb)	mg/L	2	0.04
Sulfate	mg/L	4,147	1114
Selenium	mg/L	0.47	0.0002
Uranium	mg/L	501	85

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
Vanadium	mg/L	19.3	0.2
Zinc	mg/L	17.1	0.5

<sup>1</sup> Results are the average of three groundwater monitoring wells (GWR-038, -040 -041) sampled in December 2022

## **Response to IR-06 Part 2**

Field programs conducted over the past 4.5 years were focused on de-risking key elements related to the implementation of the ISR mining methodology specific to the Phoenix deposit in a high-grade Athabasca Basin setting. These key elements were focused on:

- Permeability
- Leachability
- Containment
- Processing

De-risking programs were carried out in the lab and field setting initially on an individual basis. As the programs progressed, elements were combined in additional test work ultimately culminating in the FFT, where all elements were evaluated in a single test to inform the design of ISR.

### ***Response to IR-06 Part 2a: Feasibility of meeting remediation targets***

Groundwater remediation targets provided in the draft EIS were derived from metallurgical test results completed from 2017 to 2021 with over 125 kg of material recovered from Phoenix deposit that underwent leaching and neutralization test work (see response to IR-67). In 2022 and 2023, metallurgical test work continued to further optimize remediation and strategies and confirm test work results presented in the draft EIS. It is expected that metallurgical test work will continue in the future to further optimize remediation targets, and this will be advanced through updates to the Decommissioning Plan.

The FFT provided additional confirmation that pH target and remediation targets could be met. Data gathered during the neutralization phase of the FFT provide confidence that groundwater targets proposed in the draft EIS can be met technically and economically.

Based on laboratory testing and the results of the 2022 field testing, subsurface remediation is planned to consist of rinsing the ore zone with 35 pore volumes of fresh water, slowly raising the pH and then pumping about 75 pore volumes of basic solution through the same portion of the ore zone. This basic solution will in effect further raise the pH to a level that impedes further leaching of the deposit and reduces aqueous concentrations of contaminants of concern to below their environmental target levels.

### ***Response to IR-06 Part 2b: Groundwater flow conditions and validation of flow models***

#### **Background of Data Collection**

Hydrogeological investigations have been ongoing in the field and in laboratories since 2014. Packer, open hole, and cross hole tests have been completed in conjunction with exploration drilling programs. As well, permeability tests have been completed on sections of available competent core within the

Phoenix deposit. Open hole water level surveys have been completed across the site in 2015, 2017, 2021 and 2022. The hydraulic conductivity related field and laboratory test work data are summarized in Table IR-06-2.

Table IR-06-2: Hydraulic Conductivity Related Data Set from Phoenix and Regional Wells

Test Type	Location	Number of Data Points <sup>1</sup>
Field – Packer / Injection / Pumping / Slug	Athabasca Group	56
	Unconformity	173
	Basement	20
Lab – Permeability	Athabasca Group	721
	Unconformity	1149
	Basement	1250
Total		3,369

Note: <sup>1</sup> This is not necessarily the number of tests conducted, as a single test can yield multiple data points.

Additionally, the following hydrogeological characterization work has been completed at Phoenix:

- Geophysics surveys including:
  - Neutron survey x 5
  - Borehole or nuclear magnetic resonance (BMR or NMR) x 10
  - Sonic x 1
  - Acoustic televiewer x 9
  - Gamma/caliper x 9
  - Electromagnetic flow meter (EMFM) x 9
- Tracer Test (2021)
  - Advanced FFT (2022)

Lithology at Phoenix is considered in terms of nine HGUs that have been defined to be present adjacent to or define the main Phoenix mineralized zone (Phases 1 to 5) including:

- HGUs 1a and 1b: Athabasca Group (overlying the mineralized zone)
- HGU 2a: Upper clay cap
- HGUs 2b, 2c, 2d: Main body of the mineralized zone
- HGU 2e: Lower clay cap
- HGUs 3a and 3b: Weathered and unweather basement.

In the mineralized zone, HGUs 2b, 2c and 2e (in that order) have the highest hydraulic conductivities.

Hydraulic conductivity values in the mineralized zone in Phase 1 average  $1\text{E-}06$  m/s, with the southeastern half of the phase generally having higher values than the northwestern half. Phases 1 and 3 do not appear to be hydraulically connected. In Phase 2 there is considerably less data than for Phase 1. There appears to be no hydraulic connection between Phases 1 and 2. Based on aquifer testing and electromagnetic flow meter (EMFM) data, mineralized zone hydraulic conductivity values in Phase 2 ( $\sim 4\text{E-}06$  m/s) are on the same order of magnitude as those in Phase 1 and approximately one order of magnitude greater than those in Phases 3 and 4. In Phase 3 the mineralized zone hydraulic conductivity values ( $\sim 6\text{E-}07$  m/s) average one order of magnitude lower than those in Phase 2. The mineralized zone Phase 4 has been tested at four locations. With one exception, all values obtained from pumping, injection and slug tests have been in the range  $1\text{E-}08$  to  $8\text{E-}07$  m/s. The hydraulic conductivity values ( $\sim 3\text{E-}07$  m/s) are on the same order of magnitude as those in Phase 3. Much of the mineralized zone water in Phase 4 is capillary bound, but there are some reasonably fractured intervals in Units 2c, 2d and 2e. Comparison of mineralized zone hydraulic conductivities, averaged by mining phase, indicates that Phases 1 and 2 have the highest values due to the large presence of a thick and relatively continuous section of HGU 2b in these phases. Phases 3 and 4 have intermediate values and Phase 5 has the lowest permeability due to a thinner HGU 2b unit, and relative abundance of the clay zones in this phase.

There are several lines of evidence (from laboratory testing, observations during the FFT and geomechanical modelling of the deposit) that localized hydraulic conductivity increases may occur due to the dissolution of uranium from the mineralized zone.

#### Numerical Modelling

Numerical groundwater modelling has been conducted by SRK (2018), Petrotek (2020 and 2021), and Ecometrix (draft EIS Appendix 7-C). The degree of complexity and the purposes of these models have varied. SRK (2018) created a two-dimensional model that was bound by geological outline of the defined mineral resource in the mineralized zone as part of their PFS. This simplified approach was used based on the assumption that there was a freeze cap above the deposit (the earlier version of the freeze wall). Homogenous K values were assigned to the model and incrementally increased by roughly half an order of magnitude to estimate flow rates.

Petrotek (2020, 2021) built and calibrated several models which had differing purposes. These models were calibrated to the observed responses to aquifer tests conducted in 2019, 2020 and 2021 but they assumed that there was no vertical heterogeneity within mineralized zone and only simulated the response in Phases 1 and 3. Potential well configurations and well spacings were investigated and used to predict the response to the 2021 tracer testing. A high degree of variability in the travel times from the various injection wells and to the pumping wells was found. The variability was attributed to the high degree of heterogeneity in hydraulic conductivity and storage within the mineralized zone. One of the main purposes of this work was to provide a demonstration of proof of concept for application of ISR to the Phoenix deposit.

EcoMetrix (draft EIS Appendix 7-C) developed a regional three-dimensional FEFLOW groundwater flow and transport model that was used to both evaluate residual effects from the FFT and then as part of Denison's draft EIS to examine the post decommissioning effects on regional receptors. The model was calibrated to the regional groundwater flow patterns, was consistent with their conceptual model and was also consistent with the observed hydrochemistry in the Upper and Lower Sandstone Aquifer systems. The groundwater flow in the vicinity of the deposit was observed and simulated in the calibrated groundwater model to travel eastward within the Lower Sandstone Aquifer before moving upward through the desilicified zone in the Athabasca Group sandstone units and overlying overburden deposits toward Whitefish Lake.

As part of the Feasibility Study, Denison retained Dr. Walter Illman and his Ph.D candidate Ning Luo from the University of Waterloo. The University of Waterloo group conducted hydraulic tomography (HT) analysis of the hydraulic test data from the Phoenix deposit to aid in the characterization of the subsurface heterogeneity in  $K$  and specific storage ( $S_s$ ). The areas of the HT model, with high confidence estimation were incorporated into the 2023 WSP FEFLOW model as they represented the best estimation of the 3D distribution of the hydraulic conductivity and storativity. The FEFLOW model is a numerical representation of the site hydrogeology and groundwater flow regime in the mineralized zone and was calibrated to hydraulic testing data that has been collected for the site. FEFLOW model specified well designs including well screen locations and any planned permeability enhancements to specific wells or HGUs within wells.

The FEFLOW results were used as an input into GoldSim (GoldSim V14, Technology Group, LLC). GoldSim is a mathematical model that uses the outputs from FEFLOW to estimate the uranium dissolution by HGU and by extraction well with time. GoldSim simulated the dynamic nature of the lixiviant injection and uranium recovery systems associated with the wellfield.

#### Recovery Curve

The test work and derivation of the recovery curve from laboratory testing that has been standardized to one condition and grade. The recovery curve indicates the concentration of uranium bearing solution (UBS) produced as a function of pore volumes (PVs) recovered. Therefore, by determining the hydrogeological flow field for an array of injection and recovery wells and the related PVs recovered with time, an aggregate wellfield recovery can be calculated by applying the recovery curve to each recovery well's PV distribution.

The recovery curve is scaled in the modelling to account for variations in in situ grade.

#### Hydrogeological Modelling

The numerical groundwater flow modelling methodology was conducted using FEFLOW and was described earlier. The physical setting of the mineralized zones was numerically represented in FEFLOW based on the Denison geological block model. FEFLOW was used as the basis of wellfield layout and the



simulation of the lixiviant flow within the mineralized zone. For production modelling, the following values for each of the FEFLOW numerical elements in 3 dimensions was output:

- Production unit or well capture zone that element belonged to
  - Flow per unit time
  - Element volume
  - Effective porosity
  - HGU and uranium in situ grade

#### Wellfield Production Modelling

Using the FEFLOW simulation outputs for each mesh unit, GoldSim calculated the uranium recovery based on the number of PVs through the unit and the corresponding concentration of  $U_3O_8$  in each recovery well. The mesh units are aggregated based on the associated recovery well number from FEFLOW.

Wells are started and stopped in GoldSim to simulate the progression of mining in the wellfield. Well starting is set manually. The end of operation for each well is determined by a cutoff recovery grade. In this way the overall production from the wellfield is controlled to provide process plant feed of the required flow and grade over time. At a detailed level, well operating times can be adjusted to smooth the mass flow rate of uranium to the plant, within the limits of the model granularity.

Optimizing the production rate and total quantity required several iterations of FEFLOW and GoldSim modelling. GoldSim outputs were analyzed to identify wells that were under-performing compared to expectations. The number and position of injection and recovery wells and their flow rates were adjusted based on these results, and the FEFLOW model was re-run. This iterative process involved examination of the under-performing areas and adjustment to the flows in these areas in both FEFLOW and GoldSim.

Throughout the optimization iterations, the number of unexpected low-performing wells was reduced. When it appeared the effort had reached its asymptote the remaining low performing wells were reviewed. A statistical analysis showed that four wells patterns or production blocks were outliers. These four wells that were located in areas with otherwise consistent recovery had shown more reasonable response in prior iterations. The results from these four production units was therefore assumed to be non-representative. It was assumed these production units can be mined by varying the pumping rates, wellfield stimulation and/or adding possibly adding additional wells. Recovery from these four wells were therefore added at the average rate per HGU for their Phase and included in the overall production.

Data gathered during the field tests have been utilized for both the EA groundwater model as well as the mining model.

#### ***Response to IR-06 Part 2c. Mobilization of contaminants (e.g., Al, Se or V)***

Contaminants mobilized during the FFT were similar in concentration compared to the UBS solutions that were collected during lab scale core and column leach testing at SRC which suggests that the testing Denison conducted at lab scale and the information collected is representative of the deposit. The column test assay results in Table IR-06-3 below include the maximum as well as weighted average from all phases of the leaching and remediation test. The FFT result presented in Table IR-06-3 below was the sample with the highest concentration of uranium during the test.

**Table IR-06-3: Potential for Mobilization of Contaminants - Comparison of Results from Lab Scale Column Tests and Groundwater Results from the Feasibility Field Test**

Analyte	Column Tests		FFT
	Max	Weighted Avg	GWR-041, Oct 13, 2022
U, ppm	48222.3	13902.0	43400
Al, mg/L	783.9	284.1	180
Fe, mg/L	7029.1	1757.4	1200
Ca, mg/L	1135.1	445.8	1100
Mg, mg/L	672.3	170.5	10
K, mg/L	329.6	54.0	150
Na, mg/L	927.4	52.0	90
Pb, mg/L	16.4	3.3	1
Mo, mg/L	296.6	24.8	15
P, mg/L	44.5	6.8	20
Cd, mg/L	6.2	0.2	0
Mn, mg/L	263.3	57.9	83
Cr, mg/L	14.1	0.8	5
V, mg/L	148.3	33.8	22
Sr, mg/L	17.1	2.5	16
Ba, mg/L	6.4	1.9	5
Cu, mg/L	1610.8	280.8	2
Zn, mg/L	1276.2	38.8	5
Co, mg/L	49.3	4.1	1
Ni, mg/L	166.2	6.6	1
As, mg/L	95.9	10.4	3
Se, mg/L	1.6	0.1	1
S, mg/L	24115.4	14740.9	12333

***Response to IR-06 Part 2d. Potential for free gas evolution/two-phase flow***

Calcium carbonate is known to be present in the deposit in relatively low percentage amount. The reaction between acid and calcium carbonate can release CO<sub>2</sub> gas and therefore cause two phase flow, especially when going from the hydrostatic pressure of the deposit to the atmospheric pressure at surface which will encourage degassing of solution. It is expected two-phase flow will occur during the mine life, especially as carbonate containing material are being decomposed with the sulfuric acid of the lixiviant. The FFT provided confirmation that the proposed radon degassing surge tank directly fed by

downhole recovery pump is adequate for operations and does not pose additional Health & Safety or environmental risks.

***Response to IR-06 Part 2e. Identifying composition of lixiviant and production solutions***

As part of the metallurgical test program, over 125kg of core from the Phoenix deposit has been leached in a variety of settings, including bottle rolls, column tests, and intact core tests. This has helped to predict concentrations of both the lixiviant as well as the production solutions.

The lixiviant (mining solution) concentrations will vary depending on each individual well production profile. To ensure reagent consumption is effective and efficient it will be varied during the life of each well dependent on its characteristics.

The initial acidification of the well requires a lower acid content to ensure the formation does not plug due to precipitation, whereas during periods of high production the well can accept a higher acid concentration. Towards the end of the recovery curve, the uranium is more difficult to access and therefore the strength of the acid or the flow rate to the well need to be optimized to ensure efficient use of reagents.

It is expected that the lixiviant concentrations will vary between 0-60 g/L H<sub>2</sub>SO<sub>4</sub>, and 0-20g/L H<sub>2</sub>O<sub>2</sub> and will be situationally dependent. There is also the capability to add Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, however it is not expected that this will be required in significant concentration due to the natural abundance of iron in the deposit.

**Table IR-06-4: Representative Concentration Ranges of Uranium Bearing Solution**

	Lower-end Concentrations	Upper-end concentrations
<b>U, ppm</b>	2976	116395
<b>Al, mg/L</b>	25.8	8506.1
<b>Fe, mg/L</b>	134.0	21737.9
<b>Ca, mg/L</b>	99.7	10736.0
<b>Mg, mg/L</b>	21.7	1776.4
<b>K, mg/L</b>	8.0	756.2
<b>Na, mg/L</b>	7.0	5361.9
<b>Pb, mg/L</b>	0.1	124.5
<b>Mo, mg/L</b>	0.1	64.8
<b>P, mg/L</b>	4.0	276.6
<b>Cd, mg/L</b>	0.1	66.4
<b>Mn, mg/L</b>	8.0	980.7

	Lower-end Concentrations	Upper-end concentrations
Cr, mg/L	0.1	145.9
V, mg/L	3.4	942.4
Sr, mg/L	0.6	178.8
Ba, mg/L	0.1	104.8
Cu, mg/L	1.7	1337.9
Zn, mg/L	2.7	987.9
Co, mg/L	0.5	114.9
Ni, mg/L	0.1	216.4
As, mg/L	0.1	96.5
Se, mg/L	0.1	203.2
S, mg/L	1751.3	29671.1

***Response to IR-06 Part 2f. Success despite presence of >2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A)***

The metallurgical test work and FFT completed to date has shown that carbonate minerals present in deposit does not pose a material impact on the ISR mining method proposed for the project.

***Response to IR-06 Part 2g. Site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.)***

Please see summary above under response to IR-06 Part 2b under the heading Background of Data Collection.

### **Response to IR-06 Part 3**

Expected total recovery from deposit is 80.6%. Average uranium concentrations recovered from wellfield is estimated to be 22.5/L U. The nominal case ISR wellfield reagent consumptions are shown in the Table IR-06-5.

Table IR-06-5 Nominal ISR Wellfield Reagent Consumptions

<b>Area</b>	<b>Reagent</b>	<b>kg/kg U in feed</b>	<b>kg/m<sup>3</sup> UBS feed</b>
In situ leach (ISL)	93% sulphuric acid	1.40	12
	70% hydrogen peroxide	0.40	-
	50% ferric sulphate	0.024	-
ISL remediation	50% sodium hydroxide		15

Solutions recovered contain minimal solids based on test work completed to date. Any entrained solids in solutions will be removed through the precipitation circuits of the process plant. Should they contain appreciable of uranium, solids can be processed at another licensed facility.

#### References:

Petrotek. 2020. Interim Hydrogeologic Report – Wheeler River Project Phoenix Deposit. Unpublished report prepared for Denison Mines Corp. March 2020.

Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.

SRK Consulting. 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report prepared for Denison Mines Corp. October 2018

## Attachment: IR-10

Number	IR-10
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall
Context and Rationale	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</li> <li>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</li> </ol>



	<p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p>Technical Discussion Required: Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause</p>
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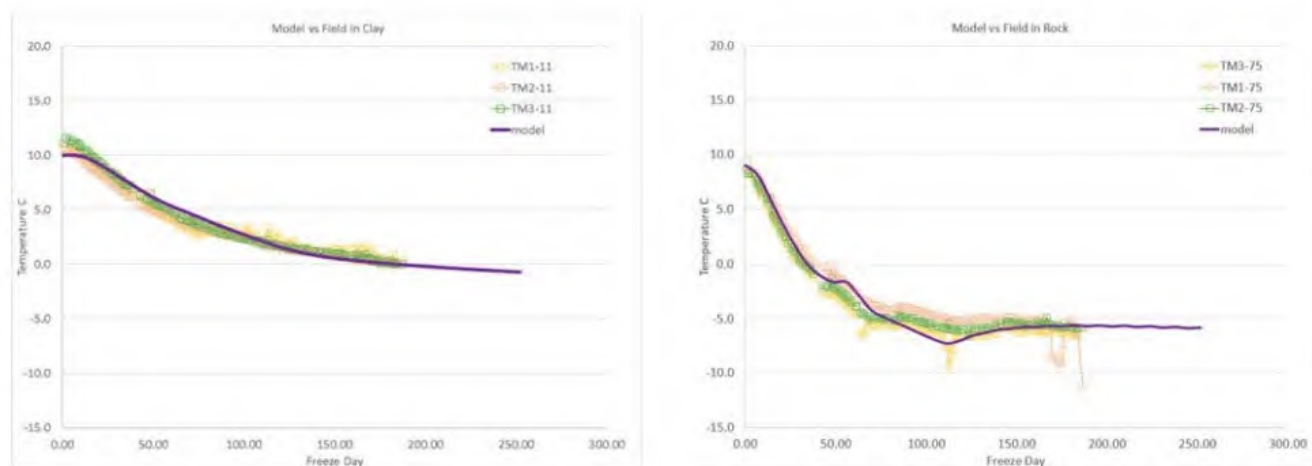
Response:

The general theme of the comments and questions stated above seem to be related to:

- verification of the freeze wall extents;
- response of the freeze wall to potential chemical interaction with the lixiviant;
- response of the freeze wall to induced hydraulic or lithostatic stress; and
- response of the freeze wall to potential exothermic processes related to ISR.

The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed on both the ore and non-ore sides of the freeze wall to confirm the thickness of frozen ground and to validate thermal finite element models of the entire area. Thermal models can very accurately represent real conditions because ground thermal properties used in the analyses only vary by a factor of two to four across all ground types, unlike hydraulic or strength properties, which can vary by many orders of magnitude across relatively short distances.

The figures below are an example of field data validating modelled predictions for a shaft freeze wall at depth.



**Figure 1: Illustration of a calibrated FEM model for freezing in clay (left) and rock (right). Temperatures were measured offset from the freeze wall pipe locations and compared with model predictions at the same location.**

The injection and recovery wells will be set up such that they are within the confines of the ore itself and migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall should be minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. Having said that, if significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice. The freezing point depression of the lixiviant proposed for this project was determined to be  $-1^{\circ}\text{C}$  and, as such, it would freeze off and become immobile before significant volume could negatively impact the freeze wall. If the lixiviant were to dissolve some of the host soil / rock binding material at the freeze wall surface, it would occupy the resulting void space, but then freeze off, which would halt further migration within the freeze wall.

Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan, ground freezing is used to support the sinking of deep potash mine shafts, which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5 m thick, which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because the interior side of the freeze wall where active ISR mining is occurring is not open to atmosphere and is fluid filled in the same way that the regional groundwater system is on the exterior side of the freeze wall, creating a balanced pressure system, where loading is equal on both the interior and exterior sides.. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several metres in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it will be located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.

The leaching process has the potential to be exothermic and generate heat, which may flow toward the freeze wall. In this instance, there is low sulphur content in the ore zone and the exothermic reaction will be minimal. Despite this, all thermal modelling in support of the freeze design assumed that the freeze wall had to develop and be sustained in the presence of an ore zone that generated a nominal amount of heat—sufficient enough to sustain a minimum temperature of  $10^{\circ}\text{C}$  even though it would naturally tend to cool below this in response to the freeze system. It is understood that the lixiviant may be heated as part of the pre-injection process, so some accounting for heat in the ore zone was included in the analysis to date. Should the lixiviant generate more exothermic reaction than predicted, there is a very low risk of it degrading the freeze wall in any significant amount. Referring back to the potash mine shaft freezing illustration, it is not uncommon for in shaft excavation activity and concrete work to

generate temperatures between 30 and 60°C that act on a freeze wall only 5 m thick and only a few metres away from the exposed shaft wall. In this extreme case, the freeze wall is more than capable of removing the generated heat. The physics of heat flow are such that heat generated by the ISR process would be free to flow towards the freeze wall; however, most of it would flow to the coldest location (e.g., the actual freeze pipes at the mid-point of the wall thickness) before it is manifested as an observable significant rise in ground temperature. Even if the heat were to warm the ore side of the freeze wall, it would not impact the non-ore side of the wall (which is where half of the total wall thickness resides). This heat may penetrate to the center of the wall but if the refrigeration plant is operating, that heat can not then flow “up gradient” on the non-ore side of the wall and thaw that side.

The concentration of the lixiviant (max ~8% sulfuric acid conc.) has a freezing point of ~-4°C. The lixiviant itself will not react chemically with the freeze wall, other than having a slightly different freezing point than formation water. The main reaction expected is dissolution of uraninite with the combination of sulfuric acid, hydrogen peroxide, and ferric iron. This reaction is exothermic, but there are several natural mitigating factors of the wellfield that aid in minimizing heat transport to the freeze wall:

- The wellfield will have flexibility in terms of reagent concentrations being added. With the bulk of the uranium being contained within a higher-grade core (interior to the deposit), the exterior of the deposit will see either lower injection/recovery flows or lower concentrations of lixiviant to be efficient with reagent consumption. Whether the concentration or flow is reduced, this limits the reaction rate and therefore total heat generation at the extremities of the deposit.
- There is no refortification of reagents underground compared to typical uranium tank leaching. This prevents additional heat generation from dilution of sulfuric acid or hydrogen peroxide.
- The heat capacity of lixiviant/UBS should be higher than the ore in the deposit, which means the UBS solution will carry the majority of the heat to surface rather than keeping the heat of reaction at depth.
- In the event the freeze wall thickness monitoring network detected an actionable thinning to the freeze wall, the concentration of lixiviant could be decreased which would reduce the heat generated per m<sup>3</sup> of lixiviant and re-establish the desired freeze wall thickness.

To summarize the risk of the degradation of the freeze wall due to exothermic reaction, it is almost impossible—with the freeze plant operating—to practically add sufficient sustained heat to thaw the proposed freeze wall to the point hydraulic containment is compromised. Sufficient operational controls will be in place to verify the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on adjacent sides of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues are to lower the temperature of the freeze system to draw more heat out, to increase the freeze coolant flow rates in freeze wells nearer to active ISR cells, or to adaptively manage the lixiviant injection and recovery rates in cells located nearer the freeze wall.

## Attachment: IR-18

Number	IR-18
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.2.3.9, Project Description Appendix 8-E
Context and Rationale	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent's responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>
Information Requirement	1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.

	<p>2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</p> <p>3. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</p> <p>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</p> <p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>
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Supporting table to the response provided in IR table:

Table 2.2-1 - Upper Bound Industrial Wastewater Treatment Plant Effluent Quality (updated)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration
Chloride	mg/L	120	SEQG/CCME	<b>600</b>
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>
Sulphate	mg/L	128	BC MOE	<b>3915</b>
TDS	mg/L	500	SEQG	<b>6420</b>
TSS	mg/L	15	Schd 4 - MDMER	6
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>
Lead	mg/L	0.005	CCME	0.0003
Molybdenum	mg/L	0.07	WHO	2.5
Nickel	mg/L	0.07	WHO	0.014
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>
Vanadium	mg/L	0.12	FEQG	0.059
Zinc	mg/L	0.1	FEQG**	0.042
Mercury	mg/L	0.000026	SEQG/CCME	0.000001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078
Phosphorus	mg/L	0.015	BC MOE	N/A
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>
Lead-210	Bq/L	0.2	HC	<b>0.419</b>
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>
Notes (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia calculated				



## Attachment: IR-20, IR-67, IR-69

Number	IR-20
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.1  Appendix 7-C
Context and Rationale	<p><b>Context:</b> The proponent's objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent's acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCan's opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent's decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>
Information Requirement	NRCan requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.

Number	IR-67
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.1 (Remediation Objectives)
Context and Rationale	<p>Context: Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices. Rationale: The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given</p>

	its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).
Information Requirement	1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities. 2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining. 3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.

Number	IR-69
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2
Context and Rationale	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCAN's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This information is important when considering source terms in reactive transport modeling.</p>
Information Requirement	NRCAN requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.

Response:

It is also important to note that Denison is completing a sequential EA and licensing process for the Project (see draft EIS Section 1). Detailed ISR mining-related information needed to support licensing

and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.

For the EIS, an initial understanding of the mining area remediation was needed to initiate the assessment of migration of constituents of potential concern in groundwater out of this area in the post-decommissioning period. The findings and conclusions of the EIS were also used, in turn, to inform and bound the engineering and feasibility work. The coreflood 2b and 3c, plus the Pre-Feasibility work (Denison, 2018) on mining area remediation (Section 2 (decommissioning section), Section 7, Appendix 7-C) was used in the draft EIS. This IR response provides additional information to support the selection of these studies.

#### Response to #1

### **1.0 Summary of Test Work**

This response is focused on the metallurgical test work done to support an understanding of the:

- a) mineralogy and hydrogeochemical changes in the ore and barrier zones as a result of the lixiviant (mining solution) injections (see IR-69);
- b) the composition of the uranium bearing solution (UBS) at the end of mining and prior to any remediation (see IR-20); and
- c) water quality and secondary mineral phases formed during remediation of the ore zone (IR67; this IR).

Metallurgical testing completed, the objectives and results of the work, and the information carried forward for discussion in this response are summarized in Table 1.

Further details on the metallurgical testing, including the sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition) are provided in the sections below. All data presented herein are from the metallurgical test programs used to support the 2018 Prefeasibility Study (Denison 2018) and the Feasibility Study (Denison 2023).

Table 1: Summary of Metallurgical Testing

Years	Description	Objective	Results	Information informing IR-20, IR-67 and IR-69
2017-2018	Batch leach tests and bottle roll/agitation leach tests	Early testing of leaching with alkaline and acidic based lixivants	Supported decision for Acid Leaching	No discussion herein; very preliminary testing.
	A column leach test conducted using sulfuric acid followed, which also included simulated groundwater restoration tests.	Initial column test with acid leaching and evaluation of groundwater remediation	Early indication of groundwater remediation needs	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation)
2021	Column leach tests on blended crushed ore	Test leach recoveries on a range of feed grades. Determine potential recovery and generate a representative sample for process plant testing.	Operationally, the feed sample for Column 1 is was verified as a reasonable blend to represent ISR wellfield production of UBS. Groundwater remediation with groundwater and alkaline solutions	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Column leach and remediation tests on crushed and screened core from individual hydrogeologic units	<ul style="list-style-type: none"><li>•Develop information to support geochemical modelling of the deposit, including leaching and neutralization phases.</li><li>•Generate a detailed chemical and mineralogical characterization of the dominant hydrogeological units(HGUs) within the ore zone</li><li>•Evaluate behaviour of different HGUs during ISR and neutralization, in particular those hosting the majority of the resource.</li><li>•Compare the efficacy of neutralization of different HGUs, with the use of dilute sodium hydroxide</li></ul>	Uranium leachability was found to vary amongst the HGUs. Also, there were some indications of an HGU ("2A") to be avoided during operations to prevent clay mobilization.	Water Quality of UBS at the end of mining.
2018	Static uranium ore dissolution (jar) test on intact core	Room temperature, 1,138 hours (48 days) exposure of drill core to concentrated sulphuric acid (35 g/L) in a very slow-motion shaker.	Provided visual indication that with sufficient soak time, lixiviant will penetrate into intact high grade uranium pieces. The incomplete recoveries at the end of the tests can be attributed largely to requiring longer residence time	No discussion herein; testing limited to visual information.
2018-2022	Coreflood tests on intact core in 2018 to 2022	Simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Objectives were to: evaluate the rate of uraninite dissolution and changes in permeability of the core with leaching; generate laboratory scale test results applicable to planning the 2022 field test; and delineate a life-of-well-pattern production profile.	<p>Results were inconsistent in the early work (Coreflood 1 to 3C) due to highly variable reagent dosages in this pioneering work. Coreflood 4 and 5 (2021-ongoing).</p> <p>In Coreflood 4, as uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase. Lessons learned from past testing, particularly with respect to reagent adjustments, were put into practice with this testing to enable completion of the longest test run to support the feasibility work. In total, 51.8% of the initial dry mass of the sample was removed by leaching; 50% of this was the result of uranium leaching. Feed grade was 26.66% U3O8.</p> <p>In Coreflood 5 is ongoing and is focused on HGU 2B, which has the majority of contained uranium, highest grade and highest natural permeability. The methodology was different from the other coreflood tests in that the flow was directed through a pencil hole in core. Cumulative recovery at end of February 2023 was 33%.</p>	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Feasibility field test (FFT) leaching and remediation in 2022	The FFT was a full-scale proof of concept in an ISR method; to demonstrate injection of lixiviant and recovery of UBS from the CSW test pattern. Injection was into 1 well (GWR-041).	After pH below 3 was achieved in GWR-041, active leaching of uranium began. UBS grade from GWR-041 rose while pH declined. Uranium grade trended upwards to 25 g/L over four days, while injection pressure decreased. This suggests that leaching played a role in reducing resistance to flow. A peak sample grade of 43 g/L U was collected from GWR-041 after a further three days, so the acid injection phase was ended (on October 12). A global leaching recovery curve could be developed using the field testing and coreflood tests.	No discussion included herein.

### **1.1 2018 Column Leach and Groundwater Restoration Test**

In early 2018, a column leach test with acid lixiviant was performed. The core material used for testing came from three drill holes. Select intervals of overlying very low-grade sandstone was blended with very high-grade intervals to create a composite feed grade of 24.2% U. Details on the core material used in the leach tests are provided in Appendix A to this response, in Table A1.

A total of 137 pore volumes (PVs) of uranium bearing solution (UBS) was generated at flow rate ranging between 2 to 4 PV/d. A 90% recovery was achieved with a peak individual sample uranium grade of 27.4 g/L and average UBS grade of 8.4 g/L U. Following the leaching, the column was flushed with simulated groundwater to simulate groundwater restoration. Analytical results from the first pore volume of water removed from the column during the restoration phase are incorporated into the range in UBS composition at the end of mining presented in Table IR-20, IR-67, IR-69-2.

*Table 2 addresses IR-20. This table summarizes information from the metallurgical testing with respect to composition of the UBS at the end of mining, prior to remediation.* See further discussion below in Section 1.3.

Flushing of the column with simulated groundwater (Phase 1 of restoration) was continued for 84 pore volumes. Phase 2 (RPV 84-108) circulated simulated ore zone water quality fortified with 1 g/L Bicarbonate [from  $\text{NaHCO}_3$ ]. The test simulated the operation of a Reverse Osmosis (RO) water treatment step where solution exiting the column would be treated prior to being re-introduced. Phase 3 (RPV 108-114) re-established injection of simulated groundwater quality. The objective of this phase was to displace the bicarbonate and to ensure ground water stability once the circulation of fluid is halted. Analytical results for groundwater collected during this restoration process are shown in Table 9 and Table 10. Information presented in those tables is discussed further in Section 2.0.

### **1.2 Column and Coreflood Tests**

The following were common to all column and coreflood tests performed:

- The pore volume was determined by pumping water (deionized water, site groundwater) into each column or core until filled.
- Temperature was controlled to 10°C by placing the apparatus in a walk-in cooler.
- An online UBS or Remediation/Flushing Solution sample was taken daily.

Table 2:UBS Chemistry at end of Leaching (Mining)

Test	Units	Coreflood 2B (2021)	Coreflood 3C	Number of Samples	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Baseline Ore Zone Groundwater Chemistry
Sample Name		D-CF2B-57	D-CF3C-142		Minimum	Maximum	GWR-032 (2021-06-04)
Acidity	mg/L			5	65000	87000	
Bicarbonate	mg/L	-	-	6	0	<1	118
Carbonate	mg/L			5	<1	<1	<1
Chloride	mg/L			1	<10	1220	220
Hydroxide	mg/L			0	<1	<1	<1
P. alkalinity	mg/L			0	<1	<1	<1
pH	pH units	2.1	1.1	13	0.63	2.10	6.83
Specific Conductance	uS/cm			9	52100	303000	860
Eh	mV			10	580	870	
Sum of ions	mg/L			5	52700	70100	504
Total alkalinity	mg/L			5	<1	<1	97
Total hardness	mg/L			5	202	1480	182
Nitrate	mg/L			5	<4	<40	<0.04
Fluoride	mg/L			5	1	34	0.23
Total dissolved solids	mg/L			5	8970	47900	599
Calcium	mg/L	557	723	13	58	723	55
Magnesium	mg/L	47	<63	13	<10	240	11
Potassium	mg/L	148.8	<86	13	6.2	149	4.6
Sodium	mg/L	17.9	<77	13	6.0	12300	81
Aluminum, dissolved	mg/L	1738	71	13	69	4609	0.0006
Antimony, dissolved	mg/L			5	0.040	1	<0.0002
Arsenic, dissolved	mg/L	<0.1	<1	13	<0.1	21	0.2
Barium, dissolved	mg/L	<0.1	<1	13	<0.05	<0.5	0.063
Beryllium, dissolved	mg/L			5	0.07	0.4	<0.0001
Boron, dissolved	mg/L			1	<1	<10	0.43
Cadmium, dissolved	mg/L	<0.1	<1	13	0.018	1.809	<0.00001
Chromium, dissolved	mg/L	9.1403	<1	13	<0.1	9.140	<0.0005
Cobalt, dissolved	mg/L	5.41	<1	12	0.5	15	<0.0001
Copper, dissolved	mg/L	5.16	10.23	13	5.2	964	<0.0002
Iron, dissolved	mg/L	3309	4094	13	820	4094	4.2
Lead, dissolved	mg/L	0.97	19.45	13	0.20	19	<0.0001
Manganese, dissolved	mg/L	16.35	<81	13	2.70	41	0.22
Molybdenum, dissolved	mg/L	1.65	59.57	13	1.65	60	0.0038
Nickel, dissolved	mg/L	15.7	<1	13	<1	27	0.001
Selenium, dissolved	mg/L	18.4	<1	13	<0.025	26	<0.0001
Silver, dissolved	mg/L			5	<0.005	<0.05	<0.00005
Strontium, dissolved	mg/L	5.2	<1	7	0.60	5	1.66
Thallium, dissolved	mg/L	-	-	5	0.05	<0.2	<0.0002
Tin, dissolved	mg/L	-	-	5	0.07	0.30	-
Titanium, dissolved	mg/L			5	2.80	32	<0.0002
Uranium, dissolved	mg/L	7.45E+03	3.88E+04	13	7.70E+02	3.88E+04	1.10E-02
Vanadium, dissolved	mg/L	160.88	62.57	13	6.16	161	<0.0001
Zinc, dissolved	mg/L	134.37	4.03	13	2.30	331	2.62
Sulfur	mg/L	9,263	22,877	13	5211	209411	4.3
Phosphorous	mg/L	-	75.4	13	2	75	<0.01
Silica, soluble, dissolved	mg/L	-	-	6	31	192	13.3
Radium-226*	Bq/L	-	-	4	230	3000	180
Radium-228*	Bq/L	-	-	1	5	5	-
Lead-210*	Bq/L	-	-	4	600	1700	2200
Polonium-210*	Bq/L	-	-	4	290	2000	110
Thorium-230*	Bq/L	-	-	4	21000	220000	7
Thorium-232*	Bq/L	-	-	4	2	12	-
Radium-226*	mg/L	-	-	4	6.29E-06	8.21E-05	4.92E-06
Thorium-230*	mg/L	-	-	4	2.75E-02	2.88E-01	9.17E-06

Notes

* Analytical results for radionuclides are limited. The ranges of radionuclide concentrations (Bq/L) provided are considered conservative because they reflect composite samples collected over the ISR leaching period in the 2021 column samples, not UBS at the end of mining	
	Analytical results for Coreflood 2B and 3C are provided (in addition to the range of UBS Constituent Concentrations) because results from the remediation portion of these tests was used for development of the Restored Solutions modelled in the draft EIS (Appendix 7-C)
	Used to highlight baseline groundwater quality in the ore zone for comparison with UBS Composition at end of mining.



## 2021 UBS Column Tests

The objective of the 2021 column tests was to test leach recoveries on a range of feed grades. Four samples were generated from nine drill holes, all proximal to the WS Shear where most of the resource lies. The samples contain varying amounts of uraninite, sulphides, clay and iron and represent blends of the various hydrogeologic units within the deposit (HGUs). Samples were crushed to -10 mm. Columns with a diameter of ~100 mm were packed with the samples. Four column tests were conducted, with details for each sample listed in Table 3.

The 2021 column tests used the full-size distribution of crushed core and achieved relatively high mineral liberation in contact with lixiviant. This results in relatively rapid leach kinetics compared to intact core. The initial flow rate was calculated based on a retention time of eight hours (3 column pore volumes per day (PV/d)).

Table 1: Summary of Samples for Column Test 1 to 4

Column No.	Sample ID	Mass (g)	Feed U <sub>3</sub> O <sub>8</sub> (wt%) <sup>a</sup>	HGUs in Blend <sup>b</sup>	Hole IDs	Number of PVs - Leaching	Number of PVs - Remediation
1	Sample A	27,338	48.1	2A/B/C/D	GWR-10, 16, 19, 21	116	6.7 (D.I. Water)
2	Sample B	18,619	46.1	2B	GWR-10, 19, 23, 26	120.4	16.5 (Site GW, 10g/L NaOH Solution)
3	Sample D	9,180	1.8	2A/C/D/E	GWR-15, 16, 19, 26	14.7	15.5 (Site GW, 10g/L NaOH Solution)
4	Samples C&E	8,742	26.9	2A/C/D/E	GWR-01, 19, 22	29.7	11.2 (Site Water, 1.5g/L NaHCO <sub>3</sub> )

Notes

<sup>a</sup> Back Calculated

<sup>b</sup> HGUs = Hydrogeological Units in the Ore Zone

A single pass flow of dilute sulfuric acid and hydrogen peroxide lixiviant was run between 22 to 38 days. Lixiviant strength was generally decreased over the course of each run. UBS composition from each of the column leach tests at the end of leaching is shown in Table 2.

On completion of the leaching tests, each column was flushed with water (de-ionized water or groundwater) and for columns #2, #3 and #4, neutralization of groundwater was evaluated using alkaline solutions. Solutions used and porewater volumes flushed are summarized in Table 3. Analytical results for solution composition during the remediation phase are included in Table 9 and Table 10.

Mineralogy of the column samples pre-testing were analyzed by XRD and QEMSCAN; the mineral assemblages aligned with the overall understanding of the ore zone mineralogy, provided as Table IR-20, IR-67, IR-69-A2 (Appendix A to this response). XRD results for the fine particles are provided as Table 4. These results show the formation of secondary sulphate minerals during the uranium ore leaching process. The other mineral phases are associated with the (pre-mining) ore zone mineralogy, provided in the draft EIS as Table 3-1 of Appendix 7-C, and provided herein in Appendix A as Table 2.

Table 4: XRD Results for Fine Particles in UBS, Column Experiments #1 to #4 (2021)

Mineral Phase	Column #1	Column # 2	Column #3	Column #4
Anglesite	18.1	9.8	-	6.6
Anhydrite	7	-	-	-
Biotite	-	38	24.2	8.3
Chlinochlore	62.6	21.2	20.3	20.1
Gypsum	-	4.4	-	-
Kaolinite	-	22	41.1	57
Quartz	-	-	5.4	-
Pyrite	12.3	4.6	8.9	7.1

Notes

Secondary Minerals

## 2022 Column Leaching and Remediation Tests

A suite of 5 column leaching tests was undertaken to support remediation planning. Whereas core flood testing may more realistically represent the ISR conditions with respect to operational conditions (i.e., using intact core and pressure applied), this phase of column testing used crushed material to accelerate the testing process and, thus, provide key information on the remediation phase and prepare for the (2022) field feasibility study.

The 2022 column testing program consisted of five 100mm diameter columns loaded with samples from different HGUs providing characterization of ore variability. The samples were selected from a blend of assay sample splits of fresh core from GWR-054 through GWR-061, supplemented by preserved core from GWR-016, GWR-022 and GWR-024 stored frozen by Denison. The hole locations are shown Figure 1 ranging along the length of the deposit. Intervals from five to eight different drill holes were composited to meet required sample mass and/or to meet representativeness for each HGU.

The samples were hand crushed to minimize fines generation, to a maximum size of 30 mm. Minimum size fraction was +0.212 mm by wet screening out fines. This was designed to promote flow through the column and minimize exposed mineral surface area. Overall procedures were like 2021 column tests. The lixiviant was a mixture of sulphuric acid and hydrogen peroxide and was prepared using Wheeler River groundwater. Lixiviant was injected upwards in essentially flooded plug flow conditions. The flow rate was calculated based on ~0.67 measured column PV/d. Test parameter variables were minimized, so the differences between HGUs could be distinguished.

Initially, all five columns were fed lixiviant from a common tank. The low-grade columns 2A and 2E were run until fully leached. From that point forward, 2A and 2E were fed from a separate tank to perform groundwater flush and neutralization. A summary of details of the column tests including pore volumes during leaching, during post-leaching flushing with groundwater, and during neutralization are provided in Table 5.

UBS composition at the end of the leaching period is provided in Table 2, and groundwater quality following the groundwater flushing and neutralization is provided in Table 9 and Table 10.

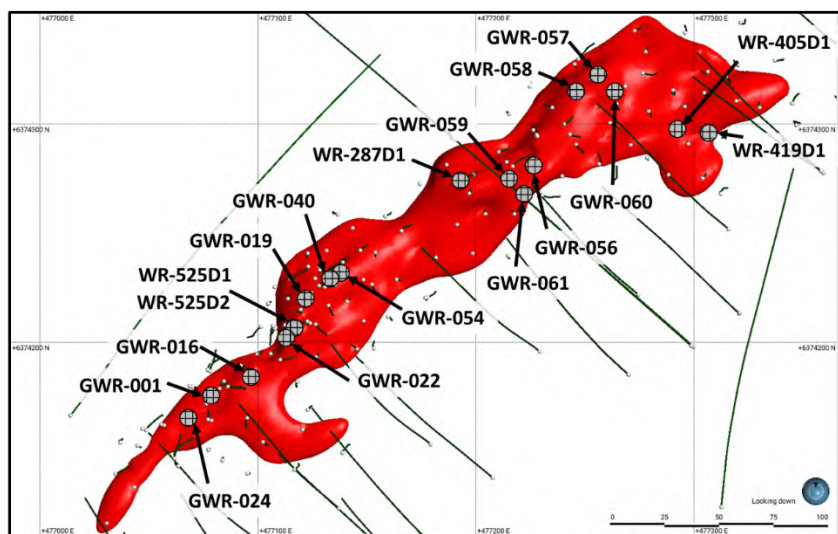


Figure 1: Metallurgical Hole Locations for 2022 Column Leach Testing

Table IR-20, IR-67, IR-69-2: 2022 Column Leach Testing Details

Columns	2a	2b	2c	2d	2e
Estimated Grade (wt % U <sub>3</sub> O <sub>8</sub> )	5.0%	58.3%	41.3%	46.1%	1.6%
	Numbers of Pore Volumes				
Phase 1: Groundwater equilibration	2.9	3.1	3.0	2.8	3.1
Phase 2: In-Situ Recovery (ISR)	20.8	66.7	64.1	62.4	19.4
Phase 3: Groundwater Flushing	15.0	16.2	15.1	11.6	14.9
Phase 4: Neutralization	4.4	4.2	11.0	2.6	3.7
Total Pore Volumes	43.1	90.3	93.1	79.4	41.1
pH at end of Phase 2	0.93	0.95	0.91	0.91	0.95
pH at end of Phase 4	9.53	7.1	3.8	7.22	7.87

QEMSCAN was done on the column pre-testing and at the end of the flushing period. The results are presented as Table 6. Mineral phases that reflect basement-derived materials in the ore zone residuals include biotite, spodumene, petalite and garnet.

Table 6: 2022 Column Leach Test QEMSCAN results

QEMSCAN	Column 2a		Column 2b		Column 2c		Column 2d		Column 2e	
	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)
Mineral	2A-BATCH-1	DCL-2a-R	2B-BATCH-1	DCL-2b-R	2C-BATCH-1	DCL-2c-R	2D-BATCH-1	DCL-2d-R	2E-BATCH-1	DCL-2e-R
Anglesite		3.84		3.28		3.99		14.18		1.15
Biotite	4.84	1.38	0.25	0.44	4.26	0.83	1.16	1.41	2.96	1.98
Bornite	0.36	0.07					0.70	1.15	0.43	0.20
Calcite			0.42	0.69		0.14				
Chalcocite (CuS)			1.54		0.28		0.31		1.28	
Chalcopyrite	12.37	13.03	0.71	2.27	0.11	0.16		0.25	8.76	3.48
Chlorite				3.15						
Clinocllore-(Fe)		11.34				0.8		9.39		52.26
Covellite (CuS)	0.35	0.38	0.19	2.61	0.39	1.34	0.06	0.18	0.10	0.20
Fe-oxide		0.03				1.15		0.53		0.03
Galena	0.63	0.40	0.43	1.23	0.25	0.3	0.53	3.06	0.10	0.02
Garnet	0.25				2.52		1.47		0.43	
Goethite-Clay mix	4.31	0.03	0.35	0.10	7.37	16.78	10.95	1.66	1.52	0.41
Illite	0.21	0.52		0.05					0.32	0.67
Ilmenite		0.08				0.09				0.47
Kaolinite	42.04	40.41	1.52	3.28	7.12	11.67	0.75	2.09	62.20	28.63
Muscovite	9.46	6.09	0.79	3.35	0.81	1.2	0.15	2.06	13.69	8.79
Petalite		0.15		0.05				0.03		0.02
Pyrite	8.48	10.44	1.49	3.38	0.98	1.58	0.12	0.09		0.84
Quartz	4.40	9.11		1.05	0.05	0.42		1.74	1.01	0.12
Rutile	0.61	0.58	0.07	0.04	0.04	0.04			0.44	0.32
Sphalerite	0.56	0.41		0.04	0.03			0.02		
Spodumene		0.17		0.05		0.16				0.05
Uraninite	10.70	1.07	92.10	74.89	75.74	58.72	83.73	61.93	6.67	0.29
Zircon	0.36	0.45	0.06	0.02		0.04				
Siderite						0.54				

## 2018-2022 Coreflood Tests

Core testing machines (CTM) were typically used to study in situ oil recovery processes, for flooding uranium deposit drill core with lixiviant to simulate ISR conditions on a micro scale which are referred to as coreflood tests. All drill cores tested were from vertically oriented drill holes allowing the flow from end to end of the coreholder to simulate flow in the vertical direction of the deposit. This is tangential to the intended predominantly horizontal flow path between wells in situ.

From late 2019 to mid-2021, coreflood tests numbered 1, 2A, 2B, 3A, and 3C were performed. The main objective was to simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Priority was placed on testing a large number of samples over short durations. Tests were ended early, so, uranium recoveries were low relative to later testing (generally < 10%). Results for Coreflood 2B and 3C are discussed further herein.

### Coreflood 2B and 3C

Details for the testing of Coreflood 2B and 3C are provided in Table 7.

Table 7: 2021 Coreflood Test Details

Coreflood	2B		3C	
Corehole	GWR-024		GWR-019	
Core Dimensions (average diameter, average length), in mm	60 x100		78*70	
Core Pore volume (mL)	36.9		53.1	
Estimated Grade (wt % U3O8)	24		70.7	
	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)
In-Situ Recovery (ISR)	34.4	2.1	82.7	0.98
Groundwater Flushing	22.7	1.91	91.6	2.83
Neutralization with NaOH	55.6	11.92	-	-
Neutralization with NaHCO <sub>3</sub>	-	-	62.4	6.87
Post-Neutralization Groundwater Flush	9.3	11.47	17.2	6.43
Total Pore Volumes	122	-	253.9	-

The UBS composition at the end of leaching for Coreflood 2B and 3C is provided in Table 2. The analytical results for these samples were provided in Table 2 because Corefloods 2B and 3C were the primary basis for the development of the restored solutions. UBS composition during flushing for these coreflood tests is discussed further in Section 2.0 and is summarized in Table 9 and Table 10.

At the end of testing, the core from Coreflood 2B was frozen. The frozen core was cut in the middle into two sides. XRD, QEMSCAN and SEM was done on one half of the sample, on the inside cut. The XRD results indicated:

- 19.5 wt% Kaolinite
- 26.7 wt % Montmorillonite
- 45.3 wt % Dickite
- 2.9 % Fluorite
- 5.6 % Pyrite

The cumulative uranium recovery for core 2B was low, and thus the sample (post-leaching) has a mineralogical composition comparable to that of the unmined ore zone. The portion of the sample that underwent mineralogical analysis was also rich in clay minerals. The QEMSCAN results are shown in Figure 2. The SEM image (not shown) shows the presence of uraninite, pyrite, and sphalerite.

The QEMScan shows a minor amount of mineral phase suggestive of a small amount of jarosite (“Fe-Al-Si-S”) closely associated with pyrite. This suggests formation of oxidation products/secondary minerals in the core with exposure to lixiviant.



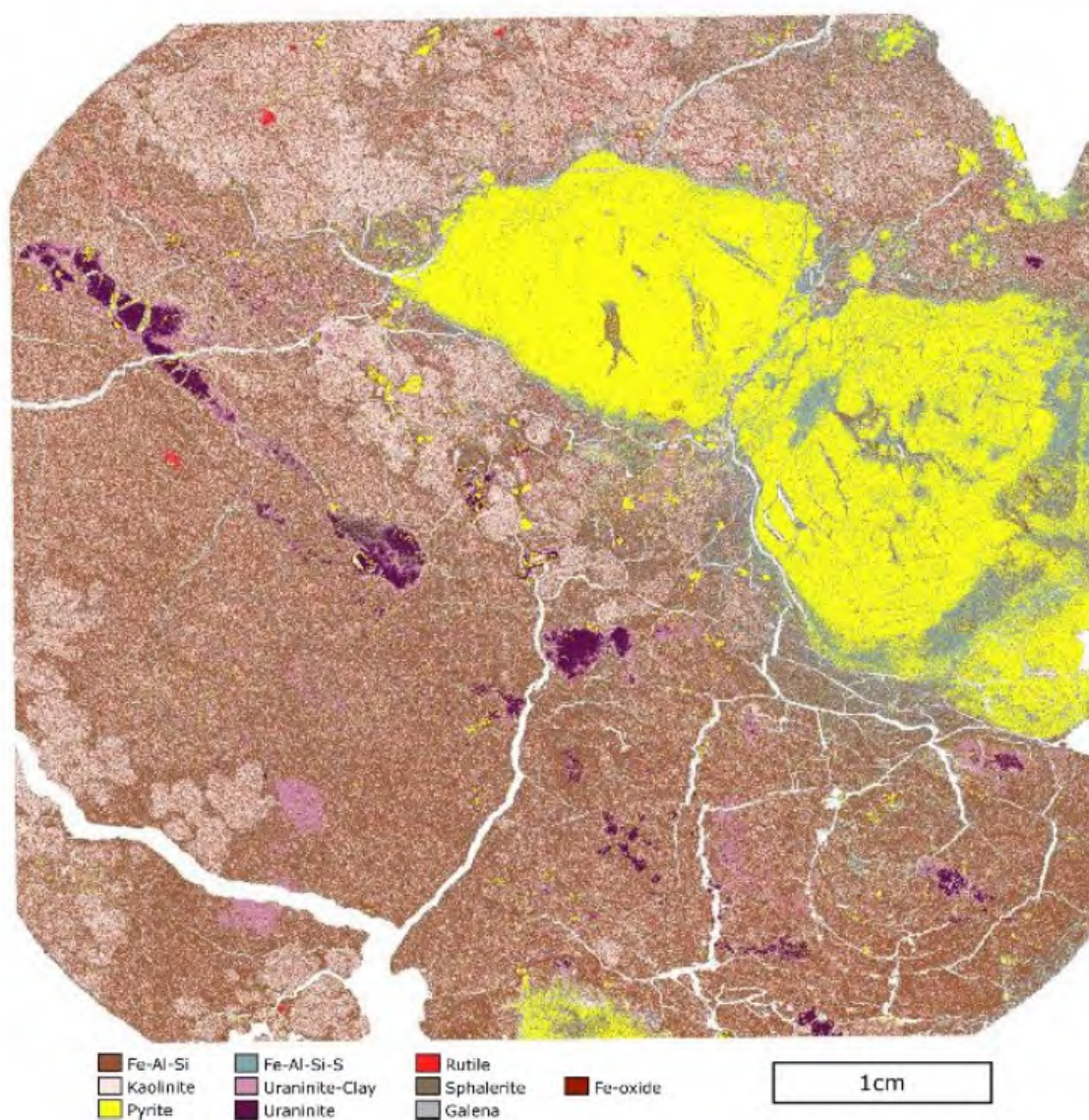


Figure 2: Coreflood 2, QEMSCAN

#### Coreflood 4

The Coreflood 4 sample was taken from a high-grade segment of HGU 2C from hole GWR-040, which is the middle CSW in the planned field feasibility test (FFT) well pattern. Thus, it was an excellent candidate to correlate with subsequent FFT results.

Coreflood 4 feed sample side view is shown in Figure 3. Near-horizontal mineral banding is evident.



Figure 3: Coreflood 4 Feed Sample Side View, Prior to Placement in Coreflood Machine

Coreflood 4 ran for a total of 113 PVs over 391 days, with life-of-test average UBS grade of 18.7 g/L U and reagent consumptions of 2.78 kg H<sub>2</sub>SO<sub>4</sub> and 0.35 kg H<sub>2</sub>O<sub>2</sub> per kg U. Part of the difficulty of production ramp-up of Coreflood 4 was due to the flow constraint of low micro scale permeability through the intact core, particularly with generally lower permeability in the vertical flow direction of coreflood samples. As uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase.

In total, 51.8% of the initial dry mass of the sample was removed by leaching. Just over half of the mass loss is accounted for by uranium leaching, and the remainder is accounted for by gangue mineralization leaching. The feed grade was back calculated from measurements of the total uranium in UBS collected throughout the test plus leach residue sections. Feed grade was 26.66% U<sub>3</sub>O<sub>8</sub>, and final recovery was 97.1%. Coreflood 4 is the most comprehensive simulation of ISR for the Phoenix FS, with the highest recovery demonstrated from an intact core to date.

Coreflood 4 provides the most information about the mineralogical and hydrogeochemical changes that are occurring in the ore zone during mining. Post-leaching, the core leached in Coreflood 4 was cut into segments, as shown in Figure 4, assayed and visually examined (photographed) for changes to the core due to leaching. The mineralogy of each section was determined.

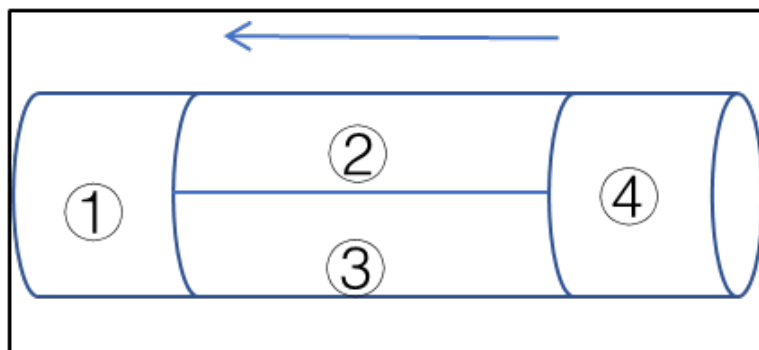


Figure 4: Coreflood 4 Cut Sections and Direction of Flow

Coreflood 4 feed side puck (Section 4), inlet face view is shown in Figure 5. The feed end was deeply eroded, nearly through to the discharge side of the section.



Figure 5: Coreflood 4 Feed Side Puck (Section 4), Inlet Face View

Coreflood 4 middle (Section 2), centre longitudinal cut face view is shown in Figure 6. It was strongly bleached throughout, with cracks that appeared after drying.





Figure 6: Coreflood 4 Middle (Section 2), Centre Longitudinal Cut Face View

Coreflood 4 discharge end puck (Section 1), inlet face view, dried, is shown in Figure 7. It was strongly bleached across the entire cross-section.



Figure 7: Coreflood 4 Discharge End Puck (Section 1), Inlet Face View, Dried

XRD for each of the sections is given in Table 8. Mineral phases that reflect basement-derived materials in the ore zone residuals include anorthite.

Table 8: XRD Results for Coreflood 4 Core Sections

Mineralogical Composition Post-Extraction	D-CF4A-1	D-CF4A-2	D-CF4A-3	D-CF4A-4
Location/section in the coreflood column	Discharge End	Midsection	Midsection	Feed End
Kaolinite (Al <sub>2</sub> Si <sub>2</sub> O <sub>9</sub> H <sub>4</sub> )	74.7	22.1	38.3	43.8
Pyrite (FeS <sub>2</sub> )	17.9	20	12.4	16
Chamosite (Mg <sub>2.518</sub> Fe <sub>2.482</sub> )Al <sub>1.25</sub> Si <sub>3.80</sub> H <sub>10</sub> ) (Chlorite Group)	7.3	5.8	1.4	--
Gypsum (CaSO <sub>4</sub> H <sub>2</sub> )	--	7.5	4.5	4.8
Barite (BaSO <sub>4</sub> )	--	1.6	0.7	--
Anorthite (CaSi <sub>2</sub> Al <sub>2</sub> O <sub>8</sub> )	--	30.7	31.8	--
Goethite (FeO <sub>2</sub> H)	--	12.4	10.9	4.3
Anglesite (PbSO <sub>4</sub> )	--	--	--	31.1

### 1.3 Composition of the UBS remaining in the Ore Zone at the end of Mining (IR-20)

The analytical results for the UBS composition in Coreflood 2B and 3C are shown in Table 2 along with a range of UBS composition that was developed from the relevant analytical results for a total of 13 samples from across the column and coreflood tests. The ranges of values for constituents of potential concern (COPCs), as defined in Appendix 7-C of the draft EIS, are provided in Table 2. Uranium and other COPC concentrations generally vary by 2-3 orders of magnitude. There is expected variability in the UBS composition because of the nature of the deposit, which has been captured in the conditions of the metallurgical testing, and the nature of the testing (e.g., core vs. crushed rock, test duration, lixiviant composition, etc.). The analytical results were given explicitly for Coreflood 2B and 3C because of the use of results from these coreflood tests to develop the restored solutions, which is discussed further in Section 2.0.

***The range of UBS composition at the end of mining has been included in Table 3-5 of Appendix 7-C as was requested as part of IR-20, such that UBS quality at the end of mining and remediated conditions (represented by the Restored Solutions) can be compared. The updated Table 3-5 has been added to this response as Appendix B.***

### 1.4 Mineralogical and Hydrogeochemical Changes to the Ore Zone with Mining (IR-69)

Understanding of changes in the mineralogy of the ore zone with mining are informed by the XRD results from Coreflood 4, as this test was terminated at the completion of the ISR process, and QEMSCAN results for the 2022 columns, because these tests provide quantitative information on the mineral assemblage following mining and with remediation. The following conclusions are made with respect to changes in the mineralogy in the ore zone with mining:

- The mining process is effective as leaching uraninite from the ore zone and also results in partial dissolution of sulphide minerals (pyrite, sphalerite, galena, etc.);
- Secondary sulphate minerals are formed as a result of the mining process. The associated equations are shown in Appendix A. Jarosite minerals were suggested surrounding pyrite particles in the QEMSCAN of Coreflood 2, but were not detected in any of the other post-mining residuals. Gypsum and barite were detected in XRD but not present at quantifiable levels in association with the 2022 column residuals. Formation of anglesite is shown by XRD and QEMSCAN in post-mining residuals.

- The elevated concentration of aluminum in solution evidences clay mineral dissolution, but overall the relative abundance of clays in the ore zone increases with ISR mining, as would be expected with ore dissolution.

The hydrochemistry of the ore zone post-mining is presented in Table 2. Consistent with the dissolution of parent minerals and the pH of the UBS, most COPCs concentrations in the UBS at the end of mining are elevated with respect to baseline groundwater conditions in the ore zone.

## 2.0. Composition of the Restored Solutions (Addresses Question #2 of IR-67)

The restored solutions were developed using the metallurgical data that were available when conditions in Post-Decommissioning were being conceptualized in 2020-2021 for numerical modelling and effects assessment (Appendix 7-C of the draft EIS). This included the early results on acid leaching of the core (2018) and Coreflood 2B and 3C results. At that time, the coreflood tests provided the most detailed information from which to develop the chemistry of the Restored Solutions #1 and #2, using the remediation portion of the tests. From the results of that testing, “Restored Solution #1” and “Restored Solution #2” (Table 3-5) were developed to represent the bounding scenarios for groundwater quality considered in the reactive transport model to evaluate the potential for environmental effects following remediation of the mining area. As is discussed further below, these solution compositions were developed to reflect remediation of the ore zone through flushing and neutralization, without over-neutralization – meaning, base addition past circumneutral conditions to alkaline conditions.

Since that time, more information from the column and coreflood tests has become available that supports the composition of the Restored Solutions put forward in the draft EIS as being representative of porewater within the mining zone with remediation.

When developing the restored solutions for the draft EIS, the approach was generally to select concentrations for any given element/parameter that represented a low to mid-range value for the COPC from the metallurgical testing solutions, to be conservative with respect to evaluating potential effect, but also to reflect the goal of the remediation (to align with ALARA, as is discussed below). For dissolved uranium, the concentration in Restored Solutions #1 and #2 were set to upper bounds of 100 mg/L and 30 mg/L, respectively. In some cases, like Co and Ni, the values selected for modelling were identified to be on the high end upon subsequent metallurgical testing. Thus, the concentrations for these elements modelled are conservative with respect to anticipated pore water concentrations of these elements post-remediation.

The basis of the selected concentrations for Restored Solution #1, which was the solution modelled in Appendix 7-C of the draft EIS, is provided below in Table 9. As Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone), this solution was carried forward for geochemical reactive transport modelling to evaluate environmental effects.



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Table 9: Groundwater Chemistry basis for Restored Solution #1

Metallurgical Test		2018 Pre-Feasibility: Restoration Phase Data	Coreflood 2B	Coreflood 2B	Coreflood 2B	Coreflood 3C	2021 Column, 2	2021 Column, 3	2021 Column, 4	2022 Column, 2a	2022 Column, 2c	2022 Column, 2d	2022 Column, 2e	2022 Column, 2e	Restored Solution #1	Notes on Value Carried Forward in Restored Solution for Model	
Sample Name		RPV30-23	D-CF2B-121-143	D-CF2B-134-144,146	D-CF2B-COMBINED-1 (D-CF2B-134-144,146)	D-CF3C-225-237	D-CL2-FW-2	D-CL3-FW-2	D-CL4-FW-2	D-CL2A-68	D-CL2C-114	D-CL2D-111	D-CL2E-63	D-CL2E-68			
Statistic		-	Average Value <sup>a</sup>	Average Value <sup>a</sup>	-	Average Value <sup>a</sup>	-	-	-	-	-	-	-	-			
Remediation Method		GW Flush	NaOH Neutralization	NaOH Neutralization	NaOH Neutralization	Bicarbonate Neutralization	Groundwater	Groundwater	NaOH Neutralization	NaOH Neutralization	GW Flush	GW Flush	GW Flush	NaOH Neutralization			
pH		pH units	3.87	4.4	4.42	2.97	2.6	2.44	2.66	3.80	2.58	2.46	2.48	4.05	4.3	High end of observed	
Eh		mV	520	525	Same as adjacent (D-CF3C-238-256)	598					570	542	426	648	-	Set in model to reflect oxidized conditions	
Pore Volumes of remediation		-	30-32	59-74		69-76	109-130				19.4	15.1	11.6	14.9	18.6	-	
Aluminum, dissolved		mg/L	5.6	9.7	10.3	7.0	<5	5.4	26	9.1	9.0	9.9	12	32.8	15.6	7	Low end of observed
Arsenic, dissolved		mg/L	<0.010	0.17	0.22	0.03	0.48	0.15	0.31	0.1	0.02	0.14	0.06	0.4	0.012	0.06	Low end of observed
Barium, dissolved		mg/L	<0.05	0.10	<0.1	<0.05	<0.1	<0.005	<0.05	<0.05	<0.05	<0.05	0.006	0.018	0.05	Mid range of observed	
Total Inorganic Carbon (C(4))		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	58	Assumed to be approximately equivalent to GW values and considers some bicarbonate	
Calcium		mg/L	109	228	210	-	81.7	11	43	23	21	22	380	20	35	110	Mid range of observed
Cadmium, dissolved		mg/L	<0.001	<0.1	<0.1	0.015	<0.1	0.061	0.033	0.020	0.051	0.001	0.004	0.0004	0.0003	0.015	Mid range of observed
Chloride		mg/L	37	-	-	-	1	<1	1	33	<1	6	3	9	200	Very limited information available. Set to a higher value to consider potential for values closer to baseline ore zone water quality	
Cobalt, dissolved		mg/L	-	2.8	2.1	2.0	<0.1	-	-	0.15	0.03	0.16	0.53	0.42	2	High end of observed	
Chromium, dissolved		mg/L	0.04	0.22	0.14	<0.05	<0.1	0.18	0.76	0.16	<0.05	<0.05	0.17	0.013	0.05	Mid range of observed	
Copper, dissolved		mg/L	2.23	0.21	0.24	0.17	<0.1	6.2	5.8	9.2	25	3.1	3.2	20.1	4.7	0.17	Low end of observed
Fluoride		mg/L	NA	-	-	-	2.4	0.32	1.6	3	6.0	4.2	2	3	-	No data available at time of developing Restored Solution	
Iron, dissolved		mg/L	54.1	378	334	324	13.0	23.2	92	40	124	33	75	74	57	100	Mid range of observed
Potassium		mg/L	<1	10.1	9.5	-	<8	3.5	4.7	1.5	3.7	1.5	5.6	1.9	1.4	9	High end of observed
Magnesium		mg/L	3.7	-	-	-	<6	0.6	11	0.2	3.0	0.4	4.4	38	43	6	Mid range of observed
Manganese, dissolved		mg/L	0.68	9.3	-	3.4	<8	0.57	0.63	0.85	2.0	0.98	4.1	0.31	0.30	3.4	Mid range of observed
Molybdenum, dissolved		mg/L	0.05	0.22	0.22	0.10	<0.1	0.16	2.1	0.10	0.05	0.05	0.03	0.58	0.019	0.1	Mid range of observed
Sodium		mg/L	221	283.2	351.0	-	120	3.1	4.1	2.8	760	3.0	4.3	3.7	378	190	Mid range of observed
Nickel, dissolved		mg/L	0.20	12.8	10.0	9.7	<0.1	0.56	3.2	0.75	0.55	0.06	0.35	1.04	0.92	9.7	High end of observed
Lead, dissolved		mg/L	3.08	2.9	3.41	3.1	1.8	4.97	0.68	0.96	1.3	0.22	0.10	2.64	0.50	3.1	Mid-high range of observed
Sulfate		mg/L	860	2700	2724	-	679	300	750	480	2180	470	1460	690	1220	620	Mid range of observed
Selenium, dissolved		mg/L	<0.025	0.31	0.23	0.08	<0.1	0.39	0.10	0.13	0.01	0.02	0.05	0.042	0.098	0.08	Mid range of observed
Si		mg/L	71.9	-	-	-	-	-	-	-	-	-	-	-	-	40	limited information available; value similar to available data assumed
Strontium, dissolved		mg/L	-	4.5	4.4	4.4	3.2	0.32	0.70	0.22	0.62	0.43	0.58	0.67	0.76	4.4	Upper range of observed
Zinc, dissolved		mg/L	1.48	1.6	1.4	1.4	0.14	1.7	3.6	3.0	10	0.14	-	0.20	0.13	1.4	Mid-range of observed
P		mg/L	-	-	-	-	<4	-	-	-	-	-	-	-	-	4	applied limited information
Uranium		mg/L	105	586	334	338	45.2	92	217	579	145	288	328	38.1	30.8	100	Mid-low end of observed; value set as upper bound in the EIS
Vanadium, dissolved		mg/L	0.09	2.9	0.8	0.51	0.32	0.35	2.8	1.1	0.13	0.70	0.51	1.8	0.006	0.51	Low end of observed
Polonium-210		Bq/L	6.3+/-0.5	-	-	1600	-	-	-	-	-	-	-	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228		Bq/L	-	-	-	<10	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-228		Bq/L	-	-	-	<3	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-230		Bq/L	105+/-9.6	-	-	<500	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Radium-226		Bq/L	65.8+/-0.3	-	-	<200	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Lead-210		Bq/L	530+/-1.3	-	-	2400	-	-	-	-	-	-	-	-	-	-	Not modelled (transport behaviour taken into account with Pb)
Thorium-232		Bq/L	0.2+/-0.04	-	-	0.05	-	-	-	-	-	-	-	-	-	-	Not modelled
Radium-226		mg/L	1.80E-06	-	-	<5.47E-06	-	-	-	-	-	-	-	-	-	5.47E-06	Limited data, high end value <sup>b</sup>
Thorium-230		mg/L	1.38E-04	-	-	<6.55E-04	-	-	-	-	-	-	-	-	-	3.93E-06	Limited data set <sup>c</sup>

Notes

<sup>a</sup> Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS

<sup>b</sup> Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.

<sup>c</sup> Limited data set meant that PFS groundwater flushing data at pH 5.8 was also considered in setting this value, with a Th-230 concentration of 2.62E-07 mg/L and a Ra-226 value of 1E-05 mg/L (see Table IR-67-10)

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Table 10: Groundwater Chemistry basis for Restored Solution #2

Metallurgical Test		2018 Pre-Feasibility; Restoration Phase Data			Coreflood 3C	Coreflood 3C	2021 Column, 4	2022 Column, 2b	Restored Solution #2	Notes on Value Carried Forward in Restored Solution for Model
Sample Name		RPV 38-42	RPV 42-53	RPV 54-57	D-CF3C-238-256	D-CF3C-COMBINED-1 (D-CF3C-238-256)	D-CL4-FW-3	D-CL2b-116		
Statistic		-	-	-	Average <sup>a</sup>	-	-	-		
Remediation Method		GW Flush	Neutralization (NaHCO <sub>3</sub> )	GW Flush	Bicarbonate Neutralization	Bicarbonate Neutralization	Distilled Water Flush Post NaOH Neutralization	NaOH Neutralization		
pH	pH units	5.8	8.5	8.3	6.51	Same as adjacent (D-CF3C-238-256)	7.48	6.51	6.1	Low end of Observed
Eh	mV				402		-	387	-	Set in model to reflect oxidized conditions
Pore Volumes of remediation		-	76-84	82-108	-	131-162	-	18.70	-	
Aluminum, dissolved	mg/L	0.27	1.32	4.4	<5	0.56	0.70	10	0.56	Low end of observed
Arsenic, dissolved	mg/L	0.10	0.04	0.06	0.25	0.1	<0.01	0.000259	0.1	Upper end of observed
Barium, dissolved	mg/L	<0.05	0.05	0.04	<0.1	0.05	<0.05	0.2	0.05	Mid range of observed
Total Inorganic Carbon (C(4))		mg/L	-	-	-	-	-	-	105	Assumed to be approximately equivalent to GW values and considers some bicarbonate neutralization
Calcium	mg/L	28	13	5	48.1		16	127	10	Low end of observed
Cadmium, dissolved	mg/L	0.002	<0.001	<0.001	<0.1	0.004	0.004	<0.1	0.004	Mid range of observed
Chloride	mg/L	15	2	12			6	-	50	Set to a higher value to consider potential for values closer to baseline ore zone water quality
Cobalt, dissolved	mg/L				0.11	<0.01		<0.1	0.01	Low end of observed
Chromium, dissolved	mg/L	<0.01	<0.01	<0.01	<0.1	<0.05	0.05	<0.1	0.05	Mid range of observed
Copper, dissolved	mg/L	0.04	<0.01	<0.01	0.12	<0.02	0.33	0.2	0.02	Low end of observed
Fluoride	mg/L	0.5	1.2	0.8			1.4	-	0.8	Mid range of observed
Iron, dissolved	mg/L	6.13	0.44	1.23	9.1	4.7		10	4.7	Mid range of observed
Potassium	mg/L	<1	<1	2	<8		1.2	<8	3.5	Mid range of observed
Magnesium	mg/L	<1	<1	<1	6.7		1.2	<6	3	Mid range of observed
Manganese, dissolved	mg/L	0.07	0.02	0.05	<8	0.48	0.28	<8	0.48	Mid range of observed
Molybdenum, dissolved	mg/L	0.03	0.05	<0.005	0.47	0.13	<0.01	0.4	0.13	Mid range of observed
Sodium	mg/L	36	235	87	251		351	887	90	Low range of observed
Nickel, dissolved	mg/L	0.03	<0.01	<0.01	0.10	<0.01	0.21	0.1	0.01	Low end of observed
Lead, dissolved	mg/L	2.13	0.36	0.39	0.20	0.32	0.25	10.0	0.32	Mid range of observed
Sulfate	mg/L	174	117	100	718.7		440	2480	136	Low end of observed
Selenium, dissolved	mg/L	<0.025	<0.025	0.026	0.86	<0.01	0.09	<0.1	0.01	Low end of observed
Si	mg/L	43.7	43.8	44.4				132.6	40	Mid range of observed
Strontium, dissolved	mg/L				2.0	2.4	0.20	0.7	2.4	Upper end of observed
Zinc, dissolved	mg/L	0.08	<0.01	<0.01	0.10	<0.05	0.46	0.1	0.05	Mid-range of observed
P	mg/L				<4			<5	4	applied limited information available
Uranium (mg/L)	mg/L	3.5	4.1	0.5	19.3	26.4	187	38.7	30	Upper End of Observed
Vanadium, dissolved	mg/L	<0.01	0.007	0.03	0.13	0.16	0.03	0.2	0.16	Upper end of observed
Polonium-210	Bq/L	14.9+/-0.3	1.9+/-0.1	2.7+/-0.1	-	280	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228	Bq/L	-	-	-	-	<2	-	-	-	Not modelled
Thorium-228	Bq/L	-	-	-	-	<1	-	-	-	Not modelled
Thorium-230	Bq/L	0.2+/-0.03	1.36+/-0.14	3.2+/-0.4	-	<100	-	-	-	See Below for values in mg/L
Radium-226	Bq/L	389+/-0.7	262+/-0.5	129+/-0.4	-	370	-	-	-	See Below for values in mg/L
Lead-210	Bq/L	301+/-0.7	40+/-0.3	22+/-0.2	-	660	-	-	-	Not modelled (transport behaviour taken into account with Pb modelled)
Thorium-232	Bq/L	<0.01	<0.01	<0.01	-	0.007	-	-	-	Not modelled
Radium-226	mg/L	1.06E-05	7.17E-06	3.53E-06	-	1.01E-05	-	-	1.01E-05	Limited data, high end value
Thorium-230	mg/L	2.62E-07	1.78E-06	4.19E-06	-	<1.31E-04	-	-	1.31E-06	Limited data set ; Low end of observed
Notes										
		Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS								
		Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS, but not considered in the development of Restored Solution #2 as pH was alkaline								
		Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.								

### 3.0. Remediation of Mining Area within the context of ALARA (Addresses Question #3 of IR-67)

Section 2.2.3 of the draft EIS presents the conceptual decommissioning plan (CDP). As part of the CDP, and as highlighted in Section 2.3.3.1.1 of the draft EIS, remediation of the mining area will continue until recovered water reaches and is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives. Such decommissioning objectives consider protection of plausible downgradient water uses. For the purpose of the assessment "plausible use" has been determined to be the protection of aquatic life in Whitefish Lake, since numeric 3D groundwater modelling has indicated that Whitefish Lake is where groundwater associated with the remediated mining area will discharge to. It is within this frame of reference therefore that the ALARA concept should be considered. That is, ALARA can be defined for the purpose of the remediation of the mining area to the extent that subsequent discharge of groundwater to Whitefish Lake does not adversely affect aquatic biota in the lake.

The metallurgical testing done to date evidences an amelioration of UBS quality post-mining with flushing using groundwater and base (hydroxide or bicarbonate) to a restored solution of pH in the range of 4.5-5.5. The intent of the remediation approach is to raise the pH consistently but incrementally, so as to avoid over-neutralizing and yielding an alkaline solution. Alkaline pH conditions favour the formation of precipitates that are not desired from a physical (clogging) or chemical standpoint (secondary solids formed in place of removal of COPCs in the dissolved-phase from the subsurface). Potential environmental effects were thus evaluated based on plausible use, as defined above, at a pH and groundwater conditions that were shown to be achievable through groundwater flushing and addition of base without the risk of over-neutralization. Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone) and was carried forward for geochemical reactive transport modelling to evaluate environmental effects.

It is noted that the freeze wall will remain in place during mining area remediation (see draft EIS Section 2.3.3.1.1), until decommissioning objectives are achieved to ensure there is no loss of tertiary control of the mining fluid (even in a diluted state). Refinement of the mining area decommissioning objectives and associated modelling will be done as the Project progresses through updates to the Decommissioning Plan; nevertheless, the objectives as they may evolve will be bound by the objectives evaluated in the EIS, which as shown are protective of aquatic biota in Whitefish Lake. The final acceptable mining area decommissioning objectives will be developed prior to initiation of groundwater remediation, as part of the Detailed Decommissioning Plan (DDP).

#### References

Denison (Denison Mines Corp), 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report dated: September 24, 2018.

Denison (Denison Mines), 2023. Feasibility Study.

## IR-20, IR-67, IR-69 Appendix A

### 2018 Column Leach Testing

Table A1: Sample Inventory for 2018 ISR Column Leach Test

Original Sample Purpose	Sample I.D.	WR Hole No.	Lithology	Est. U%	Mass (g)	Mass U (g)
Porosity/Perm.	S066906	419D1	BSMT	0.22	320	0.61
Porosity/Perm.	S066907	525D2	SDST	0.06	323	0.17
Porosity/Perm.	S066908	405D1	SDST	0.06	270	0.14
Porosity/Perm.	S066909	405D1	BSMT	0.08	299	0.21
Porosity/Perm.	S066910	525D1	BSMT	51.72	843	375
Leach Testing	S066911	525D1	SDST	0.06	282	0.17
Leach Testing Composite Sample	S066912- S066916	525D1 525D2	SDST & BSMT	29.4	1,090	276
Leach Testing Total Composite Sample	S066906- S066916	405D1 419D1 525D1 525D2	SDST & BSMT	19.03 (wet)	3,427 (wet)	652.3

Table A2: Mineralogy of the Ore Zone\*

Unit	Mineral	Ideal Formula	Major (≥2% w/w)	Minor (< 2% w/w, or, shown to be present in Petrography or core logging)
Ore Zone	Pyrite	FeS <sub>2</sub>	X	
	Galena	PbS	X	
	Chalcopyrite	CuFeS <sub>2</sub>	X	
	Quartz	SiO <sub>2</sub>	X	
	Chlorite	(Fe,Mg) <sub>2</sub> (Al,Fe <sup>3+</sup> ) <sub>3</sub> Si <sub>3</sub> AlO <sub>10</sub> (OH) <sub>8</sub>	X	
	Muscovite/Illite	KAl <sub>2</sub> (Si <sub>3</sub> Al)O <sub>10</sub> (OH,F) <sub>2</sub>	X	
	Kaolinite	Al <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub>	X	
	Fe-oxy-hydroxides	FeO(OH)·nH <sub>2</sub> O	X	
	Uraninite	UO <sub>2</sub>	X	
	UO <sub>2</sub> .33	U <sub>3</sub> O <sub>7</sub>	X	
	UO <sub>2</sub> .25	U <sub>4</sub> O <sub>9</sub>	X	
	Schoepite	UO <sub>3</sub> ·2H <sub>2</sub> O	X	
	Siderite	FeCO <sub>3</sub>	X	
	Fluorite	CaF <sub>2</sub>	X	
	Gersdorffite	NiAsS		X
	Nickeline	NiAs		X
	Dravite	NaMg <sub>3</sub> Al <sub>6</sub> (Si <sub>6</sub> O <sub>18</sub> )(BO <sub>3</sub> ) <sub>3</sub> (OH) <sub>3</sub> (OH)		X
	Pyrrhotite	Fe <sub>1-x</sub> S (x=0-0.17)		X
	Sphalerite	(Zn,Fe)S		X
	Feldspar	KAlSi <sub>3</sub> O <sub>8</sub>		X
	Calcite	CaCO <sub>3</sub>		X
	Apatite	Ca <sub>5</sub> (PO <sub>4</sub> ) <sub>3</sub> (F,Cl,OH)		X
	Corundum	Cr <sub>2</sub> O <sub>3</sub>		X
	APS Minerals	CaAl <sub>3</sub> (PO <sub>4</sub> )(PO <sub>3</sub> OH)(OH) <sub>6</sub>		X

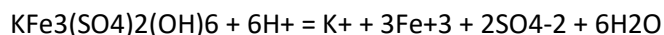
#### Notes

\*The table above is excerpted from Table 3-1 of Appendix 7-C of the draft EIS (mineralogy for other “Units” provided therein are not shown here)

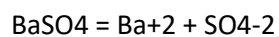
**Uraninite** **Blue bolded text** indicates dominant minerals; can be present at values exceeding 40% w/w

### Reactions forming secondary sulphate minerals

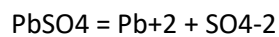
#### K-Jarosite



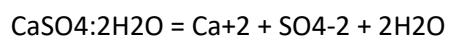
Barite



Anglesite



Gypsum



**IR-20, IR-67, IR-69 Appendix B**

**Table 3-5: Restored Solutions, UBS Composition representative of End of Mining conditions, and Representative Groundwater Composition by Hydrostratigraphic Unit**

Parameter/ Groundwater or Restored Solution	Unit	Ore Zone (GWR-032)	PWZ (GWR-031 and Cigar Lake)	Lower Sandstone Aquifer and Decalcified Zone (GWR-011)	Intermediate Sandstone Aquifer (GWR-046)	Overburden and Upper Sandstone Aquifer (GWR-036, Primarily)	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Restored Solution #1	50% Restored Solution #1	Restored Solution #2	50% Restored Solution #2
							Minimum	Maximum				
pH	unit	6.83	6.7	6.46	7.053	6.45	0.63	2.1	4.3	5.1	6.1	6.3
pe	unitless	-1.3	1.9	2.3	4.5	1.2	9.80	14.7	10	(set) 7	7.8	(set) 4
temp	°C	7	7	7	7	7	7	7	7	7	7	7
Al	mg/L	6.00E-04	3.40E-02	5.20E-02	8.00E-01	3.70E-02	6.90E+01	4.61E+03	7.00E+00	3.53E+00	5.60E-01	3.06E-01
As	mg/L	2.00E-04	5.00E-02	1.30E-03	4.75E-06	3.00E-04	<0.1	2.12E+01	6.00E-02	3.07E-02	1.00E-01	5.07E-02
Ba	mg/L	6.30E-02	3.60E-02	5.40E-02	2.41E-01	5.70E-03	<0.05	<0.5	5.00E-02	5.20E-02	5.00E-02	5.20E-02
C(4)	mg/L	1.76E+02	1.54E+02	8.66E+01	1.01E+02	3.39E+01	-	-	5.80E+01	7.23E+01	1.05E+02	9.58E+01
Ca	mg/L	5.50E+01	6.76E+00	9.78E+00	1.07E+01	2.70E+00	5.80E+01	7.23E+02	1.10E+02	6.00E+01	1.00E+01	9.89E+00
Cd	mg/L	1.00E-05	1.00E-05	1.00E-05	3.36E-05	1.00E-05	1.80E-02	1.81E+00	1.50E-02	7.52E-03	4.00E-03	2.01E-03
Cl	mg/L	1.90E+02	8.65E+01	7.20E+00	8.63E+00	6.86E+00	<10	1.22E+03	2.00E+02	1.04E+02	5.00E+01	2.86E+01
Co	mg/L	1.00E-04	1.00E-02	1.00E-04	5.84E-03	4.00E-04	5.00E-01	1.49E+01	2.00E+00	1.00E+00	1.00E-02	5.05E-03
Cr	mg/L	5.00E-04	4.50E-03	5.00E-04	1.69E-03	5.00E-04	<0.1	9.14E+00	5.00E-02	2.53E-02	5.00E-02	2.53E-02
Cu	mg/L	2.00E-04	5.00E-03	1.80E-03	6.29E-03	6.00E-04	5.16E+00	9.64E+02	1.70E-01	8.60E-02	2.00E-02	1.09E-02
F	mg/L	2.30E-01	5.30E-01	1.80E-01	5.90E-02	6.00E-02	1.00E+00	3.40E+01		9.00E-02	8.00E-01	4.90E-01
Fe	mg/L	4.20E+00	4.90E-01	8.60E-01	6.03E+00	4.05E-01	8.20E+02	4.09E+03	1.00E+02	5.05E+01	4.70E+00	2.78E+00
K	mg/L	4.60E+00	5.60E+00	2.00E+00	6.77E+00	2.80E+00	6.20E+00	1.49E+02	9.00E+00	5.51E+00	3.50E+00	2.75E+00
Mg	mg/L	1.10E+01	3.09E+00	1.60E+00	3.91E+00	1.80E+00	<10	2.40E+02	6.00E+00	3.80E+00	3.00E+00	2.30E+00
Mn	mg/L	2.20E-01	7.00E-01	3.60E-01	3.91E+00	1.40E-01	2.70E+00	4.10E+01	3.40E+00	1.88E+00	4.80E-01	4.20E-01
Mo	mg/L	3.80E-03	1.28E-02	4.20E-03	3.89E-03	7.00E-04	1.65E+00	5.96E+01	1.00E-01	5.22E-02	1.30E-01	6.71E-02
Na	mg/L	8.10E+01	7.61E+01	6.10E+00	8.96E+00	2.90E+00	6.00E+00	1.23E+04	1.90E+02	9.82E+01	9.00E+01	4.81E+01
Ni	mg/L	1.00E-03	1.50E-02	1.00E-04	4.87E-02	1.80E-03	<1	2.68E+01	9.70E+00	4.86E+00	1.00E-02	5.05E-03
Pb	mg/L	1.00E-04	1.00E-04	1.00E-04	1.57E-03	1.00E-04	2.00E-01	1.95E+01	3.10E+00	1.55E+00	3.20E-01	1.60E-01
S(6)	mg/L	1.30E+01	4.55E+00	4.70E+00	1.01E+01	1.90E+00	5.21E+03	2.09E+05	7.03E+02	3.54E+02	1.36E+02	7.04E+01
S(-2)	mg/L	1.00E-08	1.00E-09	1.00E-09	1.00E-09	1.00E-09	-	-	1.00E-09	1.00E-09	1.00E-09	1.00E-09
Se	mg/L	1.00E-04	1.00E-04	1.00E-04	3.59E-04	8.00E-04	<0.025	2.64E+01	8.00E-02	4.01E-02	1.00E-02	5.05E-03
Si	mg/L	1.33E+01	9.18E+00	2.41E+01	1.31E+01	2.62E+01	3.07E+01	1.92E+02	4.00E+01	3.21E+01	4.00E+01	3.21E+01
Sr	mg/L	1.66E+00	1.17E+00	1.20E-01	1.15E-01	1.20E-02	6.00E-01	5.19E+00	4.40E+00	2.26E+00	2.40E+00	1.26E+00
Zn	mg/L	2.62E+00	4.25E-03	1.20E-02	1.25E-02	4.40E-03	2.30E+00	3.31E+02	1.40E+00	7.07E-01	5.00E-02	3.10E-02
P	mg/L	1.00E-02	1.00E-02	1.00E-01	5.00E-02	4.00E-02	2.20E+00	7.54E+01	4.00E+00	2.05E+00	4.00E+00	2.05E+00
U	mg/L	1.10E-02	1.24E-02	7.00E-04	2.26E-02	5.00E-04	7.70E+02	3.88E+04	1.00E+02	5.01E+01	3.00E+01	1.50E+01
V	mg/L	1.00E-04	1.00E-04	1.00E-04	1.20E-03	1.00E-04	6.16E+00	1.61E+02	5.10E-01	2.55E-01	1.60E-01	8.01E-02
<sup>226</sup> Ra	mg/L	4.92E-06	5.47E-09	1.37E-08	2.54E-08	1.64E-09	6.29E-06	8.21E-05	5.47E-06	2.75E-06	1.01E-05	5.06E-06
<sup>230</sup> Th	mg/L	9.17E-06	1.00E-06	1.31E-07	2.62E-07	2.62E-08	2.75E-02	2.88E-01	3.93E-06	2.02E-06	1.31E-06	7.14E-07



## Attachment: IR-21

Number	IR-21
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.3, Project Description
Context and Rationale	<p>Context: The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p>Rationale: From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>
Information Requirement	Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.

### Response:

RESPEC (2023) memo is attached here to support the IR response provided in the table.



## EXTERNAL MEMORANDUM

**To:** Xavier Lu Dac  
Dana Harris  
Denison Mines Corporation  
230-22nd Street East  
Suite 200  
Saskatoon, SK S7K 0E9

**cc:** Project Central File 02924

**From:** Neel Gupta  
Cody Vining  
Brett Dueck  
RESPEC  
3824 Jet Drive  
Rapid City, SD 57703

**Date:** July 14, 2023

**Subject:** Results of a Geomechanical Study Investigating the Stability of the Rock Mass in Response to In Situ Recovery of Uranium-Enriched Rock for the Wheeler River Uranium Project

Denison Mines Corporation (Denison), a uranium exploration and development company, has a flagship Wheeler River Uranium project. This project is the largest undeveloped in situ recovery (ISR) uranium project in Northern Saskatchewan's eastern Athabasca Basin. The project site is located approximately 35 kilometers (km) north-northeast of the Cameco Corporation (Cameco) Key Lake operation and 35 km southwest of the Cameco McArthur River operation in the eastern Athabasca Basin. Denison proposes developing the Phoenix deposit in this region.

At the Phoenix deposit, Denison plans to drill the set of injection/recovery wells for ISR of uranium-enriched rock through leaching with a freeze wall isolating the operations from the surrounding rock mass. In response to the leaching process, the remnant ore zone may displace or fail and may no longer be able to support the overburden load while causing instability in the surrounding rock mass because of the stress redistribution. Denison, therefore, has requested a geomechanical study to analyze the geomechanical stability of the rock mass around the excavation and freeze wall from the leaching process. This memorandum documents the geomechanical study and briefly discusses the study objectives and approach, significant results, and conclusions.

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## STUDY OBJECTIVES AND APPROACH

In a recent geomechanical study [Vining et al., 2023], RESPEC Company, LLC (RESPEC) developed a three-dimensional (3D) strip model of a specific geological section where maximum ore extraction is planned to investigate the stability of the mined cavity and estimate the surface disturbance. The boundary conditions of the strip numerical model assumed an infinite array of the modeled cross-section, where ore extraction is maximum, along the length of the Phoenix deposit. Considering the boundary conditions of the strip model and presuming the average material properties of key stratigraphic layers, the numerical model predicted surface displacement of approximately 7.5 centimeters (cm) and marginal stability of the rock mass limited to the extent of 16 meters (m) from the top extent of mined excavation.

The primary objectives of the current study are evaluating the geomechanical stability of the rock mass around the excavation and proposed freeze wall in response to the in situ leaching operations in Zone A of the Phoenix deposit. To achieve the desired objectives, RESPEC modified the previously developed 3D strip model [Vining et al., 2023] to create a full-scale 3D model using the structural finite difference program *FLAC3D* [Itasca Consulting Group, Inc., 2021] while presuming the similar, average material properties of key stratigraphic layers. Considering the computational time and analysis effort, creating a numerical model that extends across the entire extent of Zone A is impractical. Because the *FLAC3D* program imposes a plane of symmetry along its boundaries, RESPEC, in consultation with Denison, simulated the half-length of Zone A, and the modeling domain encompasses the Phoenix deposit's northeast extent, as shown in Figure 1. The vertical extent of the 3D model is assumed to be 1,000 m below ground surface (bgs), and the lateral boundary is approximately 135 m away from the extent of the low-grade ore zone. The model boundaries located far away from the excavation boundaries isolated the influence of model boundaries on the excavation response. The kinematic boundary conditions of the numerical model prevent normal (horizontal) displacements along the four vertical boundaries of the model and vertical displacements of the bottom boundary. These constraints allow the interior portion of the model to move freely. In situ stress data were not available for the Phoenix deposit. The vertical stress was assumed to be lithostatic (i.e., equal to the weight of the overburden) and determined as a function of depth from the weight of the overburden. In rock mass, the horizontal stress is considered isotropic (i.e., maximum and minimum horizontal stress equal to the vertical stress). For instance, at the depth of 400 m bgs, the average in situ vertical stress is approximately 10 megapascals (MPa).

Denison provided the AutoCAD drawings of key stratigraphic layers in the Phoenix deposit, which were used to develop the 3D structural model. Table 1 summarizes these stratigraphic layers. Figure 2 presents the elevation view of the 3D model, which illustrates the continually changing elevations and thicknesses of the rock layers, for example, upper and lower clay, sandstone with sulfide, and altered basement. Except for the desilicified sandstone and sandstone with sulfide, the modeled stratigraphic units and their material properties are consistent with the 3D strip model in the previous geomechanical study [Vining et al., 2023]. In consultation with Denison, RESPEC assumed the Mohr-Coulomb property of sandstone with sulfide was similar to altered sandstone and the desilicified sandstone was similar to sand [Terzaghi and Peck, 1967].

Random rock removal was adopted to represent the in situ leaching process in the numerical model. Rock removal included the instantaneous excavation of 30 percent of rock by volume from the high-grade ore zone and 3 percent from the low-grade ore zone. According to Denison, high- and low-grade ore zones are based on the uranium grade and encompass different stratigraphic layers (e.g., upper clay, lower clay, ore zone) within the Phoenix deposit. Denison plans to adopt the freeze wall design for ISR of uranium-enriched rock; therefore, RESPEC explicitly modeled the freeze wall, which

was 20 m thick and located at a distance of 15 m from the extent of the low-grade ore zone. Figure 3 presents the vertical extent of the high- and low-grade ore zones on the vertical plane and surrounding freeze wall.

In the numerical simulation, the pressure at the excavation surface was maintained at a pressure equivalent to a wellhead pressure of 0 MPa with a freshwater gradient of 0.01 MPa/m. Considering that the overlying sandstone is fractured and permeable, and the elevation of the potentiometric surface is near the ground level, RESPEC also simulated the influence of porewater pressure on the predicted stresses and displacement, which is consistent with the previous study [Vining et al., 2023].

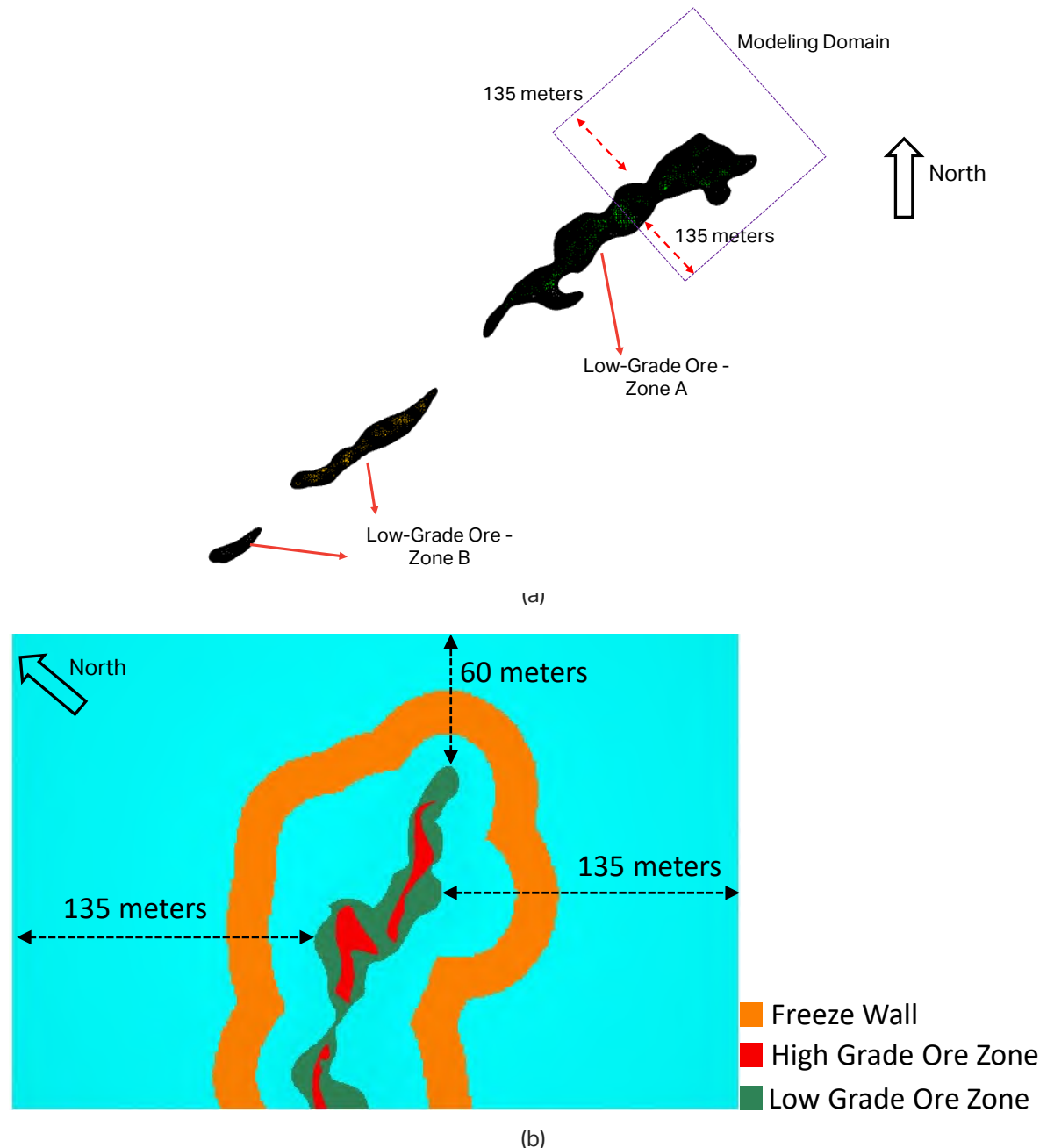


Figure 1. Plan View of the (a) Low-Grade Ore in Zone A and Zone B of the Phoenix Deposit and (b) Extent of Modeling Domain.

Table 1. Average Material Properties

Stratigraphy	Cohesion (MPa)	Friction Angle (degree)	Rock-Mass Compressive Strength (MPa)	Tensile Strength (MPa)	Rock-Mass Modulus (MPa)	Poisson's Ratio (—)	Density (g/cc)
Overburden	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Stiff Sandstone	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Altered Sandstone	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Sandstone with Sulfide	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Desilicified Sandstone	0.0	30.0	0.0	0.0	1,363.76	0.25	2.1
Upper Clay	0.03	16.6	0.12	0.20	55.17	0.28	1.7
Ore Zone	0.22	20.11	0.54	0.51	188.75	0.28	4.2
Lower Clay	0.15	18	0.48	0.20	206.43	0.28	1.7
Altered Basement	2.72	25.88	9.17	1.2	4,254.55	0.15	2.1
Stiff Basement	5.57	31.46	20.34	10.7	11,564.83	0.11	2.7

g/cc = grams per cubic centimeter

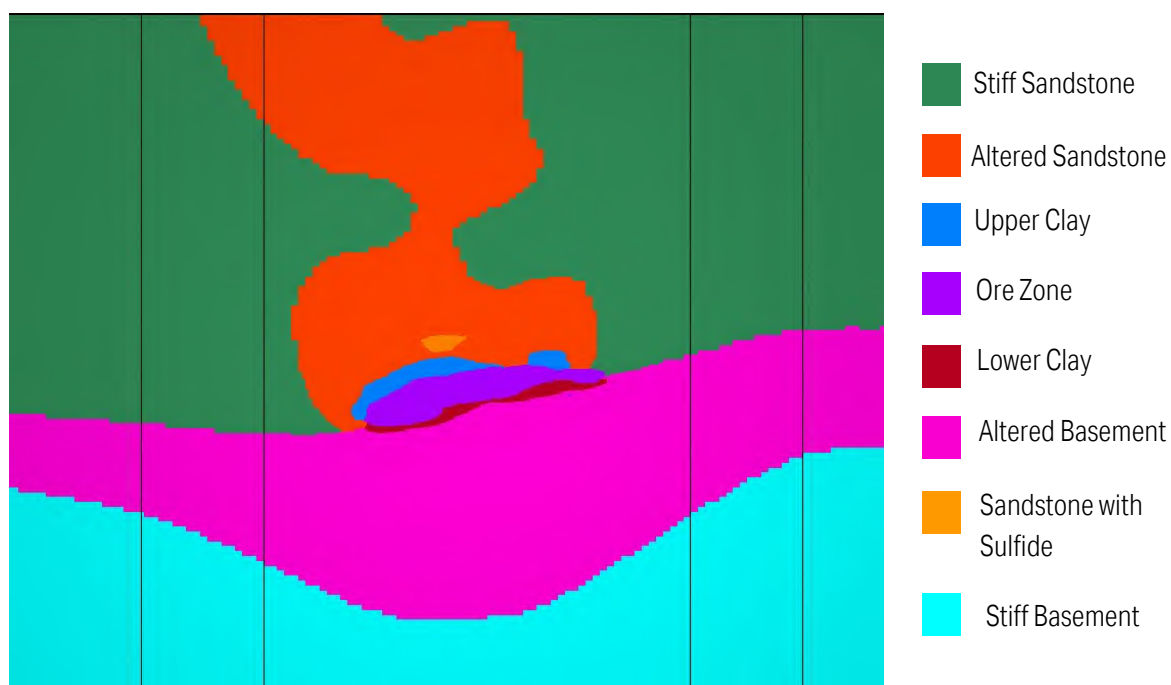


Figure 2. Elevation View of the Numerical Model Illustrating Changing Elevation of Different Stratigraphic Units Represented in the Structural Model.

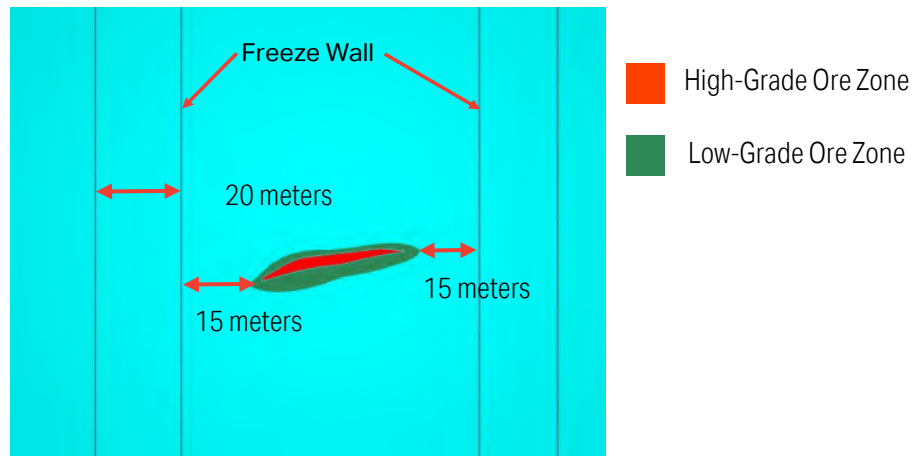


Figure 3. Elevation View of the Numerical Model Illustrating the Relative Location of the Freeze Wall to the High- and Low-Grade Ore Zones in Zone A of the Phoenix Deposit.

## RESULTS

The numerical model-predicted stresses and displacements were scrutinized to assess the surface subsidence and the stability of the remaining ore zone, surrounding rock mass, and freeze wall. The outcomes of the numerical simulation are discussed in the following subsections.

### ROCK STABILITY

RESPEC simulated the rheological behavior of rock presuming the Mohr-Coulomb constitutive model for each stratigraphic unit to analyze the stress redistribution in case of failure of the remnant rock around the excavation. In the post-simulation analysis, the Mohr-Coulomb Factor of Safety (MCFS) was determined to quantify the competency of the rock mass based on the predicted stress fields. The MCFS value greater than, equal to, or less than 1.0 quantifies the material as not failing, at failure, or failed, respectively. The potential for tensile fracturing in the rock mass was also analyzed using the least compressive principal stress (LCPS). The magnitude of LCPS will be positive at locations where a tensile stress component exists in any direction. Site-specific strength properties of the rock after freezing were unavailable at the time of the study; therefore, RESPEC took a conservative approach and assumed that the properties of the freeze wall were similar to the host rock.

Figures 4 and 5 present the MCFS contour and LCPS contour, respectively, on a horizontal plane passing through the depth of 390, 399, 406, and 413 m bgs. Figures 6 and 7 present the MCFS and LCPS contour on multiple vertical planes. MCFS contour (Figures 4 and 6) presents that the failure conditions (i.e., red contour) are limited within the close proximity (i.e., 5 to 8 m) of the low-grade ore zone, and its lateral extent varies with the depth of the ore zone below the ground surface. However, the MCFS is always greater than 2.50 within the modeled extent of the freeze wall. LCPS contour (Figures 5 and 7) presents that the marginally compressive stress conditions (i.e., yellow and red contours) are predicted within the extent of the low-grade ore zone, and compressive stresses greater than 5 MPa are predicted within the proposed extent of the freeze wall. Figure 8 quantifies the failure volume predicted within the different stratigraphic units. Within the modeled domain of Zone A, the predicted failure volume was approximately 8, 22, 41, and 26 percent of the modeled volume of sandstone with sulfide, upper clay, ore zone, and lower clay, respectively. However, the failure volume is less than 0.02 percent of the modeled volume of stiff or altered sandstone, desilicified sandstone, and altered and stiff basement rock. Additionally, 0 percent failure volume is predicted within the freeze wall.



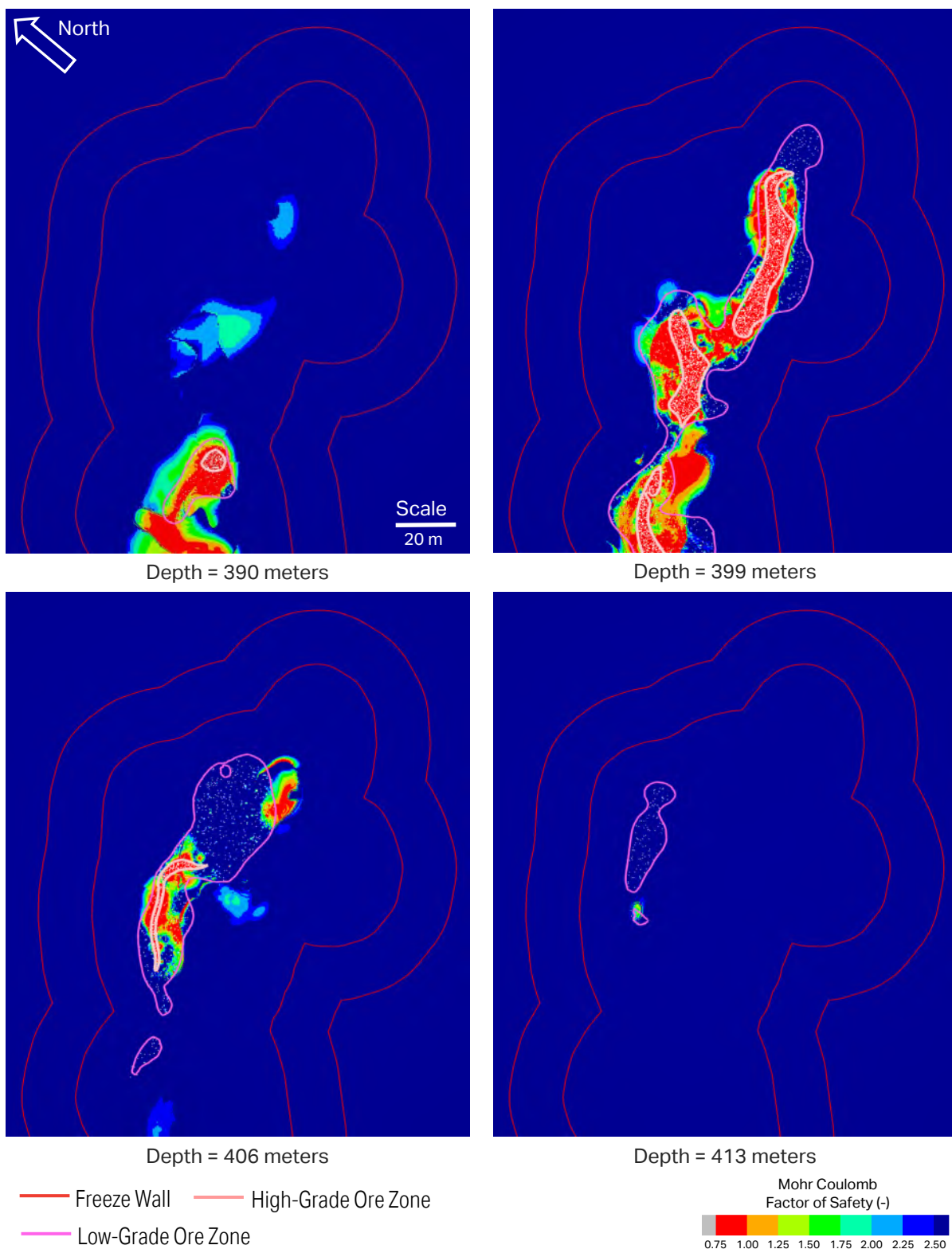


Figure 4. Plot of Mohr-Coulomb Factor of Safety Values on a Horizontal Plane Passing at a depth of 390, 399, 406, and 413 Meters Below Ground Surface.

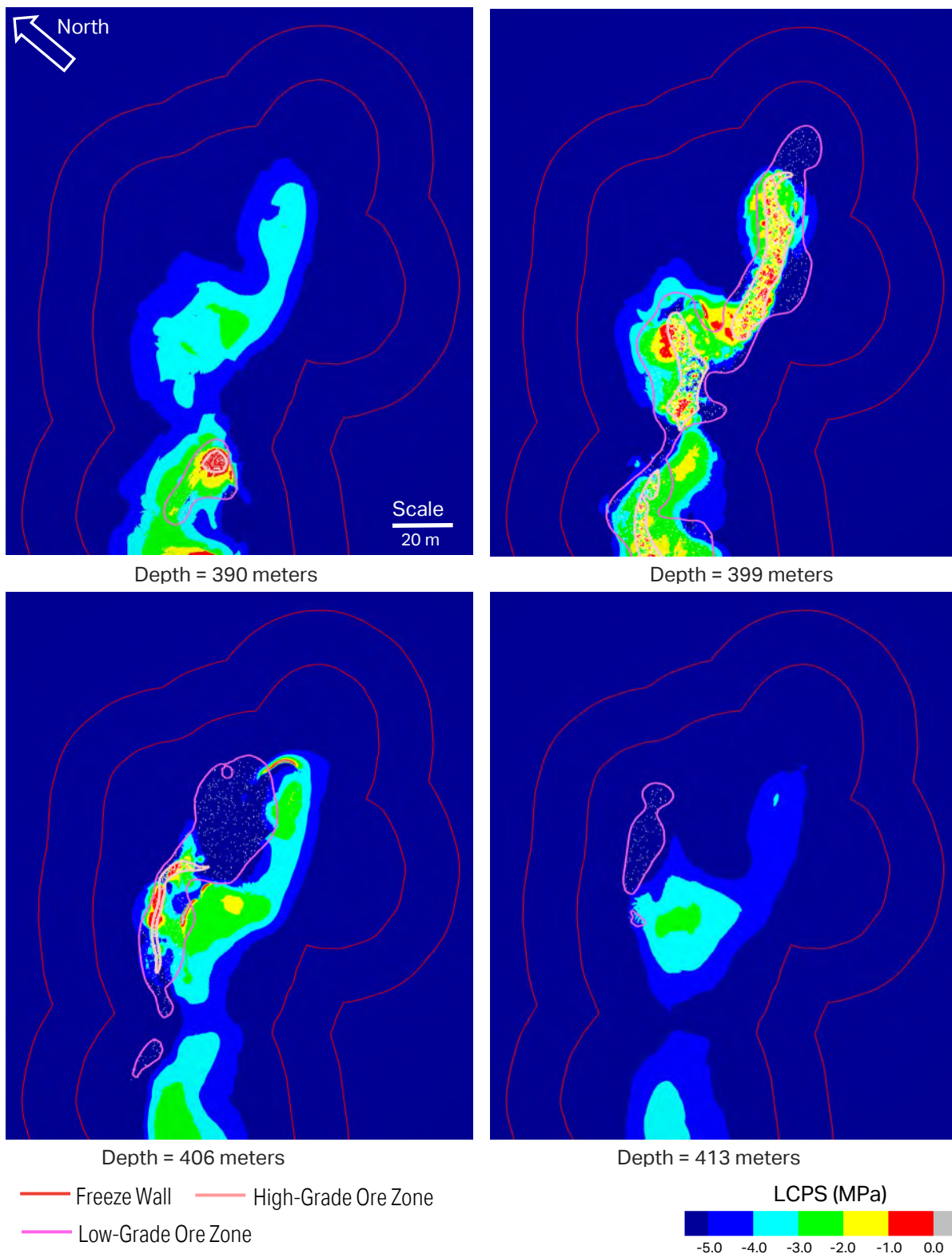
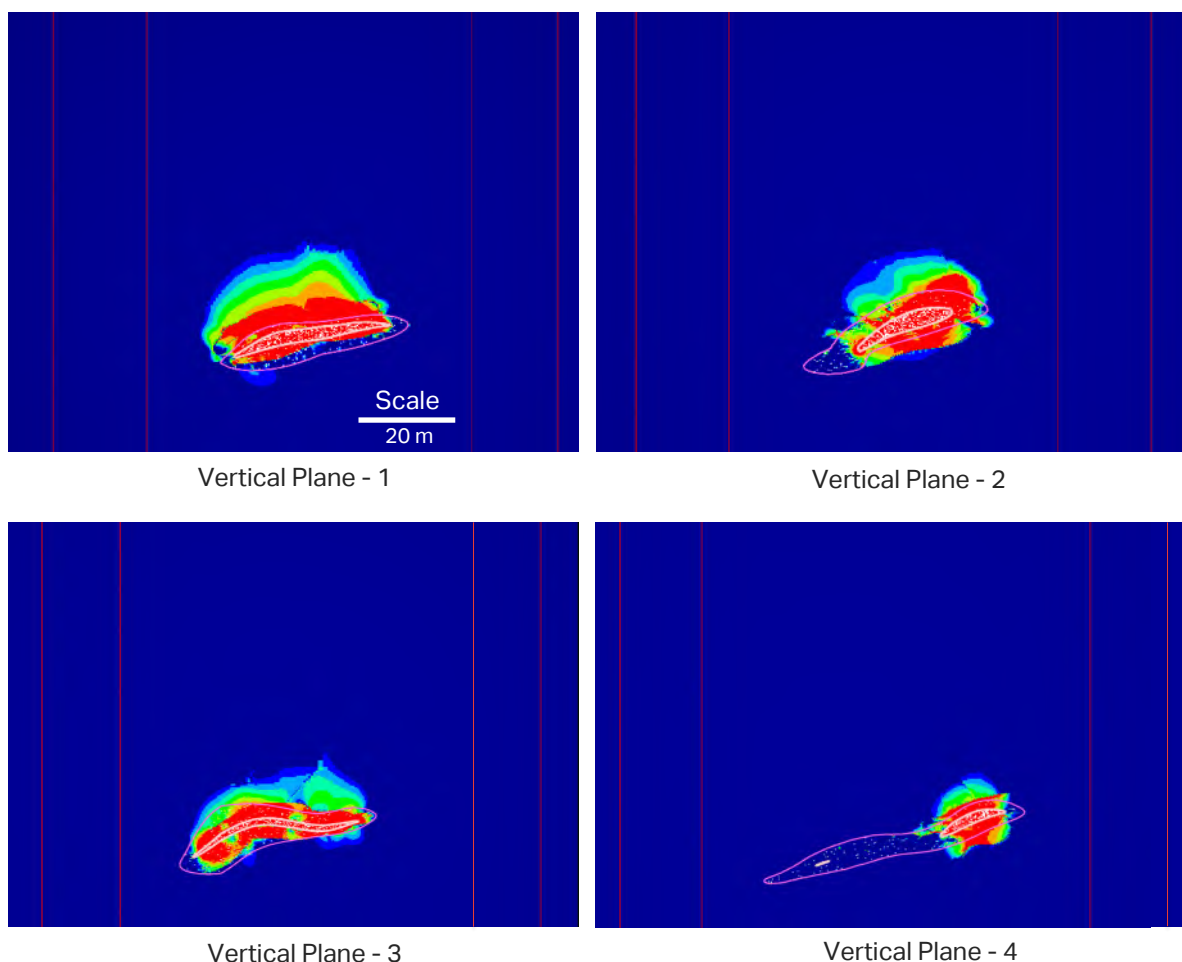


Figure 5. Plot of Least Compressive Principal Stress Values on a Horizontal Plane Passing at a Depth of 390, 399, 406, and 413 Meters Below Ground Surface.



Freeze Wall High-Grade Ore Zone  
Low-Grade Ore Zone

Mohr Coulomb  
Factor of Safety (-)

0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

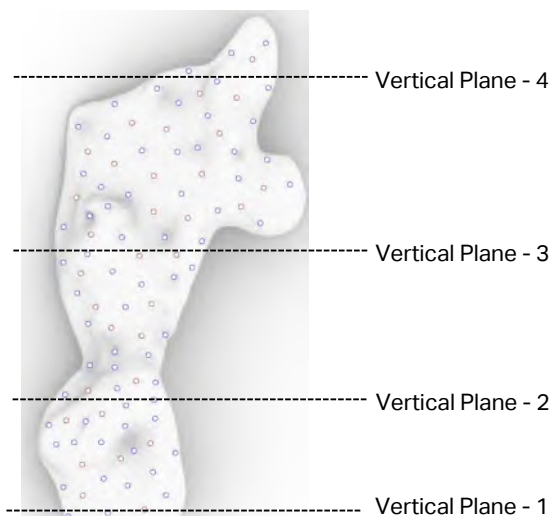


Figure 6. Plot of Mohr-Coulomb Factor of Safety Values on Multiple Vertical Planes.

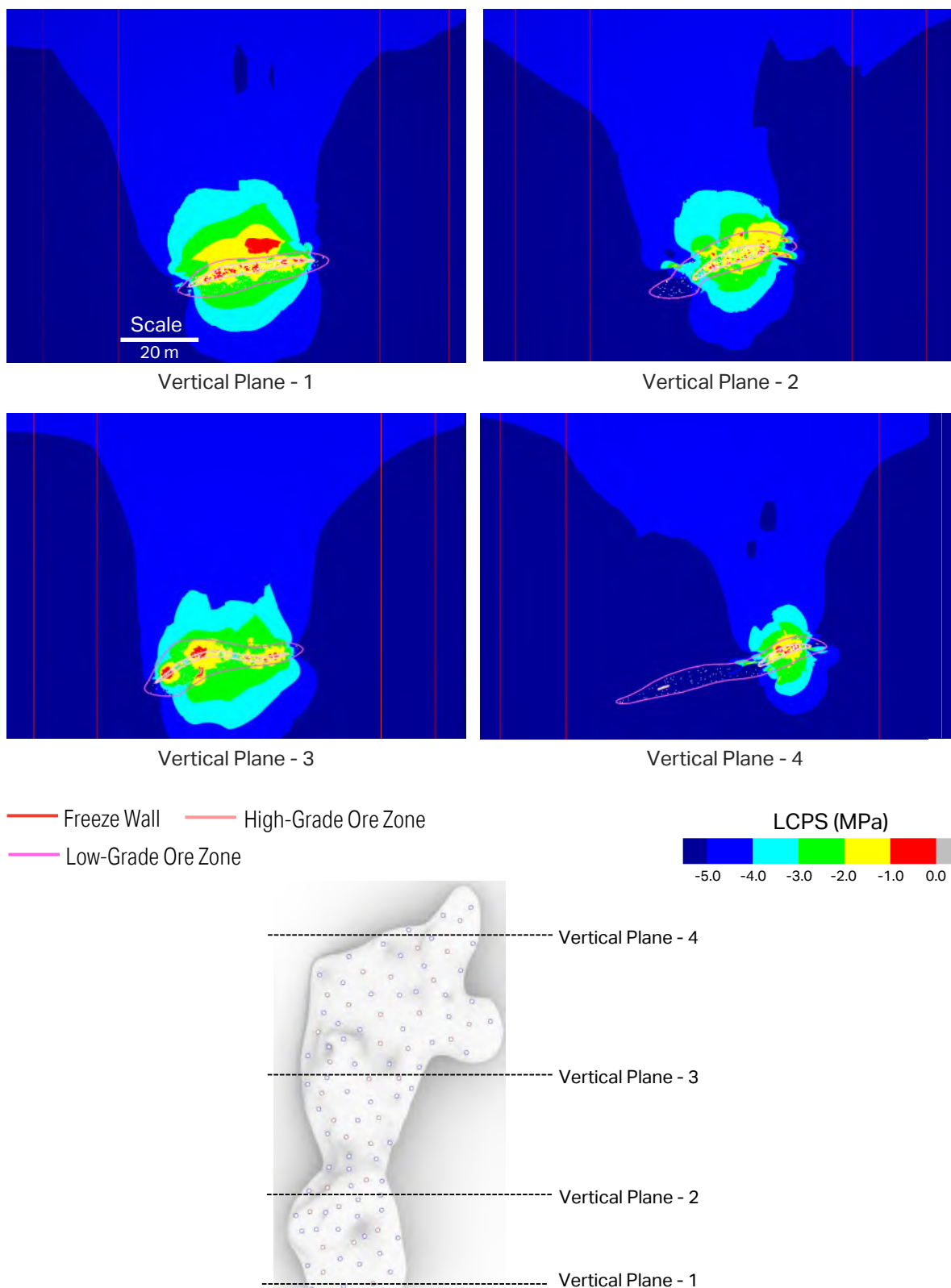


Figure 7. Plot of Least Compressive Principal Stress Values on Multiple Vertical Planes.

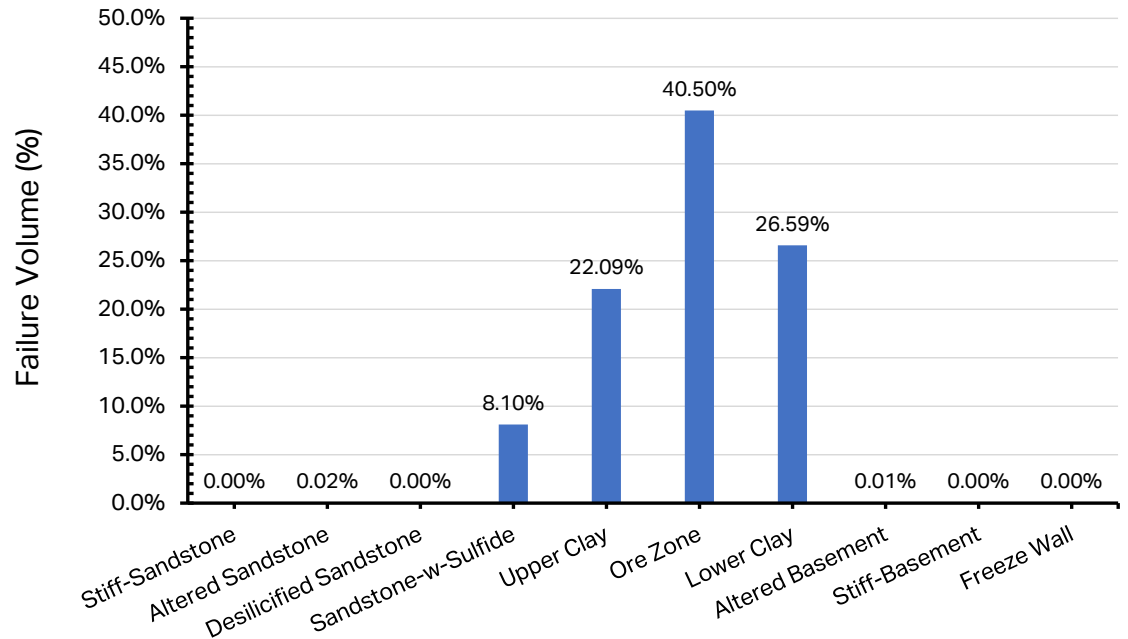


Figure 8. Failure Volume in Different Stratigraphic Units.

### SURFACE SUBSIDENCE

In response to the proposed leaching process, the surrounding host rock will displace into the mined cavity, which manifests as subsidence at the ground surface. The numerical model predicted the negligible vertical displacement of approximately 2.5 millimeters (mm) on the ground surface. Figure 9 presents the contours of vertical displacement predicted on a vertical plane passing through the modeling domain's southern boundary. The contour on the vertical plane presents that the vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm and quickly reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. The current study's numerical model-predicted surface subsidence is significantly smaller than the surface subsidence of 7.5 cm predicted in the previous geomechanical study [Vining et al., 2023], which is likely attributed to the difference in the modeling domain and boundary conditions between the two models. In the previous study, the 3D strip model presumed an infinite array of modeled cross sections and corresponding excavation of uranium-enriched rock; in the current study, the full-scale model included the representative extent of Zone A at the Phoenix deposit.



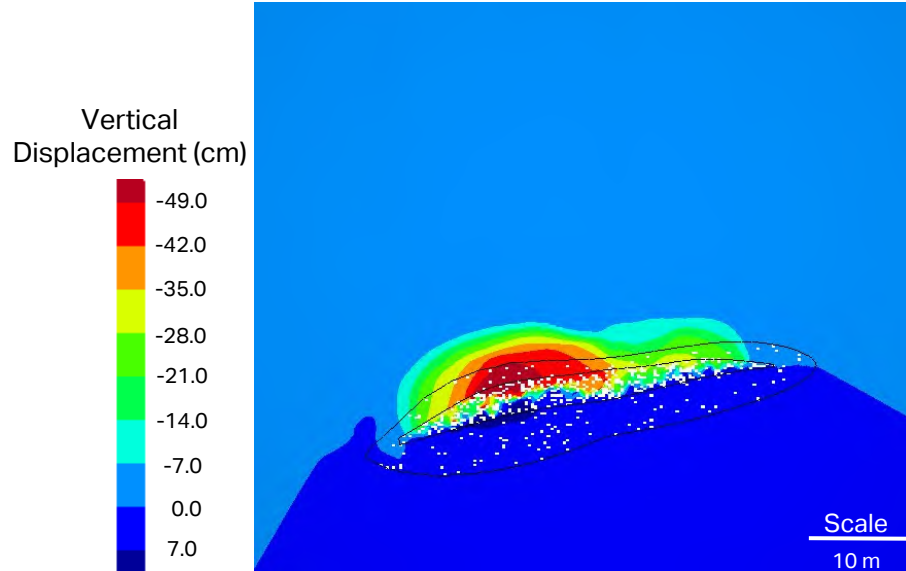


Figure 9. Contour of Vertical Displacement After the Proposed Volumetric Extraction on a Vertical Plane Passing Through the Modeling Domain's Southern Boundary.

## CONCLUSIONS

The study objective was to better understand the anticipated response of the surrounding rock mass, particularly the freeze wall, after proposed volumetric rock extraction from the high- and low-grade ore zone. The significant outcomes from this study are as follows:

- / **The geomechanical numerical model predicted stability against shear or tensile failure within the proposed extent of the freeze wall.** Considering the average estimate of the material properties of modeled stratigraphic layers, the predicted failure conditions in the rock mass are limited to 5 to 8 m of the extent of the low-grade ore zone. Within the proposed extent of the freeze wall, the MCFS values are greater than 2.50, and the magnitude of LCPS is greater than 5 MPa in compression, indicating the limited potential of instability in the freeze wall.
- / **The numerical model predicted vertical displacement at the surface in response to the proposed volumetric extraction is negligible.** The vertical displacement of the rock mass near the modeling domain's southern extent is at a maximum immediately above the low-grade ore zone, ranging between 42 and 49 cm, which reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. At the ground surface, the average vertical displacement is approximately 2.5 mm.

## REFERENCES

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Terzaghi, K., and R. B. Peck, 1967. *Soil Mechanics in Engineering Practice*, 2<sup>nd</sup> Ed., John Wiley & Sons, New York, NY.

Vining, C. A., N. Gupta, and J. Nopola, 2023. *Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 2)*, RSI(RCO)-2924/5-21/14, prepared by RESPEC, Rapid City, SD, for X. Lu Dac and D. Harris, Denison Mines Corporation, Saskatoon, SK, February 9.



## Attachment: IR-24

Number	IR-24
Dept.	CNSC
Project effects link	Alternative Means
Reference to EIS, appendices, or supporting documentation	Section 2.10.2 Alternative Means
Context and Rationale	<p>Context: While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Rationale: As noted in the Agency’s Operational Policy Statement on Addressing “Purpose of” and “Alternative Means” under the CEAA 2012: “If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice.”</p>
Information Requirement	<p>Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Note: In addition to the adding text to summarize, Table 6 in Appendix 2-C could be useful to understanding table 2.10.1 in the EIS.</p>

### Response:

*Revised text for final EIS, Section 2.10.2.*

#### **2.10.2 Alternatives Means Assessment**

Denison first evaluated production potential from the Project in 2010. Since that time, the Project has undergone significant design and review stages and has naturally evolved into the Project described and assessed in this EIS. Appendix 2-C provides details related to the alternative means assessment framework employed and the results of the alternatives assessment for key Project components and activities; this section of the EIS provides a summary of Appendix 2-C.

Alternative means are the various ways Denison considered to implement Project components and activities. During the planning process, it is common to consider various means by which to fulfill a specific aspect of the Project.

A systematic assessment of these alternatives was used to select preferred alternatives that are carried forward as Project design elements in a manner consistent with Canadian Environmental Assessment Agency's operational policy statement (Canadian Environmental Assessment Agency 2015). These preferred alternatives ultimately become the basis upon which potential Project-related effects are evaluated in the EIS. The preferred alternatives have been presented in the preceding section of this Project Description. The documentation of this systematic alternative assessment provides transparency and traceability with respect to decision making on Project design. It also documents how input received by Indigenous groups and other Interested Parties has been considered in the design/planning process.

The alternative means assessment has been carried out in a stepwise fashion as follows (Figure 2.10-1):

1. Identification of Alternative Means: Project components for which alternate means were considered are identified;
2. Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors: the technical and economic feasibility of these alternate means is considered along with a specific screening for land use intensity and importance. Only alternate means that are deemed technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.
3. Potential Residual Effects Associated the Alternative Means: the potential residual effects of each alternative, in consideration of mitigation, are described; and,
4. Evaluation of Alternative Means: a comparative evaluation of alternative means that considers the potential residual effects for each alternative relative to various assessment criteria and indicators.

A description of the above four steps along with an example from Appendix 2-C (for Mining - Method) is provided in the following sections.

#### **2.10.2.1 Identification of Alternative Means**

Several Project components and activities had alternate means or options considered:

- Mining
  - Method
  - Freeze design for tertiary containment of mining solution
  - Permeability enhancement

- Mining solution
- Processing
  - Location of processing
  - On-site processing method
- Water management
  - Freshwater supply
  - Drinking water
  - Treated effluent discharge location
  - Treated effluent discharge location to surface water
- Waste management
  - Organic waste disposal
  - Process precipitate management
  - Domestic waste disposal
- Access and transportation
  - Access road alignment
  - Stream crossing structures
  - Worker transportation
- Power
  - Primary power supply
- Support facilities
  - Camp location optimization

For each Project component or activities listed above, a variety of options were considered. For example, the options considered under Mining – Method included:

- Option 1: Open pit
- Option 2: Jet boring
- Option 3: Surface boring
- Option 4: Micro tunnel boring
- Option 5: ISR

#### **2.10.2.2 Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors**

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015).

Denison integrated an additional category at this early stage in the alternative means assessment framework: land use screening. Although technical feasibility can include land use considerations, Denison opted to include land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by interested parties. In conjunction with screening for technical and economic feasibility, an initial evaluation was conducted to review Indigenous and other land use in the area to identify alternative means that may interact with areas of high land use intensity or areas of cultural importance (e.g., known gravesites). Consideration was given to information made available to Denison in the early stages of project planning. Note that subsequent, additional consideration of engagement information, including Indigenous and other land and resource use is completed at later stages in the alternatives means assessment framework (Section 2.10.2.4). The purpose of considering land use information at this stage was to identify land use that could compromise the feasibility of the Project and screen an alternative means out from additional evaluation.

For each Project component or activity, a consideration of the technical, economic, and land use characteristics of each alternative was considered. The purpose of this step in the alternative means assessment framework is to identify feasible alternatives for further assessment and to eliminate those alternative means that are not considered to be feasible from a technical, economic, or land use lens. Only those alternatives that are deemed technically and/or economically feasible and avoided interaction with areas of high intensity or high importance land use, are carried forward for further assessment.

For example, at this step in the alternative means assessment framework Option 1 Open pit mining (under Mining – Method) was screened out due to economic factors. For Mining – Methods, the remaining four options were carried forward for further assessment.

#### **2.10.2.3 Potential Residual Effects Associated the Alternative Means**

For all alternative means carried forward from the previous step, the expected residual effects following application of mitigation measures were considered. This step in the alternative means assessment framework identifies the potential residual effects which are then brought forward to the evaluation of alternative means. Again, as an example, the information related to Mining - Method (from Appendix 2-C, Table 4) is summarized here in **Table 2.10-1**.

#### **2.10.2.4 Evaluation of Alternative Means**

Detailed comparative evaluations of alternative means is presented in Appendix 2-C, Table 6 to Table 22. These evaluations considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in **Table 2.10-2** (same as Table 5 from Appendix 2-C), following the application of mitigation measures (described in Appendix 2-C Table 4).

By way of example (refer to Appendix 2-C for details), a detailed evaluation of Mining – Method from Appendix 2-C has been provided here as **Table 2.10-3**.

Based on the above alternative means assessment process, a preferred alternative means for each respective Project component or activity evaluated was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided in Appendix 2-C including input received by Indigenous groups and other Interested Parties.

For reference, the alternative means assessment is conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives. The preferred alternative(s) was selected and evaluated in much greater detail in the EA. A summary of the alternative means carried forward into the EA is provided in **Table 2.10-4**.

### **2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment**

As described above, Indigenous Knowledge, local knowledge, and engagement has influenced the alternative means assessment, specifically in step 2 (Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors) and step 4 (Evaluation of Alternative Means) of the alternative means assessment framework.

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015). Denison opted to integrate an additional category at this early stage in the alternative means assessment framework: land use screening. Denison included land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by Interested Parties. At this step in the alternative means assessment framework, an option for treated effluent discharge location was eliminated due to land use screening in conjunction with technical considerations.

Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement sessions, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. The comparative evaluation of alternative means includes specific input received from

Indigenous groups and other Interested Parties that contributed to the selection of the preferred option, when applicable. Refer to the row titled *Input received from Interested Parties* in **Table 2.10-3** below for an example of how engagement influenced the selection of mining method.

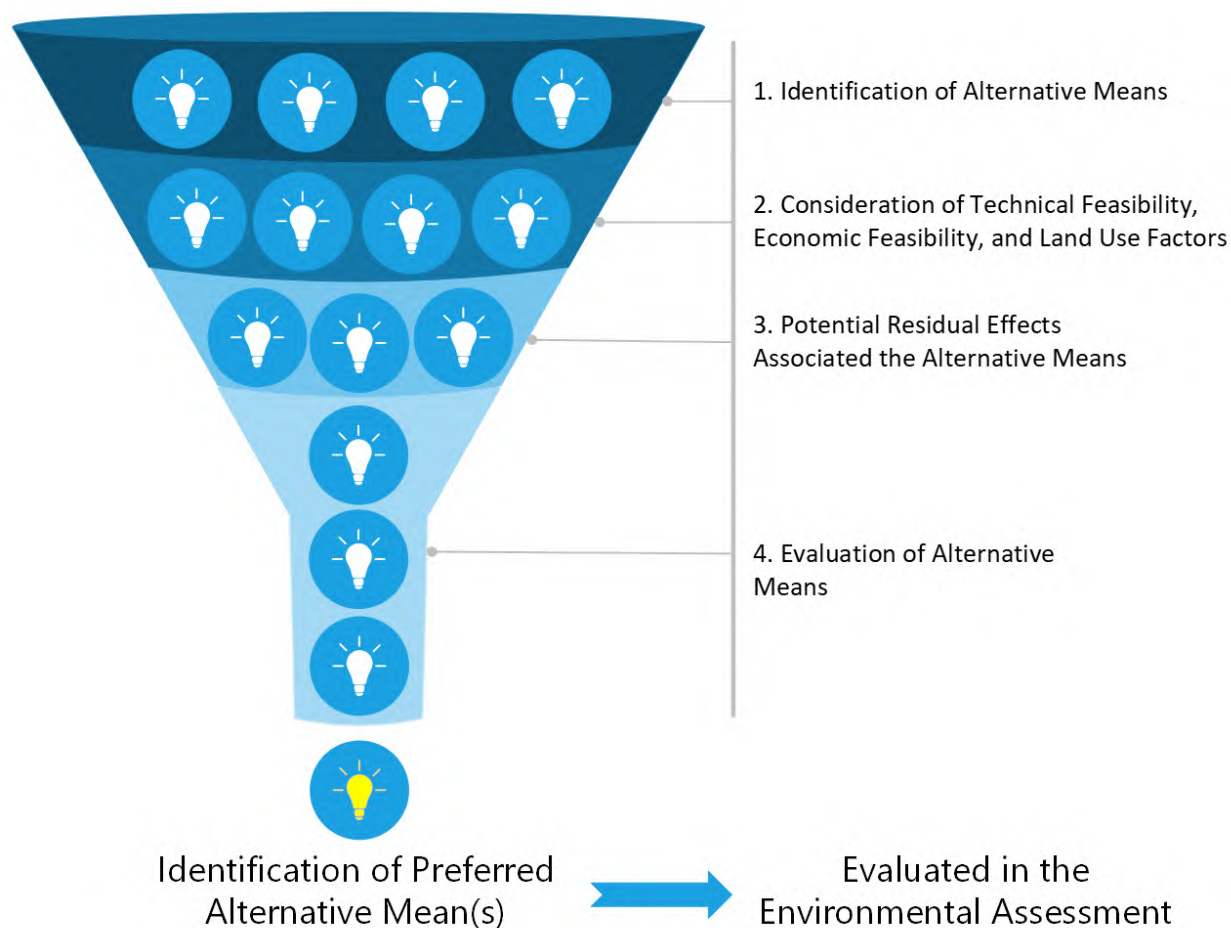


Figure 2.10-1: Alternative Means Assessment Framework for the Project



**Table 2.10-1: Mitigation Measures and Residual Effects for Mining - Method (Excerpt from Appendix 2-C Table 4)**

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
Mining	Method	Option 2: Jet Boring	<p>Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria</p> <p>Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release</p> <p>Limit any surface development to extent practical and avoid areas of significance</p> <p>Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management</p>	<p>Effects to local geology by development of underground workings</p> <p>Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining</p> <p>Effects on air quality via emissions from ventilation of underground workings</p> <p>Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings</p> <p>Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features</p>
		Option 3: Surface Boring	<p>Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria</p> <p>Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release</p> <p>Limit any surface development to extent practical and avoid areas of significance</p> <p>Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management</p>	<p>Effects to local geology by development of underground workings</p> <p>Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining</p> <p>Effects on air quality via emissions from ventilation of underground workings</p> <p>Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings</p> <p>Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features</p>
		Option 4: Micro Tunnel Boring	<p>Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria</p> <p>Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release</p> <p>Limit any surface development to extent practical and avoid areas of significance</p>	<p>Effects to local geology by development of underground workings</p> <p>Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining</p> <p>Effects on air quality via emissions from ventilation of underground workings</p> <p>Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings</p>

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
			Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to surface water quality and surface water-related receptors whereby mine water is released to local surface water features
		Option 5: ISR	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of ISR mining area  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support ISR mining  Effects on groundwater quantity and flow paths based on development of ISR wellfield (injection and recovery well systems)  Effects on groundwater quality by introduction of ISR mining solutions to the mining area  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features

**Table 2.10-2: Detailed Alternatives Means Assessment Evaluation Criteria and Metrics (same as Table 5 in Appendix 2-C)**

Criteria	Section	Valued Component	Indicator	Metric
Biophysical Environment	Atmospheric and Acoustic Environment	Air quality	Changes in air quality, including concentrations of dust, combustion products, uranium, metals and/or radionuclides	Alternatives that minimize changes in air quality and effects on ecological and human receptors are preferred.
		Noise	Changes in sound levels	Alternatives that minimize the increase in sound levels, and subsequent effects on wildlife and human receptors, are preferred.
	Geology and Groundwater	Geology	Changes in geology	Alternatives that avoid or minimize effects on geology are preferred
		Groundwater quantity	Changes in groundwater levels, groundwater flow patterns, and discharge rates to local surface water bodies	Alternatives that minimize interaction with groundwater quantity are preferred.
		Groundwater quality	Changes in concentrations of physical and chemical parameters in groundwater with consideration of discharge to local surface water bodies	Alternatives that minimize changes in groundwater quality, in the context of groundwater discharge to surface water bodies, are preferred.
	Aquatic Environment	Surface Water Quantity	Changes in surface water quantity through water taking, surface water discharge, and project overprinting of drainage areas (footprints)	Alternatives that minimize Project footprint, as well as surface water intake and release to surface water bodies, are preferred.
		Surface Water Quality	Changes in physical and chemical parameters of surface water quality can result from discharge of treated effluent to surface water bodies and land disturbance and clearing can mobilize solids into the aquatic environment	Alternatives that minimize Project footprint and changes in surface water quality and effects on fish, and other ecological receptors, are preferred.
		Fish and Fish Habitat	Changes in fish and fish habitat may develop from Project overprinting of fish habitat (habitat alteration or loss), changes in surface water quantity, surface water quality (physical and chemical parameters), sediment quality, or benthic invertebrates	Alternatives that minimize interaction with fish and fish habitat are preferred.
		Sediment Quality	Changes in sediment quality mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on sediment quality are preferred.
		Benthic Invertebrates	Changes in benthic invertebrate communities and quality from uptake of chemical parameters	Alternatives that minimize effects on benthic invertebrates are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
		Fish Health	Changes in fish health mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on fish health are preferred.
	Terrestrial Environment	Terrain	Changes to terrain	Alternatives that minimize interaction with terrain are preferred.
		Soil	Changes in soil quantity or quality	Alternatives that minimize loss or alteration of soil quantity, and minimize changes in soil quality, are preferred.
		Organic matter/peat	Loss of organic matter/peat	Alternatives that minimize loss or alteration of organic matter/peat are preferred.
		Vegetation and Ecosystems	Change in areal extent of vegetation habitat types and ecosystems	Alternatives that minimize loss vegetation and ecosystems are preferred.
		Listed Plant Species	Change in number of listed plant species	Alternatives that minimize direct and indirect effects on listed plant species are preferred.
		Wetlands	Change in areal extent of wetlands	Alternatives that minimize loss or alteration of wetlands are preferred.
		Ungulates	Changes in ungulate habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize ungulate habitat loss or alteration and minimize ungulate mortality are preferred.
		Furbearers	Changes in furbearer habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize furbearer habitat loss or alteration and minimize furbearer mortality are preferred.
		Woodland caribou	Changes in woodland caribou habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize woodland caribou habitat loss or alteration and minimize woodland caribou mortality are preferred.
		Raptors	Changes in raptor habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize raptor habitat loss or alteration and minimize raptor mortality are preferred.
		Migratory breeding birds	Changes in migratory breeding bird habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize migratory breeding bird habitat loss or alteration and minimize migratory breeding bird mortality are preferred.
		Bird species at risk	Changes in bird species at risk habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize bird species at risk habitat loss or alteration and minimize bird species at risk mortality are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
Human Environment	Human Health	Human Health	Changes in human health from exposure to non-radiological and radiological constituents in air, water, and food	Alternatives that minimize negative changes in human health are preferred.
		Worker Health	Worker conventional health and safety and radiation exposure	Alternatives that reduce conventional health and safety risks and radiation exposure are preferred.
	Land and Resource Use	Indigenous Land and Resource Use	Changes in the area of land available for Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in Indigenous land and resource use are preferred.
		Other Land and Resource Use	Changes in the area of land available for non-Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in other land and resource use are preferred.
		Heritage Resources	Change in the number of known archaeological resources	Alternatives that minimize direct or indirect alteration or loss of archaeological resources are preferred
	Quality of Life	Cultural Expression	Changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet	Alternatives that minimize direct or indirect adverse effects on cultural expression are preferred.
		Community Well-being	Change in income of local workers and community cohesion	Alternatives that minimize direct or indirect adverse effects on community well-being are preferred.
		Infrastructure and Services	Changes in traffic, community infrastructure and services	Alternatives that minimize direct or indirect adverse effects on infrastructure and services are preferred.
	Economics	Economy	Changes in participation in the traditional economy	Alternatives that minimize direct or indirect adverse effects on economy are preferred.
Other Evaluation Factors				
Criteria			Metric	
Technical Factors	Complexity of design, construction, operation, and decommissioning		Simple or straightforward designs, construction techniques, and operational procedures based on tested and proven technologies are preferred. Alternatives that are more amenable to decommissioning and/or reclamation are preferred.	
Cost Factors	Capital, operating, and decommissioning costs		Lower capital costs are preferred to reduce the pre-production costs and influence the project economic viability. Lower operational costs are preferred to maintain project economics. Lower decommissioning costs are preferred to reduce long term liabilities	

**Table 2.10-3: Mining – Methods - Alternative Means Assessment (same as Table 6 in Appendix 2-C)**

Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Biophysical	Atmospheric and Acoustic Environment	Air quality	Less preferred option. Air quality on surface would be influenced by slurry handling, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock. Air quality in the mine workings would be managed with ventilation.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 5. Changes in concentrations of radon in air from well development would be similar to option 5.	Less preferred option. Air quality in the mine workings would be managed with ventilation. Air quality on surface would be influenced by hoisted cuttings or slurry, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 3. Changes in concentrations of radon in air from well development would be similar to option 3.
		Noise	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 4.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from production drilling from surface includes compressors and mobile equipment would be continual.	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 2.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from surface drilling equipment includes compressors and mobile equipment would be intermittent as drilling is done only as required.
	Geology and Groundwater	Geology	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.
		Groundwater quantity	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Preferred option with smallest interaction on groundwater quantity compared to options 2, 4 and 5.	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Less preferred compared to option 3. Use of ground freezing temporarily interacts with groundwater flow during operations.
		Groundwater quality	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Mining area remediation during decommissioning would mitigate effects on groundwater quality.



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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
	Aquatic Environment	Surface Water Quantity	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.
		Surface Water Quality				
		Fish and Fish Habitat				
		Sediment Quality				
		Benthic Invertebrates				
		Fish Health				
	Terrestrial Environment	Terrain	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 4 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the second lowest of the four options. This option is more preferred than option 2 and 4, similar to option 5 with regard to potential effects on the terrestrial environment.	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 2 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the lowest of the four options. This option is more preferred than option 2 and 4, similar to option 3 with regard to potential effects on the terrestrial environment.
		Soil				
		Organic matter/peat				
		Vegetation and Ecosystems				
		Listed Plant Species				
		Wetlands				
		Ungulates				
		Furbearers				
		Woodland caribou				
		Raptors				
		Migratory breeding birds				
		Bird species at risk				
	Human Environment	Human Health	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine rock,	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			rock, slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.		slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.	
		Worker Health	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Surface operation with specialized surface equipment to drill horizontal cavities at ore depth. Physical ore cuttings will need to be rehandled on surface to either slurry for wet transport or dewater for dry transport increasing dose relative to Option 5 (which has a fraction of the drill cuttings to handle). Good conventional H&S as there is minimal mobile surface equipment.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, this option has potentially the highest dose as workers will have greater potential exposure to radiation while servicing equipment that is working within the ore zone. Underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Lowest dose of the four mining options evaluated in terms of dose associated with drill cuttings. The main contributor to worker dose would be radon associated with drilling the ISR wells. Surface piping of UBS, pumphouses, and well maintenance will also be a source of dose during pipeline repairs and inspection of equipment.
	Land and Resource Use	Indigenous Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Other Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Heritage Resources	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.
	Quality of Life	Cultural Expression	No appreciable difference was identified between alternatives for changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet.			
		Community Well-being	No appreciable difference was identified between alternatives for change in income of local workers and community cohesion.			
		Infrastructure and Services	No appreciable difference was identified between alternatives for changes in traffic, community infrastructure and services.			
	Economics	Economy	No appreciable difference was identified between alternatives for changes in participation in the traditional economy.			

Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Technical Factors	Complexity of design, construction, operation, and decommissioning	<p>Potential advantages: technology currently in use in Canadian uranium industry; mine layouts do not require development at or above the unconformity; remote system – safe for radiological risks.</p> <p>Potential technical weaknesses: Long duration development timeline; low production rate with limited ability to increase; currently used at only one mine with limited experience outside of that operation; may require extensive research and development; high technical risk including underground operating risks, inflow risk, design and operating risk; may require bulk freezing approach versus perimeter freeze design as assumed in the PEA. This would increase freeze cost and time significantly.</p>	<p>Potential advantages: technology in widespread use in oil and gas industry; reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (weeks); good production rate with scalability; similar technique under evaluation in Canadian uranium industry (Orano’s SABRE mining method).</p> <p>Potential technical weaknesses: Drilling accuracy is paramount and needs additional testing; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in civil / municipal applications; remote system – safe for radiological risks under normal operating conditions; self-supported tunnels, thus risk of ground failure or inflow in tunnels reduced; simple concept and operation, variety of knowledgeable contractors/personnel; moderate production rate (approximately 4M lbs/yr per machine); ability to apply multiple units (scalability).</p> <p>Potential technical weaknesses: Recovery of ore may be limited to 90% at best due to configuration of the tunnels; congested working space in the launch stations; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in international uranium operations (USA, Kazakhstan, Australia); reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (months); reduced technical risk with majority of remaining risks tested during feasibility stage; toll milling not required.</p> <p>Potential technical weaknesses: Not currently in use in Canadian uranium industry; mining solution permeability requires additional testing to increase confidence; low production rate – based on production rate at US operations (future testing may allow for higher production rates).</p>

Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Cost Factors	Capital, operating, and decommissioning costs	Option 2 has high operating cost relative to the grade of the ore body, high capital costs and long duration development timeline, although the technology is in use at an existing uranium operation in Canada.	Option 3 has low capital and operating costs compared to jet boring.	Option 4 has the lowest ore recovery and high capital costs and long duration development timeline. Technology is commonly used in civil engineering.	Option 5 has low capital and operating costs. The technology is in widespread use at international uranium operations. ISR mining operations often have comparatively low capital and operating costs, as well as shorter timelines to first production and greater flexibility to allow production to be scaled to meet market demands.
<p>Input received from Interested Parties:</p> <p>Denison discussed potential mining methods early in the engagement process. As part of the engagement program for the Project, Denison organized a series of in-person workshops with Indigenous and non-Indigenous communities of interest (COI) and other Interested Parties in 2018. The workshops gathered community and student input in relation to potential mining methods for the Phoenix deposit. Given the history of uranium mining in the Athabasca Basin, there is a wealth of knowledge on various mining methods, and Denison sought input for which method would be best suited to efficiently and safety mining the Phoenix deposit.</p> <p>The following mining methods were evaluated for effectiveness in mining the Phoenix deposit at the Project: Jet Boring, Surface Boring, Micro Tunnel Boring and In Situ Recovery. There was no specific engagement data collected related to surface boring or micro tunnel boring. Workshop participants noted that while jet boring was a relatively well-known method of mining, the high economic costs may make it undesirable for the Phoenix deposit (18-EN-VPL-2.38) (18-EN-ERFN-5.44). ISR mining is new to northern Saskatchewan and Canada. Some workshop participants were unsure how to evaluate the potential benefits and/or drawbacks of this mining method (18-EN-VILX-3.69), however other participants were confident in the method, saying they know it works in other locations, there are minimal waste streams, and method is more economically feasible than other methods (18-EN-VILX-3.68). A participant in the Village of Beauval workshop preferred the small footprint and lesser environmental impacts of ISR and viewed this method as a new opportunity for northern Saskatchewan (18-EN-VB-4.51). New opportunities are welcomed in the area, as they can support local businesses, provide training and learning opportunities, and keep money within the local economy (16-EN-MLA-109.26).</p>					
<p>Selected alternative for mining method = Option 5: ISR</p> <p>Rationale: Mining methods were evaluated through an increasingly rigorous process and considered factors such as: safety, environment, production rates, capital costs, operating costs, schedule, operational flexibility, and risk. The top four mining methods considered for the Phoenix deposit were: jet boring, surface boring, micro tunnel boring, and ISR. Independent preliminary economic assessment or class 5 level assessments were completed on each of these four options in 2017. The parameters evaluated included safety, environmental impacts, radiological safety, capital cost, operating cost, development timeframe, production rate, economic results (net present value, internal rate of return), regulatory risk, technology risk, equipment and contractor availability, and operating flexibility; this information has been summarized above in the alternatives means assessment cells. In addition, workshops were held in local Indigenous and non-Indigenous communities to capture community input into the selection of a preferred mining method once the options were narrowed down. Ultimately, based on the alternatives evaluated and feedback from Communities of Interest, Denison included the ISR method in the prefeasibility study (PFS; Denison 2018) and this mining method was selected as the basis for the EA.</p>					

Less Preferred

Neutral

More preferred

**Table 2.10-4: Summary of Alternative Means Carried Forward into the Environmental Assessment**

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Mining	Method	Table 6	<del>Open-pit</del>	Jet Boring	Surface Boring	Micro Tunnel Boring	ISR		
	Freeze design for tertiary containment of mining solution	Table 7	Freeze dome	Freeze wall					
	Permeability enhancement	Table 8	Hydraulics	Propellant	Mechanical				
	Mining solution	Not applicable. Option 1 basic solution was deemed not technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.	<del>Basic solution</del>	Acidic solution					
Processing	Location of processing	Table 9	Off-site processing at an existing mill	On-site processing in purpose built processing plant					
	On-site processing method	Table 10	Ion exchange	Solvent extraction	Direct precipitation				
Water management	Freshwater supply	Table 11	Groundwater	Surface water					
	Drinking water	Table 12	Truck drinking water to site	Generate drinking water on site with a potable water treatment plant					



Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
	Treated effluent discharge location	Table 13	To groundwater	<b>To surface water</b>					
	Treated effluent discharge locations for surface water	Table 14	Kratchkowsky Lake (LA-7)	Whitefish Lake north (LA-6)	<b>Whitefish Lake south (LA-5)</b>	McGowan Lake (LA-1)	Russell Lake	<del>Mardoc Lake (LA-4)</del>	<del>Williams Lake-LB-3</del>
Waste management	Organic waste disposal	Table 15	On-site disposal using an incinerator	On-site disposal in domestic landfill	<b>On-site composting</b>				
	Process precipitate disposal	Table 16	On-site permanent disposal	<b>Off-site reprocessing and final disposal</b>					
	Domestic waste disposal	Table 17	Collection and disposal off site by a third-party contractor	<b>Collection and disposal in an on-site domestic landfill</b>					
Access and transportation	Access road alignment	Table 18	Direct route	Direct route to reduce cut volumes	<b>Follows part of the existing exploration access road</b>				
	Stream crossing structures	Table 19	Culverts	<b>Clear span bridges</b>					
	Worker transportation	Table 20	Ground transport	<b>Air transport to existing airstrip at nearby Cameco operations</b>	<b>Air transport to new airstrip constructed and operated by Denison</b>				
Power	Primary power supply	Table 21	Liquefied natural gas power plant	<del>Solar photovoltaic power plant</del>	Diesel generators	<b>Provincial power grid</b>			

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Support facilities	Camp location optimization	Table 22	First location - Prefeasibility	Second location – Reduce fill volumes	Third location - Southwest from second location				

**Selected alternative**

~~Strike through~~ option was eliminated at an earlier step due to technical, economic, or land use factors (see Appendix 2-C)

## Attachment: IR-28

Number	IR-28
Dept.	CNSC
Project effects link	Current use of lands and resources for traditional purposes
Reference to EIS, appendices, or supporting documentation	<p>Section 4, IER and engagement appendices, including:</p> <ul style="list-style-type: none"> <li>• Appendix 2-A</li> <li>• Appendix 6-B</li> <li>• Appendix 7-B</li> <li>• Appendix 8-A</li> <li>• Appendix 9-A</li> <li>• Appendix 10-B</li> <li>• Appendix 11-A</li> <li>• Appendix 12-A</li> <li>• Appendix 13-A</li> <li>• Appendix 14-B</li> </ul>
Context and Rationale	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>
Information Requirement	<p>1) Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p>

	<p>2) Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3) Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>4) Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>
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Response:

This response has broken up information into two sections – the information requirement in relation to Section 4 and the associated related sections in the Indigenous Engagement Report (IER), and the engagement appendices that are associated with various sections of the EIS.

**Section 4 and the IER: Context**

Engagement with Indigenous and non-Indigenous Communities of Interest and Other Communities has been ongoing since 2016 and has evolved over time. Some changes have occurred from the beginning of engagement activities in 2016 to today, such as:

- early engagement occurring with the Northern Village of Pinehouse Lake, to the current state where Kineepik Métis Local #9 (KML) now generally represents the interests of the Métis citizens of the Northern Village of Pinehouse Lake together, along with general non-Indigenous residents;
- the Duty to Consult delegated to the Métis Nation – Saskatchewan from the A La Baie Métis Local #21, the Sipishik Métis Local #37, Patuanak Métis Local #82, and the Sled Lake / Dore Lake Métis Local #67; and
- interest expressed in the Project by Peter Ballantyne Cree Nation, who had not been previously identified by Denison, the CNSC nor the Province of Saskatchewan as having potential interests in the Project.

**Section 4 and the IER: Interests, Issues and Concerns**

Denison has worked to adapt to the changes as they have arisen. As such, we recognize that some of the *Interests, Issues and Concerns* tables (“Issues Tables”) can be further updated with new information

about potential issues that have arisen in relation to the Project, of which both the issue and Denison's response to the issue will be further subject to validation by the Indigenous Nation or community.

It is important to note that not all issue or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response—but mitigation and monitoring measures will be included where it makes sense to do so.

In respect of understanding and enhancing the identification of issues by an Indigenous nation or community, we can advise the CNSC that presently we have:

- 1) reviewed each Issues Table to determine any engagement data gaps evident as presented in the draft EIS, which may have occurred due to the changing nature of engagement over time as specified above;
- 2) updated each Issues Table with the key issues raised by the Indigenous Nation and community as a result of comments made on the draft EIS;
- 3) have developed a plan for validation and positive resolution of the Issues Table with each Indigenous Nation and community and are presently seeking confirmation with each group accordingly; and
- 4) (in the near future) seek confirmation on acceptable path forward in relation to validation of issues and/or resolution, where it is mutually agreed upon. Where it is not mutually agreed upon, Denison will identify a proposed rationale for potential next steps.

As an important note on this, Denison received permission to use three Indigenous Knowledge reports in the EIS, to provide additional comprehensive information in relation to the relationship to the land and connection to the environment from the Indigenous nations who shared this information. Information from these reports was used accordingly in the draft EIS to inform the environmental assessment and methodology. At the request of these Indigenous nations, these reports have been provided to the regulators under confidential cover. Denison did not carry forward items into the draft EIS that were outside the scope of the agreed-upon nature of the information exchange between Denison and the Indigenous nation. As such, at the time, Denison did not bring forward concerns raised in these reports through to Section 4 of the draft EIS.

Each of the Indigenous nation for whom these reports were prepared has now provided publicly available comments on the draft EIS where they have summarized their own issues and concerns about the Project, *some* of which arise from the confidential materials they have provided to the regulator. As such, Denison can now confidently update the Issues Table with these comments provided on the public record, which will enable a transparent accounting of issues from the worldview.

#### **Section 4 and the IER: Clear Documentation in Issues Tables**

Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached.

We can advise that the steps identified above have been successfully achieved with KML, and as such, Appendix A to this submission includes the Issues Table that will be inserted into the final EIS for KML (Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 [and corresponding table in the IER])

and serves as an example of the Issues Table that will be generated for all the other Indigenous nations and communities.

In this table Denison has added additional information in relation to *How Comment was Addressed / Considered in the Draft EIS* as requested by the CNSC, including any specific mitigation and/or monitoring measures pertinent if appropriate. Additionally, the *Status* column includes whether the issue is complete or ongoing, and the *Justification of Status* column now includes the evidence to support the status conclusion, and if necessary, additional details are provided in the *Ongoing Resolution of Concerns (if Required)* column. The *Ongoing Resolution of Concerns* column will outline the planned process to be followed with the Indigenous nation or community in respect of validation and/or resolution of the issue.

It is Denison's objective to successfully validate and resolve concerns with Indigenous nations and communities prior to the finalization of the EIS. As per Denison's outlined engagement strategy, a focussed approach will occur, first with respect to Indigenous and non-Indigenous Communities of Interest, and then with other Interested Parties.

Where Denison is unable to demonstrate that positive validation and resolution have been attained, clear information will be provided in the relevant table for the Indigenous nation or community in Section 4 of the final EIS (and if required, the IER) outlining the efforts undertaken to do so, planned next steps, or clear rationale for why a positive resolution has not been found to date.

#### **Section 4 and the IER: Planned Engagement and Next Steps**

Denison understands the importance of outlining to the CNSC the planned engagement activities to occur with Indigenous nations and communities. As identified above, part of engagement activities is in relation to positive validation and resolution of key issues. Additionally, Denison will be undertaking additional engagement activities that are outlined as follows as of June 30, 2023.

#### **English River First Nation ("ERFN")**

##### **Interests, Issues and Concerns:**

- 1) Denison has reviewed ERFN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with ERFN regarding a process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators will be included as part of this process.
- 4) Status of successful validation by ERFN of Denison responses to Issues Table—in progress.

##### **Engagement activities**

- 1) Site tour is planned for summer 2023 with ERFN Leadership, Technical team and Members.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - a. mitigation, monitoring and residual effects
  - b. forthcoming licensing actions

##### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the EIS and the associated section in the IER.



### **Kineepik Métis Local #9 (“KML”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed KML comments provided on the draft EIS.
- 2) Issues, Interests and Concerns table from Section 4 of draft EIS was revised according to Appendix A of this IR to be updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions actively occurring with KML regarding process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators were included as part of this process.
- 4) On June 10, 2023, Denison received positive validation that Denison's responses to KML issues, as described in the Issues Table, were acceptable to KML.
- 5) Status of successful validation by KML of Denison responses to KML Issues Table—**complete**.

**\*\*It is important to note that KML and the Northern Village of Pinehouse are working on the above matters together as a collective\*\***

#### **Engagement activities**

- 1) Site tour is planned for summer 2023 with KML Leadership, Technical team and Citizens.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - c. mitigation, monitoring and residual effects
  - d. forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Ya'thi Nene Lands and Resources Office (“YNLR”) (Representing the Athabasca Basin First Nations and the Athabasca Basin Communities)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed YNLR comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with YNLR regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) Status of successful validation by YNLR of Denison responses to YNLR Issues, Interests and Concerns—**in progress**.

#### **Engagement activities**

- 1) Undertook in-person community meetings in January 2023 in coordination with the YNLR in Black Lake, Fond du Lac, Hatchet Lake and Uranium City.
- 2) Coordinating process for additional engagement with YNLR for fall 2023 as they deem appropriate to discuss:
  - a) mitigation, monitoring and residual effects
  - b) forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Métis Nation – Saskatchewan (“MN-S”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed MN-S comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.

- 3) Denison has offered to meet to discuss the process toward resolution of draft EIS comments with MN-S as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) MN-S and Denison met on June 12, 2023, to provide a status update on completion of deliverables with respect to Capacity Funding Agreement, and in particular, the Métis Knowledge Study. MN-S outlined steps being followed in respect of this work. Denison indicated its willingness to meet regularly to support the efforts of MN-S in this regard. A tentative meeting has been set for the week of June 26-29, 2023.
- 5) Status of successful validation by MN-S of Denison responses to MN-S Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Undertook in-person community NR1 and NR3 meetings in February 2023, as coordinated and led by MN-S.
- 2) Will take direction from MN-S about coordinating additional meetings with MN-S as they deem appropriate to discuss matters of interest.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Birch Narrows Dene Nation (“BNDN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed BNDN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested the BNDN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project, as indicated by BNDN as existing. To facilitate this, Denison has shared a proposed confidentiality agreement with BNDN to facilitate the sharing of such information.
- 4) Discussions are actively occurring with BNDN regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 5) Status of successful validation by BNDN of Denison responses to BNDN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.
- 2) On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.
- 3) On May 10, 2023, Denison met with BNDN, to discuss the process going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison's access to data BNDN has referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to additional funding from Denison to BNDN. Denison continued to request the available site-specific information to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN to potentially adjust engagement approaches with BNDN.

- 4) On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided additional information from BNDN that BNDN would connect with Denison in the future to determine next steps together.
- 5) On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.
- 6) Subject to process set between Denison and BNDN as identified above, engagement process to be determined.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Peter Ballantyne Cree Nation (“PBCN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed PBCN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested PBCN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project.
- 4) To facilitate this, PBCN has directed Denison to access the traditional territory map in a confidential fashion from the CNSC.
- 5) On May 30, 2023, Denison has made this request of the CNSC.
- 6) Per below, Denison intends to provide materials to PBCN responding to the concerns raised in the EIS.
- 7) Status of successful validation by PBCN of Denison responses to PBCN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with PBCN on May 16, 2023, to provide an overview of the Wheeler River Project. During the meeting, PBCN indicated they would share a traditional territory map and had land and occupancy information in relation to the Wheeler River Project. PBCN indicated they desired another meeting to discuss their interests in the Wheeler River Project further. During this meeting Denison and PBCN acknowledged the challenges of meeting immediately, but committed to doing so.
- 2) As of June 30, 2023, Denison and PBCN have not met, but have intent to do so. Generally, the purpose of the next meeting would be for PBCN to provide more detail on their interests in the Wheeler River Project, and Denison would provide responses to the high-level issues raised by PBCN in their draft EIS comments.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Lac La Ronge Indian Band (“LLRIB”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS:
  - a) Denison has confirmed that the Wheeler River Project is not located within the Lac La Ronge Indian Band Traditionally Occupied Territory as described in <https://pubsaskdev.blob.core.windows.net/pubsask-prod/86730/86730-English.pdf> (page 84) (email to Ty Roberts, LLRIB - date February 14, 2023).

- b) Denison has confirmed that the Trapping furblock in which the Wheeler River Project is located is N-18 (ERFN) (email to Ty Roberts, LLRIB - date February 14, 2023).
- 3) Per below, Denison is providing materials to LLRIB responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by LLRIB of Denison responses to LLRIB Issues, Interests and Concerns–**in progress**

**Engagement activities**

- 1) Denison will send correspondence to LLRIB regarding the issues raised in the letter sent to the CNSC on the draft EIS in the coming months. In this correspondence, Denison will reiterate its interest in participating in a meeting of the LLRIB Land and Resources Board at a time that is mutually convenient. Denison has also requested the information from the LLRIB that indicates there is some trapping activity near the Project, to better understand the nature of these activities in relation to the Project.
- 2) As of June 30, 2023, Denison and LLRIB have not met, but have intent to do so at a mutually convenient time.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Prince Albert Grand Council (“PAGC”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Per below, Denison is providing materials to PAGC responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by PAGC of Denison responses to PAGC Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Denison will be sending correspondence to PAGC regarding the issues raised in the draft EIS with a response to issues raised by PAGC.
- 2) Based on the outcome of the effort above, Denison will undertake next steps accordingly.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Northern Village of Beauval & Northern Village of Ile a la Crosse (“NVB” & “NVILX”)**

**Interests, Issues and Concerns:**

- 1) No comments were received on the draft EIS by these Interested Parties.
- 2) The format of the Issues Tables for NVB and NVILX will be formatted according to Appendix A of this IR—for the final EIS.
- 3) Denison will develop a process with NVB and NVILX in relation to the Issues Tables for each of these Interested Parties to seek successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns.
- 4) Status of successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Community and Leadership engagement–planned for fall 2023 to discuss:
  - a) mitigation, monitoring and residual effects

b) forthcoming licensing actions

**\*\*NVILX subject to discussions with MN-S\*\***

**Future Documentation in updated EIS and updated IER**

1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Section 4 and the IER: Updates Planned for the Final EIS**

The following will be updated for the final EIS:

- Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices
- Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)
- Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)
- Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)
- Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)
- Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)
- Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)
- Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)
- Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)
- Table 4.3-10: Key Issues and Concerns from Ya'thi Néné Lands and Resources Office (and corresponding table in the IER)
- Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse
- Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval
- Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse

A new table will also be included for Peter Ballantyne Cree Nation in the final EIS and in the IER.

### **Engagement Database Summary Tables in Various Appendices: Context**

Denison's overall approach to respecting the information shared with Denison, as a result of engagement interactions from 2016 onwards, was to aspire to interweave the data outcomes throughout the entire assessment, rather than providing a single summary chapter in the draft EIS. To do this, Denison's Subject Matter Experts reviewed the over 2,000 lines of engagement data collected from 2016 onwards, and determined what and which information could meaningfully inform their assessment approach. This resulted in engagement data being reflected throughout the entire draft EIS, informing almost all aspects of the assessment. To make sure the reviewer could reasonably understand the context in which the engagement data was collected, Denison created an Engagement Database Summary Table as an Appendix item for each section of the draft EIS where engagement data were used. Each Engagement Database Summary Table identifies the *Unique ID* referenced in the chapter, the *Record of Contact* ("ROC") number that can be used to look up the original source materials in the EIS Appendix 4-A: Supporting Materials, the *Event Type*, the *Date*, the *Event Summary*, the *Interested Parties* with which the engagement occurred, the *Comment* made, and the *Response* from Denison. Denison has now added a final column called *Context*, which provides specifics about how the comment was used in the section.

It is important to note that not all issues or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response, but mitigation and monitoring measures will be included where it makes sense to do so.

It is also important to note that these engagement data are not intended to be representative of the Indigenous nation or community perspective, as the comment may have been made by an individual from the Indigenous nation or community, and not specifically by the leadership. The Issues Tables (as discussed in this IR) are those Tables that summarize the collective interests, issues and concerns by the leadership, which Denison has identified will be subject to the validation process as outlined above. These appendices are simply intended to provide transparency around the engagement data points that had been used in the draft EIS in some manner, and are, therefore, not part of the validation process designed for Indigenous nations and communities.

### **Engagement Database Summary Tables in Various Appendices: Updates Planned for the Final EIS**

Please see Appendix B to this IR for an example of the new format for the Engagement Appendices. The following in the EIS will be updated:

- Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description
- Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description
- Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater
- Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment
- Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment
- Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health



- Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use
- Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life
- Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics
- Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions
- Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
<b>Monitoring</b>	<p>Interest in information and direct participation in monitoring baseline and effects.</p> <p>Concern that project should have independent monitoring for the Project and that information from this be shared with communities.</p>	ROC 2 ROC 105 ROC 444	<p>An Environmental Protection Program will be established to provide an overarching framework for key environmental monitoring and management plans and to ensure a means to demonstrate compliance with applicable environmental regulatory requirements and other performance targets that Denison may set. The program would be developed in a manner that aligns with the ISO 14001 EMS Standard. Aspects of the Environmental Protection Plan will include:</p> <ul style="list-style-type: none"> <li>-Management and Monitoring of Emissions</li> <li>-Liquid Effluent Monitoring Plan</li> <li>- Air Emissions Monitoring Plan</li> <li>- Groundwater Monitoring Plan</li> <li>- Environmental Monitoring Plan</li> <li>- Woodland Caribou Management Plan</li> </ul> <p>As the Indigenous Community of Interest with a residential community most proximal to the Project, Denison has committed to collaborating with Kineepik Métis Local on a community specific monitoring regime, suited to their interests and needs in order to provide transparent information to discourage avoidance of the area and alleviate perceived concerns about potential impacts. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>See Section 16 for a summary of monitoring and follow-up programs.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Economics</b>	Concern and interest in economic opportunities associated with Project and education and training to facilitate access and participation by community members.	ROC 62 ROC 105 ROC 388 ROC 444 ROC 620 ROC 623	Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Mitigation and enhancement measures will be implemented by Denison to enhance the positive effects of the Project on employment and training, income, traditional economy, and business opportunities and minimize adverse effects including:</p> <ul style="list-style-type: none"> <li>-A Human Resource Development Plan to initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities;</li> <li>-Establishment of a procurement approach through all phases of the Project, focusing on businesses based within the LSA communities, followed by Indigenous and / or businesses in the RSA;</li> <li>-Negotiation with the Province of Saskatchewan to develop the Project's Surface Lease Agreement and Human Resource Development Agreement.</li> </ul> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including in relation to ongoing education and training as deemed appropriate by KML.</p> <p>See Section 13 for a summary on local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p> <p>See Section 13 for information regarding employment, employment opportunities, and career growth for community members.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Economics</b>	Interest with potential contracts and business opportunities for northern Indigenous companies.	ROC 105 ROC 114 ROC 118 ROC 444	The Project will create employment and business opportunities and increase income for workers and businesses in the LSA, RSA, and beyond the RSA during all phases of the Project. Denison has estimated a workforce during the two-year Construction period of 300 people and during the Operation phase 180 people are expected to be employed to operate the ISR wellfield and processing plant, including	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>supporting activities. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA will be given first priority for employment and training and business opportunities, followed by Indigenous and / or other communities in the RSA.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including business opportunities as deemed appropriate by KML.</p> <p>See Section 13 for a summary of local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Engagement</b>	<p>Interest in implementation of appropriate engagement process activities.</p> <p>Concern was raised over the approach to consultation with others (other communities) and questions raised on whether a Collaborative Agreement was possible during operations.</p>	ROC 106 ROC 114 ROC 118 ROC 135 ROC 388 ROC 444	<p>Denison has identified key objectives respecting Indigenous engagement associated with the Project:</p> <ul style="list-style-type: none"> <li>-Build and maintain authentic relationships based on a foundation of trust, good faith, and transparency.</li> <li>-Create a respectful dialogue process that promotes communication and collaboration among Denison and Indigenous communities, in a timely and accurate fashion.</li> <li>-Understand how the proposed development of the Project may affect the interests of Indigenous peoples (including Indigenous and/or Treaty Rights), and work with Indigenous peoples to avoid, mitigate, or otherwise address effects, while also collaborating to maximize potential positive effects.</li> </ul> <p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML and continues to engage with KML and NVP with respect to the Wheeler River Project.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>The Agreement negotiated between Denison and KML is demonstrative of Denison's responsiveness to the request from KML for such an agreement.</p> <p>See Section 4 for additional information on the consultation process.</p>			
<b>Cumulative Effects</b>	Concern was expressed over cumulative effects in the region.	ROC 105	<p>Denison conducted a cumulative effects assessment, which included the Highway 914 extension project, on categories:</p> <ul style="list-style-type: none"> <li>-The Atmospheric and Acoustic Environment.</li> <li>-Geology and Groundwater.</li> <li>-The Aquatic Environment.</li> <li>-The Terrestrial Environment.</li> <li>-Human Health.</li> <li>-Land and Resource Use.</li> <li>-Quality of Life.</li> <li>-Economics.</li> </ul> <p>Denison respects and understands KML's concern about the cumulative effects in the region, particularly in relation to access to traditional lands and resources in correlation with industrial and mining developments. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the ILRU RSA, resulting in potential cumulative effects to Indigenous land use activity in the area. This is largely due to the proposed Highway 914 extension project.</p> <p>See Section 16 for a summary of the cumulative effects assessments for each category above.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest in information about current market conditions and overall viability of the Project.	ROC 105	Denison has identified that there is current and future market demand for uranium, the primary raw material for nuclear fuel generation. The Project can address gaps in annual global uranium supply and the use of uranium in nuclear power plants can contribute to net-zero goals, and this can be achieved while making a meaningful contribution to the Canadian economy. The Project was considered in relation to technical feasibility, economic feasibility, and land use criteria to determine viability of the Project.	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			See Section 2 for information about Project components and purpose.		validation by KML received by email on <b>June 10, 2023</b>	
<b>Project Description</b>	<p>Feedback on mining options and technical questions were asked on the different methods of mining.</p> <p>The community provided comments on the different on-site road options.</p>	ROC 2	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>Through an alternative means assessment, Denison considered options in relation to access and transportation. The access road alignment will follow part of the existing exploration access road, stream crossing structures will use clear span bridges, and worker transportation will be air transport to a) nearby Cameco operations or, b) a new airstrip constructed and operated by Denison.</p> <p>Denison incorporated the feedback provided on road options select the <b>current</b> road alignment for the Project.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest for information about type and how chemicals and other hazardous products would be transported, and whether an emergency response team would be ready to respond.	ROC 444	<p>Denison will establish a Transportation of Dangerous Good Program, intended to provide for the safe transport of goods by conforming to all applicable laws, regulations, company policies, and procedures. The Transportation of Dangerous Goods Program applies to all modes of transport and all locations where Denison assumes care and control of the materials.</p> <p>Denison will establish an Emergency Preparedness and Response Program to identify how the Project will prepare for and addresses emergencies that may affect the health and safety of persons, the environment, and the protection of property. Emergency</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue



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			<p>Preparedness and Response Program would be developed consistent with guidance provided by CNSC in REGDOC-2.10.1, Nuclear Emergency Preparedness and Response (CNSC 2016).</p> <p>Increased pressure on emergency services is most likely to stem from an accident or malfunction on Highways 914 or 165. The extent to which these changes could affect any given community would depend on the nature of the accident or malfunction. Accidents and malfunctions for the Project were determined to (generally) have a highly unlikely to unlikely probability of occurrence, with an overall risk rating of low to moderate; however, the severity of accidents and malfunctions was determined to be minor to major. If such an event were to occur, local resources may be called upon to provide support, which may result in a call to fire, RCMP, or ambulance services depending on the nature of the event. Denison will provide any necessary training and/or equipment to local first responders to make sure they are sufficiently prepared to deal with an unlikely accident or malfunction.</p> <p>Denison's objective is to utilize existing emergency response teams from other operations prior to drawing on community-based resources. In the unlikely event that this were to occur, and KML resources were drawn upon, the Agreement negotiated between provides the foundation for discussions in respect of such incidents.</p> <p>See Section 2 for information pertaining to the above programs.</p>		email on <b>June 10, 2023</b>	
<b>Land and Resource Use</b>	Russell Lake was noted of particular importance for recreational/commercial fishing.	ROC 2 ROC 620	<p>Denison noted the importance of Russell Lake and considered Russell Lake in the LSA in terms of recreational/commercial fishing.</p> <p>Negligible aquatic habitat loss is predicted in LA-5 (also known as Whitefish Lake) due to the installation of a discharge pipeline and diffuser configuration. The total area of the lake substrate that would be overprinted by the pipeline is expected to be approximately 135 m<sup>2</sup>, which will constitute less than 0.05% of the lake's surface area. No other alteration, disruption, or destruction of aquatic habitat in the aquatic environment LSA is expected. Project-induced changes to the</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>abundance and distribution of fish is, therefore, not expected. The effect, if any, is expected to undetectable to fishers.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in environmental monitoring associated with the Project, including the potential for monitoring fish species harvested by and important to, KML.</p> <p>See Section 11 for information on how the Project will interact with land and resources including how potential effects will be mitigated.</p>		email on <b>June 10, 2023</b>	
<b>Indigenous and Local Knowledge</b>	The community has pre-existing Indigenous Knowledge and will work with Denison on this.	ROC 106	<p>In 2018, KML approached Denison to support a land use mapping initiative in the Project area. The 2018 study builds on existing land use maps, completed in 2011. A verification meeting was held in late 2018 to make sure no geographic data gaps existed and that the results speak for the whole community. In 2022, KML prepared a document to voice their perspectives on Project VCs and to provide a record for EIS development. Based on 12 community engagement sessions and review of the land use maps, KML explained their unique social, cultural, and historical context, expressed a general consensus of support for the Project, and described issues and concerns.</p> <p>See Section 3 for information on IK and LK and how this information was integrated throughout the EIS.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Questions and clarifications on ISR mining methodology, including freeze wall technology and Project power requirements.	ROC 62 ROC 604 ROC 620 ROC 623	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML continues to engage with KML and NVP with respect to the Wheeler River Project.</p> <p>See Section 4 for additional information on the consultation process.</p>		<b>June 10, 2023</b>	
<b>Economics and Local Capacity Building</b>	Expressed a need for building capacity locally in terms of training and education, emergency response, waste management, and additionally expressed a want of local procurement and industry supporting infrastructure.	Draft EIS Comments	<p>As outlined in Denison's Indigenous Peoples Policy, Denison recognizes the critical necessity of advancing reconciliation with Indigenous peoples in Canada and the important role of Canadian business in the reconciliation process. Denison is committed to providing Indigenous people and businesses with sustainable economic opportunities and benefits and sharing the economic benefits of Denison's business activities.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including commitments for ongoing education and training as deemed appropriate by KML, support to the vision of local industry supporting infrastructure.</p> <p>In terms of building capacity locally for emergency response and waste management, Denison supports KML's vision on these items where it makes sense and is possible. The Agreement provides a framework for future possibilities such as these.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Access and Transport</b>	Expressed a need for industrial grade improvements between Highway 2 and the Key Lake Gate to support the increase in heavy traffic.	Draft EIS Comments	<p>Highway improvements are not within Denison's jurisdiction and are not considered in the EIS for the Wheeler River Project. However, Denison notes KML's perspective of increased traffic volumes and subsequent desire for highway improvements.</p> <p>On Highway 914 between Key Lake and Pinehouse, Denison anticipated that road users would see an increase between 16% and</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>40% over the life of the mine. Trucks travelling on this section of highway will increase from 35 to 53 at peak operational times.</p> <p>Denison's vision in respect of this concern is that Denison and KML work together as partners in discussions about highways with the Provincial Government.</p> <p>However, in respect of actions Denison can undertake regarding traffic along the road at times important for the undertaking of cultural activities, Denison commits to:</p> <ol style="list-style-type: none"> <li>1) Assisting KML with the clear identification of the forthcoming culture camp along highway 914 (clear signage</li> <li>2) Having Project vehicle slow down to 40km/hr from mid-August to mid-October, during the times when KML members may be using the portion of the road near the culture camp. To be specific, this includes 2.5km before the entry into the culture camp, and 2.5km after the entry into the culture camp.</li> </ol> <p>See Section 2, Appendix 2-B for more detail pertaining to traffic volumes.</p>		KML received by email on <b>June 10, 2023</b>	

## Appendix B

### Section 9: Engagement Database Summary Table – Vegetation and Ecosystems

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-VILX-3.32	3	Workshop	2018-01-17	As part of the engagement program for the Wheeler River Project, Denison organized a workshop in Ile a la Crosse for community and A La Baie Métis members to attend. The workshop gathered community and student input in relation to road alignment options, treated effluent discharge locations, and mining methods.	Village of Ile a la Crosse	Need to understand impact on groundwater and lakes.	<p>Denison considered this in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in Areal Extent of Habitat Types, Number of Listed Plants, and Areal Extent of Wetlands</p> <p>And in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in the Concentrations of Constituents of Potential Concern in Vegetation</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from an individual who attended workshop in Ile a la Crosse in the year 2018, which reiterates the importance of groundwater and lakes, thereby providing further validity to the inclusion of water quality and water quantity as a potential pathway of influence in terms of areal extent of habitat types, number of listed plants, the areal extent of wetlands, and changes in the concentrations of constituents of potential concern in vegetation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Groundwater impacts were assessed in Section 7 titled Geology and Groundwater. Impacts to lakes were assessed in Section 9 titled Aquatic Environment. Section 7 and 9 provide details to support the conclusion that there is no significant impact in terms of groundwater or lakes.</p>
20-LK-LEASESUR-267.67	267	Survey	2020-02-01	Denison sent all known local cabin and lodge leaseholders a survey in the mail to be completed regarding their interests in Wheeler River. Denison received 6 responses from the survey, which has informed it's understanding of leaseholder uses in the area and interests regarding elements to be assessed as part of the environmental assessment.	Leaseholder, Wheeler River Lodge	Concerns over fishing and hunting pressure [from the mine and people accessing the area].	<p>Denison considered this in section:</p> <p>Cumulative Effects, Potential Cumulative Effects</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from a leaseholder who completed a survey in in the year 2020, which reiterates the importance of land use activities, thereby providing further validity to the inclusion of increased access to the terrestrial RSA as a potential pathway for cumulative effects in terms of invasive plant introduction and increased dust deposition.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Both fishing and hunting were assessed in Section 11 titled Land and Resource Use. The assessment considers both terrestrial and aquatic resource availability, as well as the health and abundance of resource, in terms of both Indigenous Land and Resource Use and Other Land and Resource Use. The assessment in Section 11 additionally incorporates increased access owing to the extension of highway 914 as part of the cumulative effects assessment while existing projects were captured and assessed within baseline conditions. Section 11 provides details to support the conclusion that there is no significant impact in terms of fishing and hunting.</p>

## Appendix B

### Section 11: Engagement Database Summary Table – Indigenous Land and Resource Use

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-ERFN-5.1	5	Workshop	2018-05-03	<p>As part of the engagement program for the Wheeler River Project, Denison organized a workshop for ERFN at their Patuanak Reserve location for ERFN and Patuanak members to attend. The workshop aimed to gather community input in relation to road alignment options, treated effluent</p> <p>discharge locations, and mining methods. The meeting had been delayed many times, and was held in the Health Clinic because there was a regional power outage.</p>	English River First Nation	<p>I always come from the elders' perspective. Since 1906, the area where you're working has been Treaty 10 land. Those lands were the primary area of ERFN and contain burial sites and birth sites of ERFN members. The Dené name of the Wheeler River, Russell Lake and Cree Lake all come from the Denésuliné of English River. The elders have always expressed that it's a primary area of ERFN. One of our late elders was born north of there in 1922. Our traditional gathering place is there.</p>	<p>Denison considered this in section:</p> <p>Existing Environment, Contemporary Indigenous Land and Resource Use in the Region, English River / Patuanak</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the land and resource use section of the EIS serves as a local perspective, documented as coming from a member of English River First Nation who attended a workshop in the year 2018. Existing conditions are based on available information and are accompanied by supporting information including available IK, LK, and results of engagement activities of specific relevance to the particular VC/KI. As such, the direct quote was incorporated into the characterization of the existing environment as it relates to occupancy, cultural sites, and navigation pertinent to English River First Nation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>English River First Nation is categorized as an Indigenous Community of Interest. Detail on Indigenous COI criteria is provided in detail in EIS Section 4 titled Engagement. Consideration of ERFN territory, as well as ERFN perspectives, has been interwoven throughout the EIS wherever pertinent.</p> <p>Potential impacts to heritage resources were assessed in Section 11 in the subsection titled Heritage Resources. Section 11 provides details to support the conclusion that there is no significant impact in terms of heritage resources. This section also provides detail on the Heritage Resource Management Plan.</p>



## Appendix B

### Section 13: Engagement Database Summary Table – Economics

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
21-EN-VPL-444.16	444	Virtual Meeting	2021-02-11	Denison hosted a virtual meeting for the municipality of Pinehouse Lake. The public meetings were focused on the Project generally, and did not seek input or comments on the distinct interests of the Métis in respect of the Project or Métis land use. This was expressly stated at the outset of each of the public meetings. Included in the discussion was an overview on the Valued Components for the Wheeler River Project, with a request to provide feedback to Denison via an online survey with specific questions pertaining to Valued Components.	Village of Pinehouse Lake	Will there be opportunities for people from Pinehouse to be employed?	<p>Denison considered this in section:</p> <p>Existing Environment, Key Indicator: Employment and Training, Employment Rate</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the economics section of the EIS serves as a local perspective, documented as coming from a resident of Pinehouse Lake who attended a virtual meeting in the year 2021, which reiterates the importance of employment, thereby providing further validity to the inclusion of employment and training as a key indicator and additionally providing substance to the characterization of local perspectives on the existing environment as it relates to an emphasis on employment.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Employment was assessed in Section 13 which provides detail related to all facets of the Economic assessments including detail on how the Project will create employment opportunities and increase income for workers and businesses in the LSA, RSA and beyond the RSA during all phases of the Project.</p>

## Attachment: IR-35

Number	IR-35
Dept.	CNSC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6, Chemicals of Potential Concern
Context and Rationale	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>
Information Requirement	Please consider acrolein in the assessment or provide a rationale for its exclusion.

### Response:

The air quality assessment in the draft EIS considered combustion emissions (i.e., NO<sub>x</sub>, SO<sub>2</sub>, CO, and fine particulate matter) from diesel-powered equipment/vehicles and the standby diesel generators. While acrolein is a component of diesel exhaust, it was not identified as a contaminant of potential concern (COPC) given that the use of diesel equipment/vehicles and generators at the Wheeler River Project will be limited. To demonstrate this, a quantitative screening level assessment of acrolein emissions from diesel combustion was carried out here to address this IR. Because there is no acrolein criterion or standard in Saskatchewan, Ambient Air Quality Criteria (AAQC) from Ontario were used. These criteria have also been adopted in Alberta. The screening level assessment is described in the following text.

Using the nitrogen oxide (NO<sub>x</sub>) results from the air quality modelling assessment in Appendix 6-A, 1-hour and 24-hour dispersion factors (i.e., µg/m<sup>3</sup> per g/s emitted) were calculated for each assessment scenario. A dispersion factor was calculated for both the worker camp receptor, and the off-property receptor with the highest predicted NO<sub>x</sub> concentration. These dispersion factors were then applied to estimates of acrolein emissions to predict 1-hour and 24-hour concentrations of acrolein at both locations. The acrolein emission rate from the standby diesel generators were estimated using fuel flow

rates from manufacturer’s specifications and emission factors from Chapters 3.3 and 3.4 of the U.S. EPA AP-42 Compilation of Emission Factors, depending on the generator size. For mobile equipment and vehicles, a ratio of acrolein to non-methane hydrocarbons (NMHC) was applied to the total HC emission factors (see Section A.9 and A.10 of Appendix 6-A), conservatively assuming total HC equals NMHC. The ratio of acrolein to NMHC was obtained from the U.S. EPA document “*Speciation Profiles and Toxic Emission Factors for Non-road Engines in MOVES3*” (2022) and assumed Tier II engines. The site-wide emission rates for acrolein were estimated to be 1.89E-03 g/s for Construction, 1.04E-03 g/s for Operation, and 1.53E-03 g/s for Decommissioning. In all scenarios, the generators were assumed to operate 24-hours per day and increased equipment usage during Construction and Decommissioning resulted in higher acrolein emissions compared to the Operation scenario.

The results of the screening level assessment are outlined in the table below. Calculated acrolein concentrations are compared against Ontario AAQC, which are based on health as the limiting effect. As can be seen in the table, acrolein concentrations are expected to be well below the applicable criteria for all scenarios. The highest estimated concentrations will occur for the Decommissioning scenario and are 6.7% of the 24-hour AAQC, and 1.8% of the 1-hour AAQC at the worker camp. At the maximum off-property receptor, the estimated acrolein concentrations for Decommissioning are predicted to be 0.9% and 2.0% of the 1-hour and 24-hour AAQC, respectively.

Based on the results of the screening level assessment, acrolein is not considered a COPC.

#### Calculated Dispersion Factors and Resulting Acrolein Concentrations

Scenario	Averaging Period	Ontario AAQC (µg/m³)	Emission Rate (g/s)	Dispersion Factor <sup>[1]</sup> (µg/m³ per g/s)		Concentration <sup>[2]</sup> (µg/m³)		% of Ontario AAQC	
				Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor
Construction	1-hour	4.5	1.89E-03	25.5	24.9	4.84E-02	4.71E-02	1.1%	1.0%
	24-hour	0.4		9.2	5.0	1.75E-02	9.56E-03	4.4%	2.4%
Operations	1-hour	4.5	1.04E-03	37.5	23.6	3.91E-02	2.47E-02	0.9%	0.5%
	24-hour	0.4		12.9	5.3	1.35E-02	5.55E-03	3.4%	1.4%
Decomm.	1-hour	4.5	1.53E-03	54.1	26.2	8.29E-02	4.01E-02	1.8%	0.9%
	24-hour	0.4		17.4	5.2	2.66E-02	8.02E-03	6.7%	2.0%

**Notes:**

[1] Based on the incremental NOx predictions at the worker camp receptor and the off-property receptor where maximum NOx concentrations were predicted.

[2] Concentrations are incremental and do not include the addition of a background. Background is expected to be negligible.

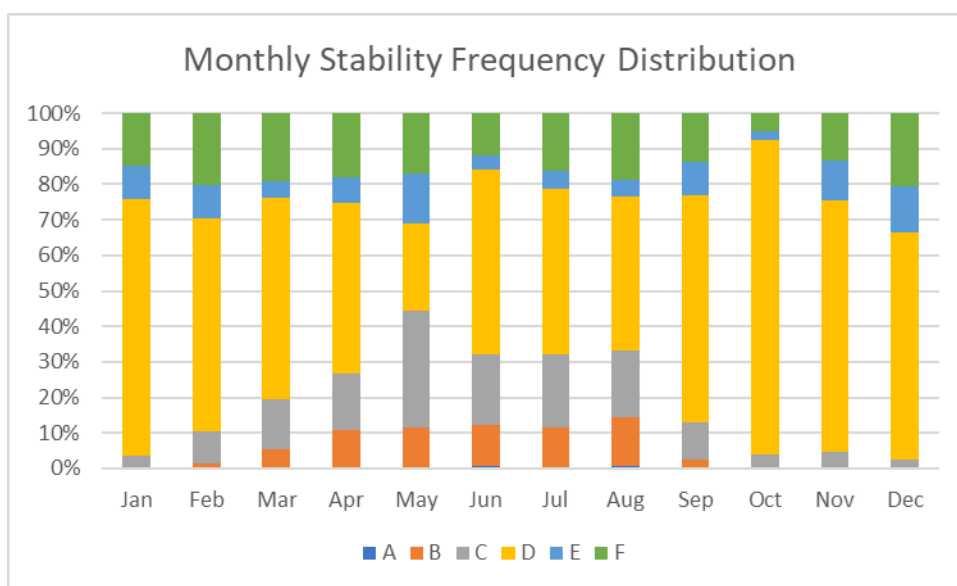
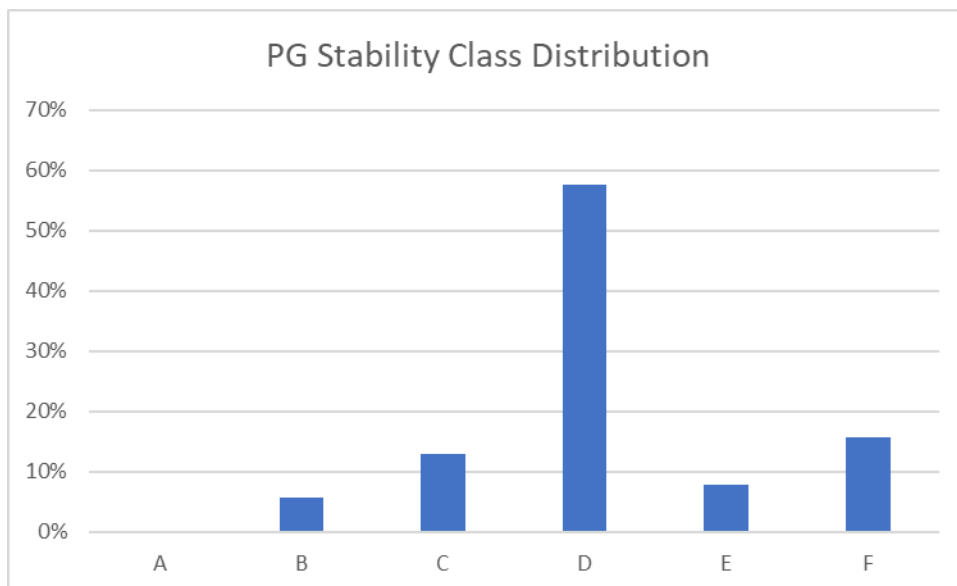
## Attachment: IR-39

Number	IR-39
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6.1.4.2, Potential Project- Related Effects
Context and Rationale	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent’s CALPUFF model runs indicated exceedances for 24- hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>
Information Requirement	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.

### Response:

The draft EIS aggregated the total number of exceedances predicted over the one-year CALMET data set to determine the maximum frequency of exceedances. While information on diurnal and seasonal patterns of exceedances is useful for developing air emissions management and monitoring plans, the total number of exceedances was required to identify and evaluate potential residual effects in the EIS.

Information regarding the presence of inversions in the CALMET data set was presented during the Meteorology Technical Meeting held on January 27, 2023. As shown in the figures below, stable conditions (PG stability class categories E and F) occur about 24% of the time and are most prominent during December (33% of the time).

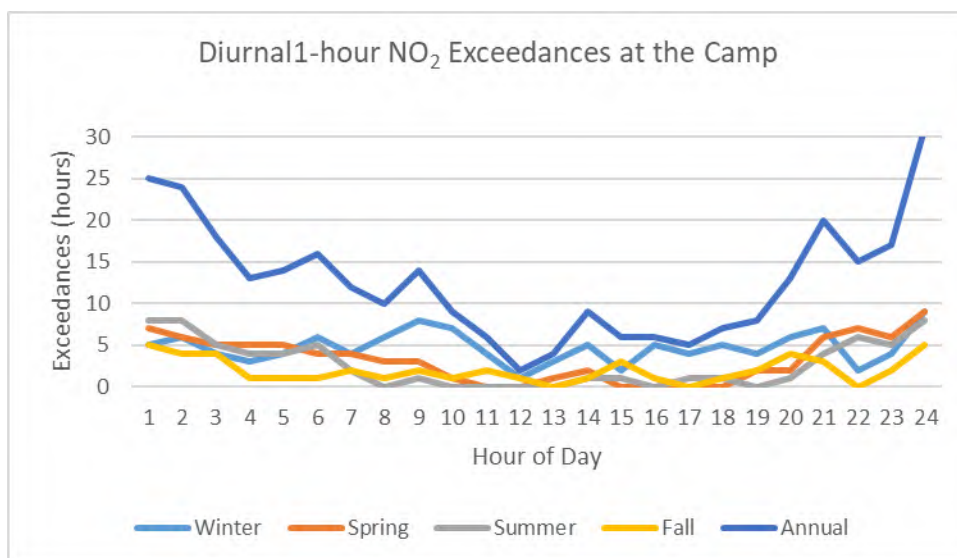
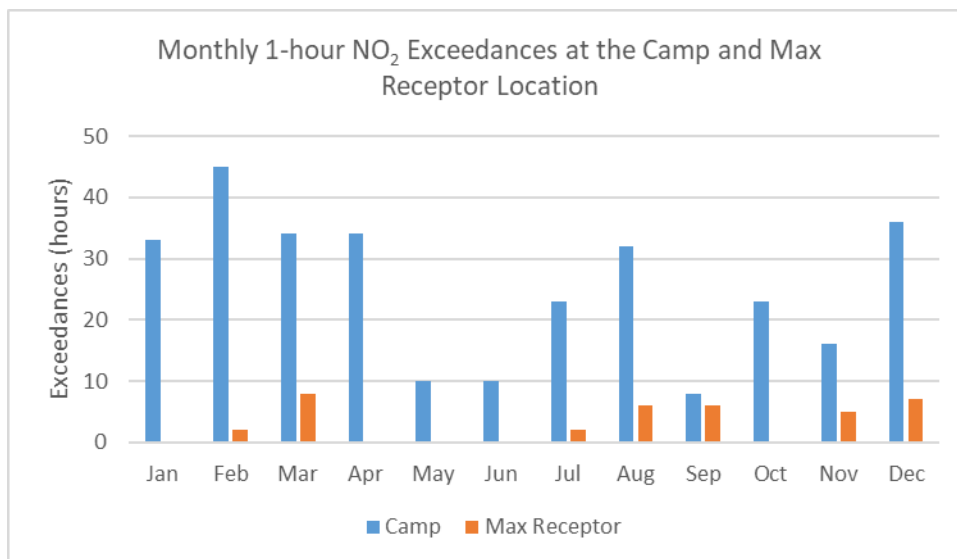


In addition to the previous information, the temporal patterns of the predicted exceedances for 1-hour NO<sub>2</sub>, and 24-hour TSP, PM<sub>10</sub>, and uranium for each of the assessment scenarios have been evaluated at the camp receptor and at the receptor with the maximum predicted concentration. The results of this analysis are presented in a series of figures below. While NO<sub>2</sub> exceedances are limited (i.e., < 5% of the time), some temporal patterns do emerge. Namely, 1-hour NO<sub>2</sub> exceedances are primarily expected to occur during the coldest months (January, February, and December) and during the morning and overnight hours when inversions are more likely to occur. For 24-hour TSP and PM<sub>10</sub>, exceedances are predicted to be most frequent during the May to October period, corresponding to higher emission rates compared to the November to April period (see Section 4.0 of Appendix 6-A). Being that there are so few 24-hour uranium exceedances, no obvious temporal pattern was identified, but the months with the highest number of exceedances at the camp receptor are expected to be April, October, and

December and only one exceedance is predicted from May to September. This suggests that exceedances of the 24-hour uranium criteria are more likely to occur during the colder months, possibly due to the increased presence of inversions.

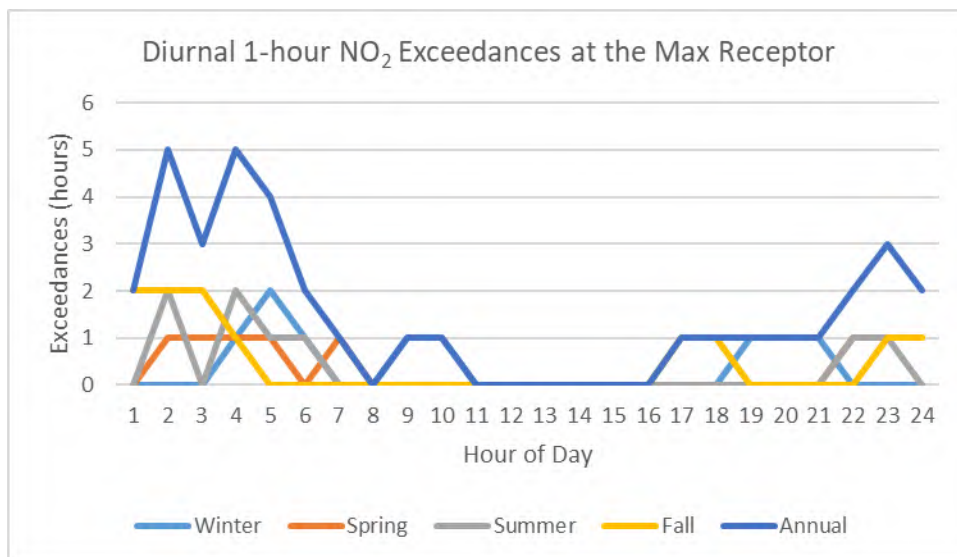
The aforementioned information will be considered as mitigation and monitoring plans are developed.

*Figures for Construction Exceedances*

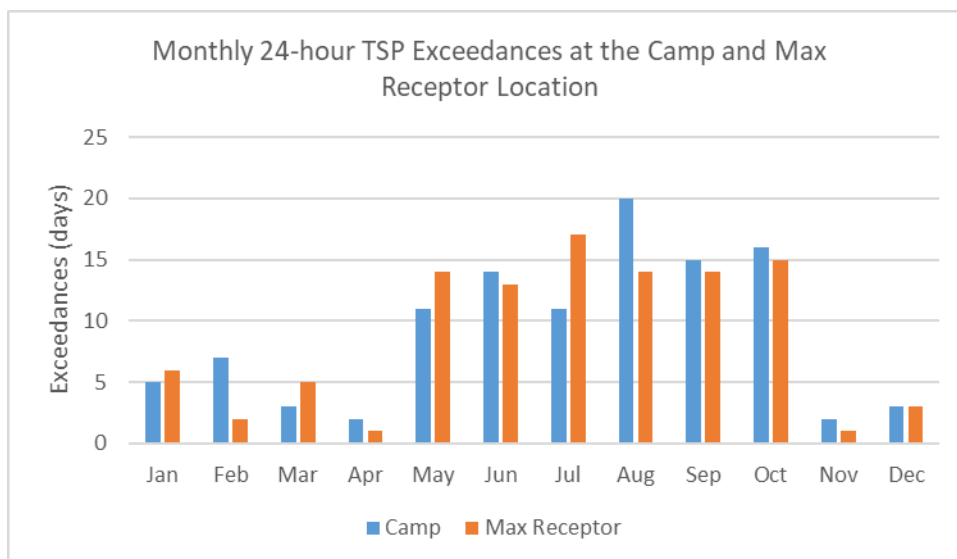


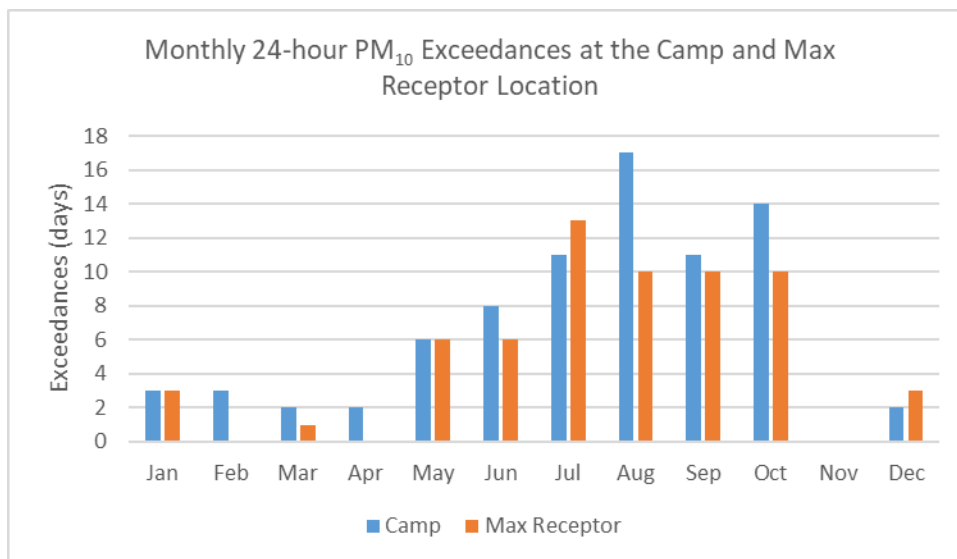
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



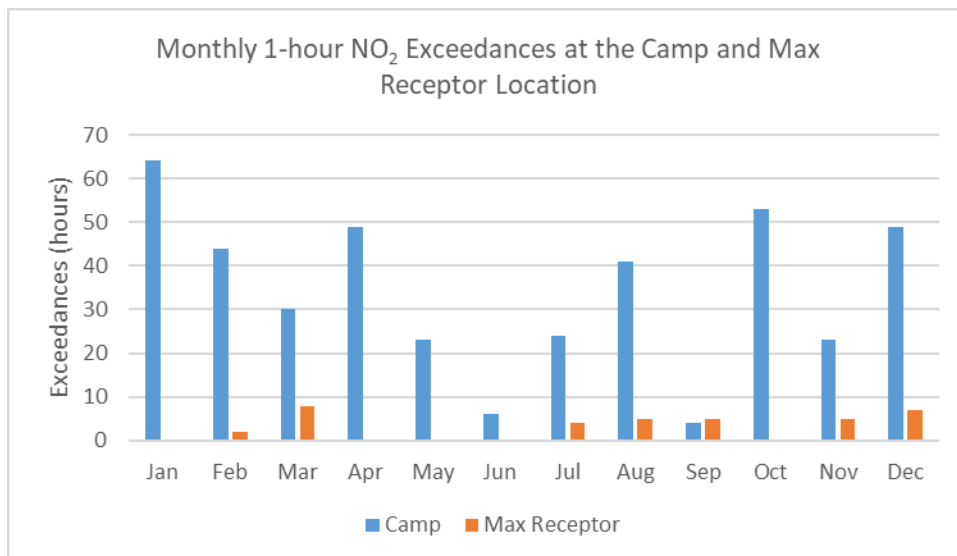


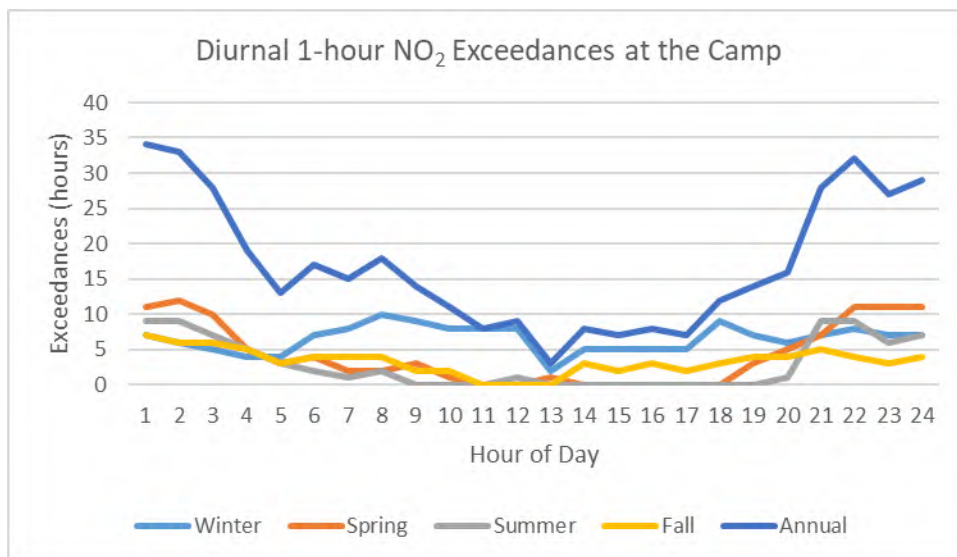
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



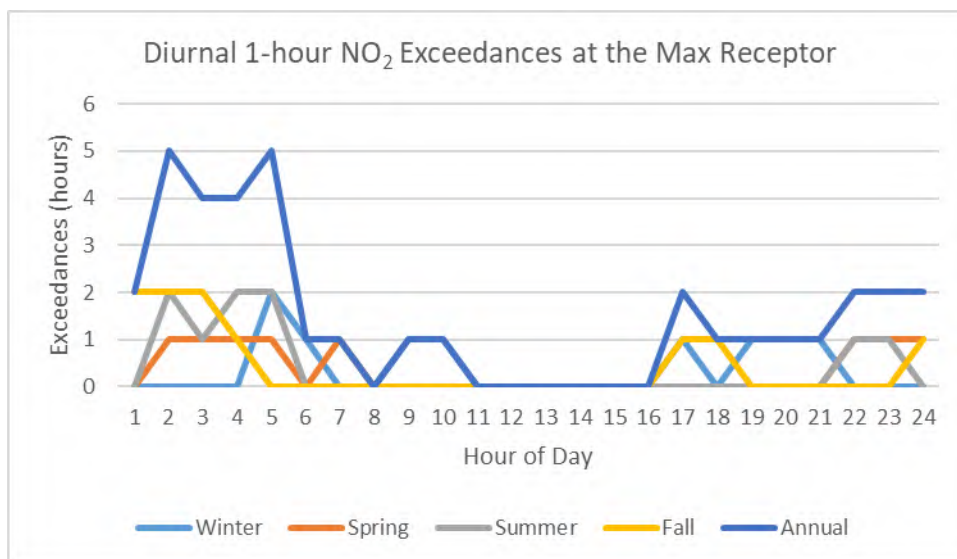


*Figure for Operation Exceedances*

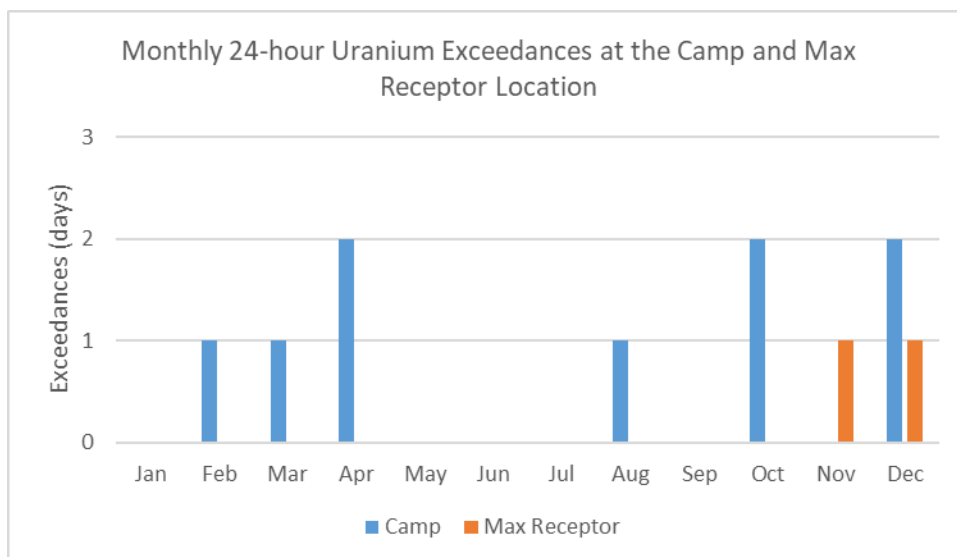
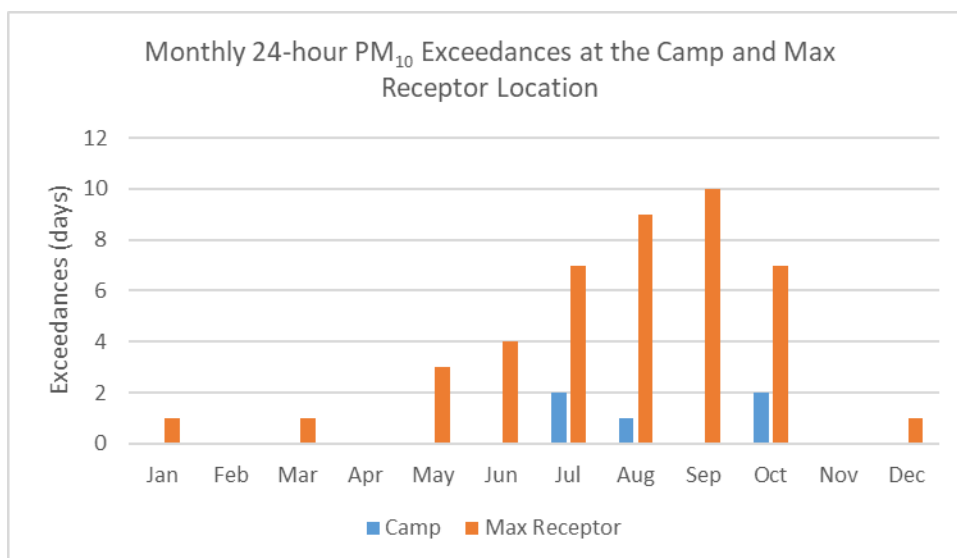
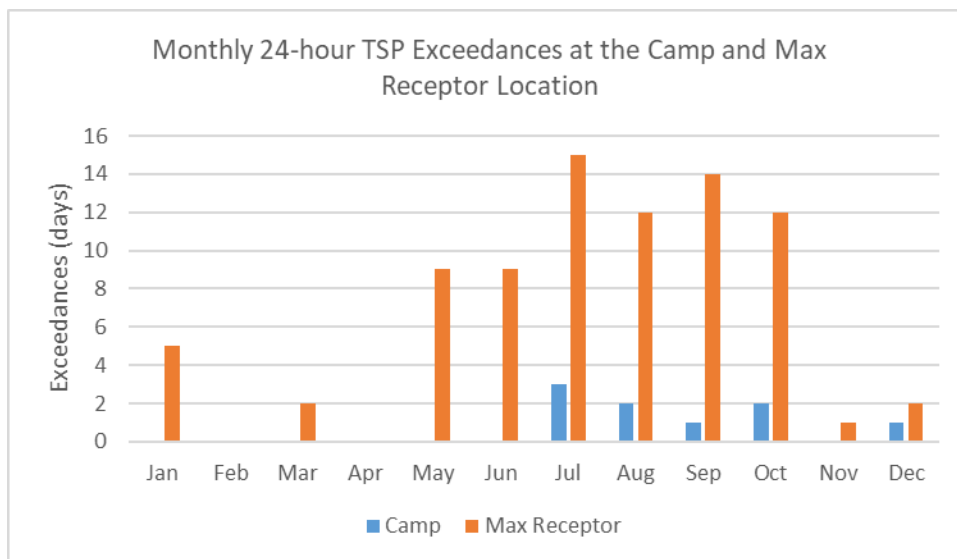




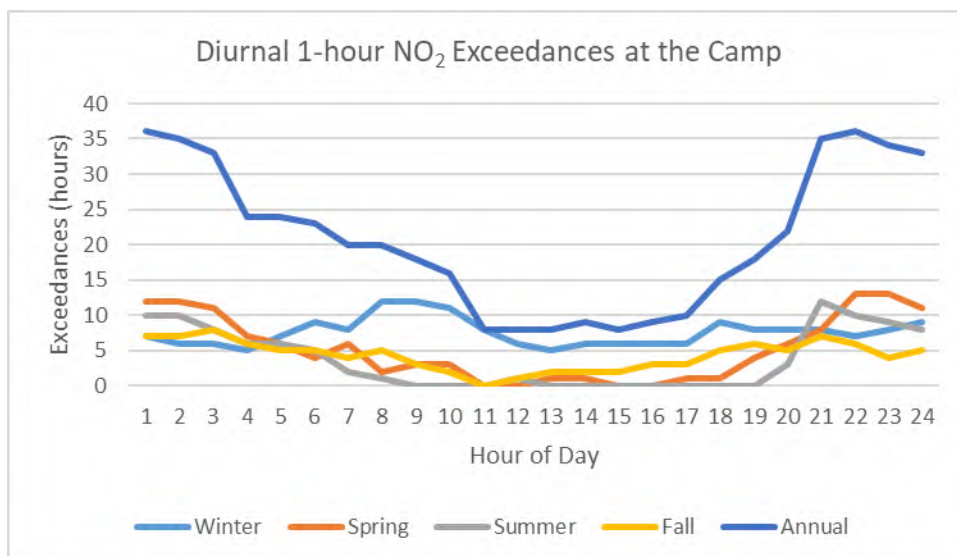
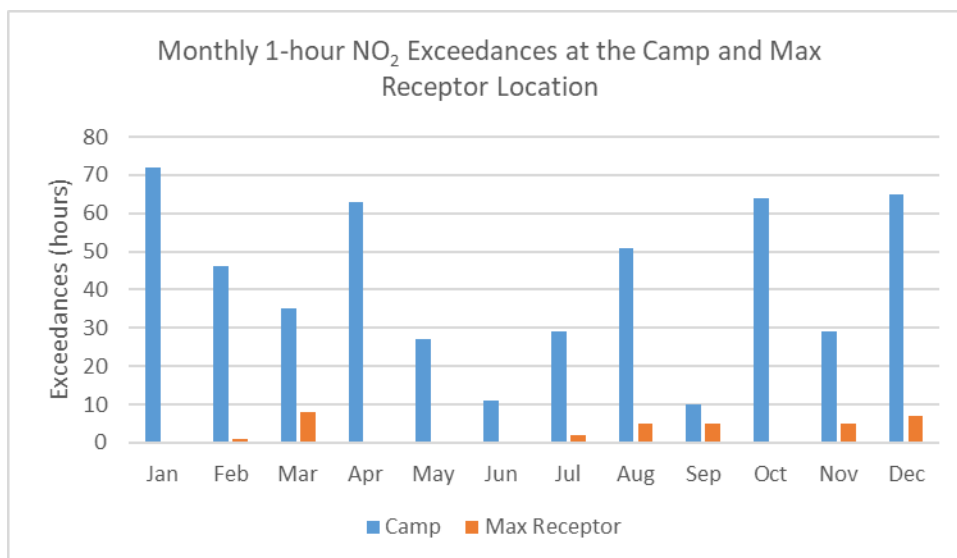
Note: Winter =Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



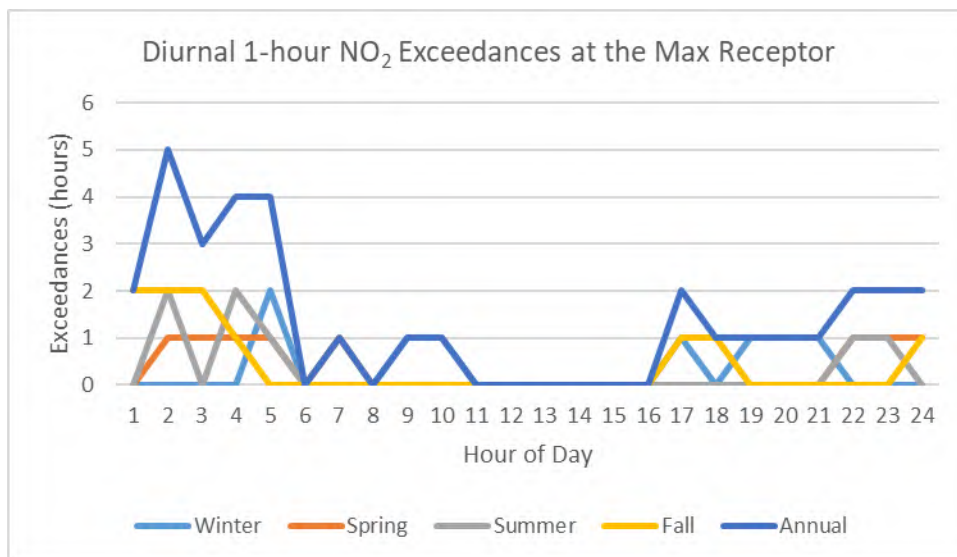
Note: Winter =Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



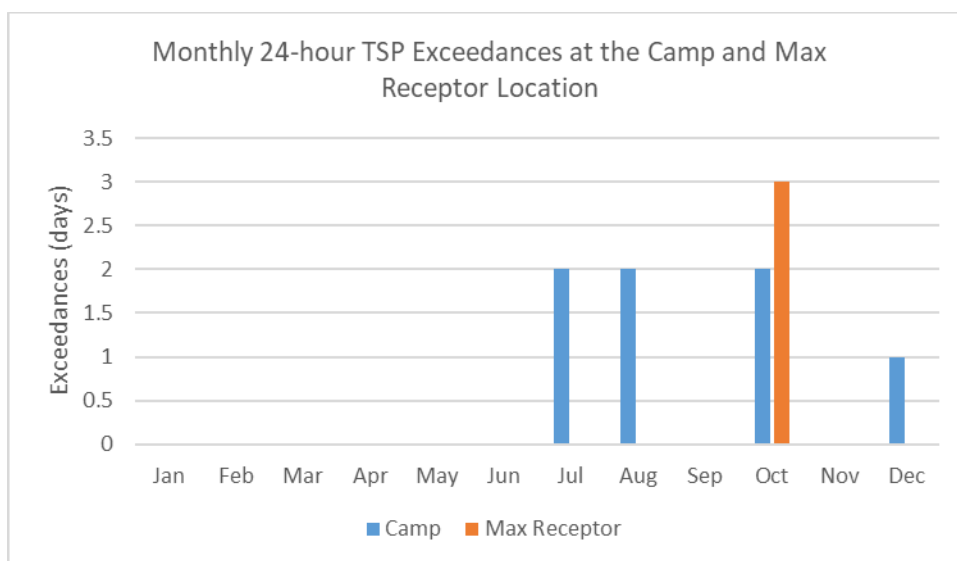
*Figures for Decommissioning Exceedances*



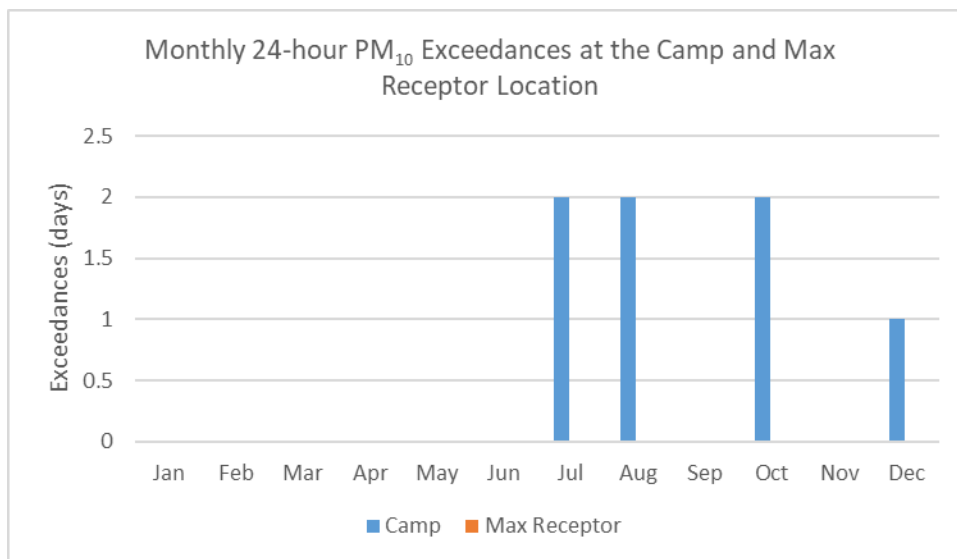
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov







Note: There were no exceedances predicted at the maximum off-property receptor in the Decommissioning Scenario

## Attachment: IR-45

Number	IR-45
Dept.	HC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6 Air Quality Technical Supporting Document Section 6.3.1
Context and Rationale	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p>Context: Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: "concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel". However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p>Rationale: Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p>References:</p> <p>[1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p> <p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>

Information Requirement	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table.[i]
	[i] Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation
	Health Canada, Water and Air Quality Bureau, October 2022
	Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m³ increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \mu\text{g}/\text{m}^3$
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = 1.127$
	$\beta \times 10 \mu\text{g}/\text{m}^3 = \ln 1.127$
	$\beta = (\ln 1.127)/(10 \mu\text{g}/\text{m}^3) \text{ ,}$
	$\beta = 0.01196$
	The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):
	$ALCM = \left[ \frac{(e^{\beta \cdot \text{Exposure}} - 1)}{e^{\beta \cdot \text{Exposure}}} \right] \cdot \text{Baseline rate} \cdot \text{Years}$

ALCM = additional lung cancer mortality cases per 100,000 population
β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))
Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)
Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation
Years = years of project or project phase
Sample calculation:

	Project estimates an exposure from relevant source(s) of 0.067 µg/m3 over 50 years of operation
	$ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$ $ALCM = \left[ \frac{(e^{0.01196 \cdot 0.067} - 1)}{e^{0.01196 \cdot 0.067}} \right] \cdot 45.5 \cdot 50$
	ALCM = 1.8 additional lung cancer mortality cases per 100,000
	<b>References:</b>
	[1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society,
	Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON:
	Canadian Cancer Society; 2021. Available at: <a href="https://cancer.ca/Canadian-Cancer-Statistics-2021-EN">cancer.ca/Canadian-Cancer-Statistics-2021-EN</a>
	[2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer
	from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017
	(2020). <a href="https://doi.org/10.1186/s12889-020-08771-w">https://doi.org/10.1186/s12889-020-08771-w</a>
	[3] Health Canada. Lung cancer and ambient PM2.5 in Canada: a systematic review and meta-analysis.
	[4] Health Canada, 2022. Available online at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a>

Response:

#### **Sources of Diesel Emissions from the Project**

The Project-related atmospheric releases considered in the Environmental Risk Assessment (ERA) in the draft EIS Appendix 10-A were consistent with the air emissions inventory detailed in the Air Quality Assessment (draft EIS Section 6 and Appendix 6-A). The emissions will vary over time based on the schedule of Project activities and the air quality assessment scenarios were developed based on the year with the maximum activity occurring in each Project phase. There are several combustion sources at the site, which would be expected to contribute diesel emissions during the relevant phases of the Project. Combustion sources at the site include:

- diesel generators;
- propane heaters; and
- diesel and gasoline combustion associated with construction equipment and vehicles utilizing the on-site roads.

These combustion sources would contribute particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), NO<sub>x</sub>, SO<sub>2</sub> and CO to the atmospheric environment. Concentrations of these parameters were predicted in the Air Quality TSD

(Appendix 6-A) at several receptor locations within the Local Study Area and were used as surrogates for diesel emissions from the Project. It is important to note that scoping of the air quality assessment followed a conservative approach. For instance, and of relevance to this IR, although Denison expects the site will be powered by the provincial grid during Operations, the air quality assessment conservatively assumed that the back-up diesel generators would run continuously (24/7) during Operation and Decommissioning in order to predict worst-case concentrations and bound the evaluation of Project residual effects.

#### **Assessment of Diesel Emissions in the ERA**

Particulate matter, of which diesel particulate matter would be a subset and in particular a subset of or associated with the PM<sub>2.5</sub> fraction, was assessed in the ERA in Appendix 10-A based upon predicted concentrations at receptor locations as documented in the Air Quality Assessment (EIS Section 6 and Appendix 6-A). As discussed in Section 3.2.1.3.2 of the ERA (Appendix 10-A), predicted concentrations of particulate matter (including TSP and PM<sub>2.5</sub>) during Construction, Operation, and Decommissioning all met their respective annual screening values of 60 µg/m<sup>3</sup> for TSP and 8.8 µg/m<sup>3</sup> for PM<sub>2.5</sub>. Exceedances were predicted for TSP and PM<sub>10</sub> of the 24 hour screening values in all Project Phases, attributable to fugitive dust from earthworks and unpaved roads and not operation of generators. There were, however, no exceedances of the 24 hour screening value for PM<sub>2.5</sub>, the fraction of particulate matter most likely to be associated with diesel emissions.

#### **Assessment of Diesel Emissions using HC New Approach**

The method recommended by HC in this IR was used to calculate the additional lung cancer mortality (ALCM) over the baseline rate from PM<sub>2.5</sub> using the predicted PM<sub>2.5</sub> concentrations presented in the EIS. The same human receptor locations assessed in the ERA (Risk2 through Risk5, Table 3-7 in Appendix 10-A) were considered including the residency times for each receptor type consistent with Table 4-2 in Appendix 10-A, and shown in Table IR45-1 below.

**Table IR45-1: Summary of Human Receptor Locations and Residency Assumptions**

Receptor ID	Receptor Location Description	Receptor Type	Residency Assumption
Risk2	Human Location Trapper	Fisher/Trapper	50% at Risk2, 50% at Risk5
Risk3	Human Location Camp Worker	Camp Worker	50% at Risk3, 50% at Risk5
Risk4	Human Location Seasonal Resident	Seasonal Resident	30% at Risk2, 70% at Risk5

Baseline concentrations for PM<sub>2.5</sub> are 3.1 µg/m<sup>3</sup>. The following equation (Greco et al., 2020) was used to calculate the ALCM.

$$ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$$

Where  $\beta = 0.01196$

Exposure = estimated PM<sub>2.5</sub> exposure concentration with background removed

Baseline rate = 45.5 per 100,000

Years = years of project or project phase (construction = 2 years, operation = 15 years, decommissioning = 5 years)

The exposure concentrations for PM<sub>2.5</sub> were scaled to consider the fraction attributable to diesel sources, consistent with Section 4.0 in Appendix 6-A (Construction = 22.8%, Operation = 26.8%, and Decommissioning = 36.2%). Considering these assumptions, the following table provides the ALCM for each project phase:

**Table IR45-2: Summary of Additional Lung Cancer Mortality Rates at Human Receptor Locations**

Receptor ID	Construction	Operation	Decommissioning
Risk2	0	0	0
Risk3	0	0	0
Risk4	0	0	0

Note: Results are interpreted per 100,000 people.

As shown above, the risks for the general public at Risk2, Risk 3 and Risk4 demonstrate that no additional lung cancer mortality cases are expected per 100,000 population as a result of exposure to diesel particulate matter (using PM<sub>2.5</sub> as a surrogate) due to the Project. Therefore, there is unlikely to be an increased incidence of lung cancer mortality due to exposure to diesel particulate matter generated by the Project activities.

#### **Mitigation measures to limit diesel emissions and exposure**

Various mitigation measures will be implemented to control or reduce the impacts to the atmospheric environment from the Project. These include administrative and physical controls based on best industry practices, as listed below and outlined in the draft EIS Section 6 and Appendix 6-A and in IR responses:

##### **Administrative controls**

- Create and implement a dust management plan, including the application of water and/or chemical suppressant to control fugitive dust, in addition to other operational strategies to assist in dust control;
- Planning vehicle and equipment routes to minimize travel distances, where possible; and
- Employ standard operating procedures and complete regular inspections of equipment machinery to ensure it is in good working order.
- Vehicles and equipment will be equipped with Tier 4 engines where feasible (IR-139).

##### **Physical controls**

- Avoid dust-generating activities (e.g., earthworks, material handling) during dry or high wind conditions;
- Avoid dropping material from height;



- Ensure all exhausts (e.g., mobile equipment, generators) are in good working condition;
- Turn off vehicles and equipment when not being used;
- Minimize or reduce vehicle and equipment speed by enforcing speed limits;
- Apply water at least twice per day to unpaved roads and surfaces; and
- Maintain unpaved road surfaces via grading or other maintenance practices to reduce the amount of silt (i.e., fines) present in the roadbed material.

### Conclusions

Considering PM<sub>2.5</sub> as a surrogate for diesel particulate matter, the modelled concentrations of PM<sub>2.5</sub> are not expected to result in any additional lung cancer mortality cases per 100,000 at the receptor locations that are relevant for members of the public (i.e., hunters, trappers, fishers, recreational users, seasonal residents) and the camp worker. The overall risk is expected to be negligible; however, monitoring of particulate matter will be carried out throughout the Project and compared to risk-based criteria. Therefore, no further Project controls beyond those identified are proposed for the protection of human health due to diesel particulate matter.

### References

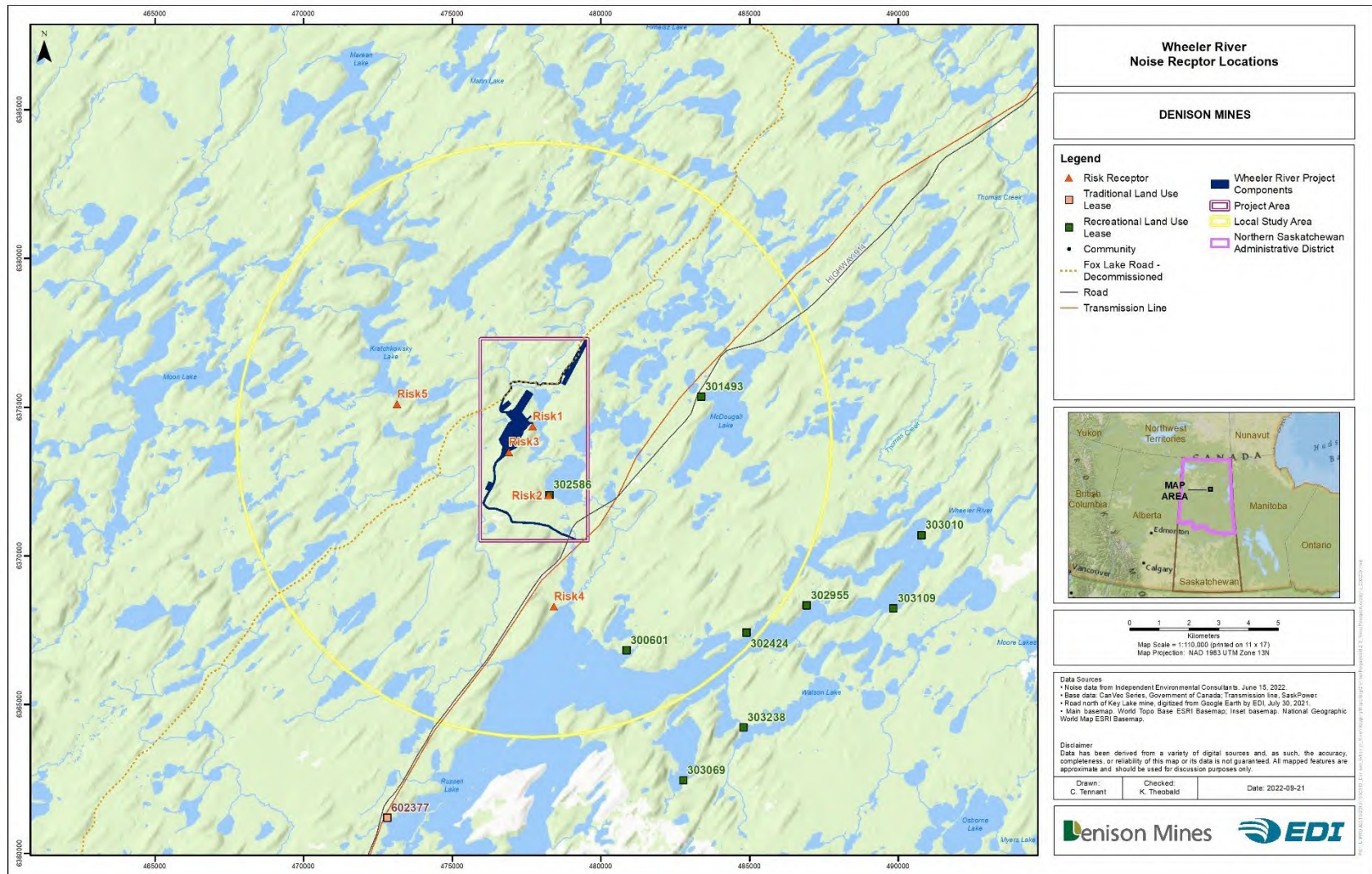
CCME (Canadian Council of Ministers of the Environment). 2023. Canadian Ambient Air Quality Standards. Last accessed online 2023/06/27 from <https://ccme.ca/en/air-quality-report>.

Greco, S.L., MacIntyre, E., Young, S. et al. 2020. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017

## Attachment: IR-48

Number	IR-48
Dept.	HC
Project effects link	Physical stressors (noise and vibration)
Reference to EIS, appendices, or supporting documentation	Appendix 6-E, Figure 6.2.3, p. 6-57
Context and Rationale	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p>Context: Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p>Rationale: The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>
Information Requirement	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.

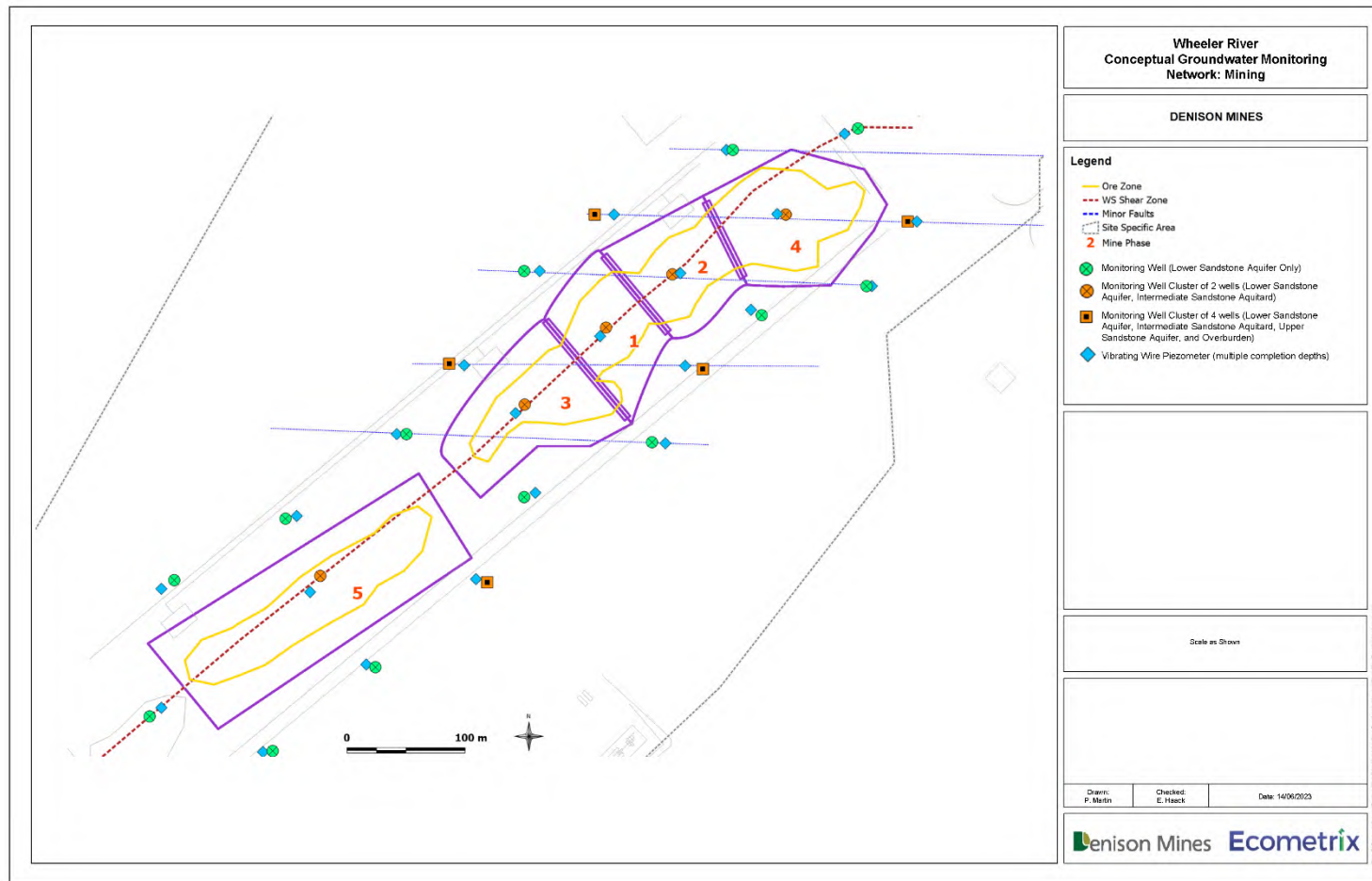
Supporting figure to the response provided in IR table:



## Attachment: IR-51

Number	IR-51
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Section 7, Figure 7.8-1  Appendix 7-C
Context and Rationale	<p><b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.</p> <p><b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?</p>
Information Requirement	<p>Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).</p> <p>Please clarify how the establishment of a continuous freeze wall will be monitored.</p>

Supporting figure to the response provided in table:



## Attachment: IR-57

Number	IR-57
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.3.3.2 Appendix 7-A, Sections 3.1.2 and 3.7, Appendix 7-C, section 2.5.2
Context and Rationale	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>
Information Requirement	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).

### **Response:**

Vertical gradients are presented in Table 3-5, Section 3.7 of Appendix 7-A, while Table 3-1 presents water levels observed at individual groundwater monitoring wells. Discussion of



vertical gradients is limited to groups of wells which are close together (e.g., GWR-036 and GWR-037 which are approximately 10 m apart) rather than clusters of wells which are further apart (e.g., the upgradient cluster, where wells are approximately 400 m apart).

Vertical gradients are implicitly calculated as water levels from all observation wells are incorporated as calibration targets using their coordinates in 3D space. Recognizing that all water level observations are subject to human error, and as such values that are very close to one another (e.g., as observed at GWR-008 and GWR-009) are treated as essentially the same value.

As requested, the table below presents observed and simulated vertical gradients at the well clusters presented in Table 3-1, Appendix 7-A. Observed static water levels are presented as there were issues with the barometric pressure correction for transient water levels.

Cluster	Well	Unit	Observed Water Level (static)	Simulated Water Level	Screen mid-point Elevation	Observed Gradient	Simulated Gradient	Notes
<b>NW</b>	GWR-003	OVB	503.97	503.87	467.8			
	GWR-027	ISA	500.91	501.00	246.3	0.0065	0.0061	
	GWR-025	LSA	502.34	502.40	146.3	-0.0058	-0.0057	
<b>SE</b>	GWR-007	OVB	514.12	503.48	515.2			perched aquifer at GWR-007 impacts gradient calculation
	GWR-009	ISA	502.20	502.57	285.5	0.0231	0.0018	
	GWR-008	LSA	502.40	502.37	166.2	-0.0007	0.0007	
<b>Up-gradient</b>	GWR-006	OVB	514.70	515.81	504.75			
	GWR-028	ISA	511.00	510.40	241	0.0073	0.0107	
	GWR-029	LSA	514.80	515.07	172.25	-0.0158	-0.0194	
<b>Down-gradient</b>	GWR-005	OVB	501.99	500.94	382.55			
	GWR-014	ISA	501.60	501.21	348.05	0.0010	-0.0007	
	GWR-012	LSA	501.27	501.40	166.5	0.0009	-0.0005	

As indicated in this table, the model provides an excellent representation of the observed gradients estimated using these monitoring well clusters.

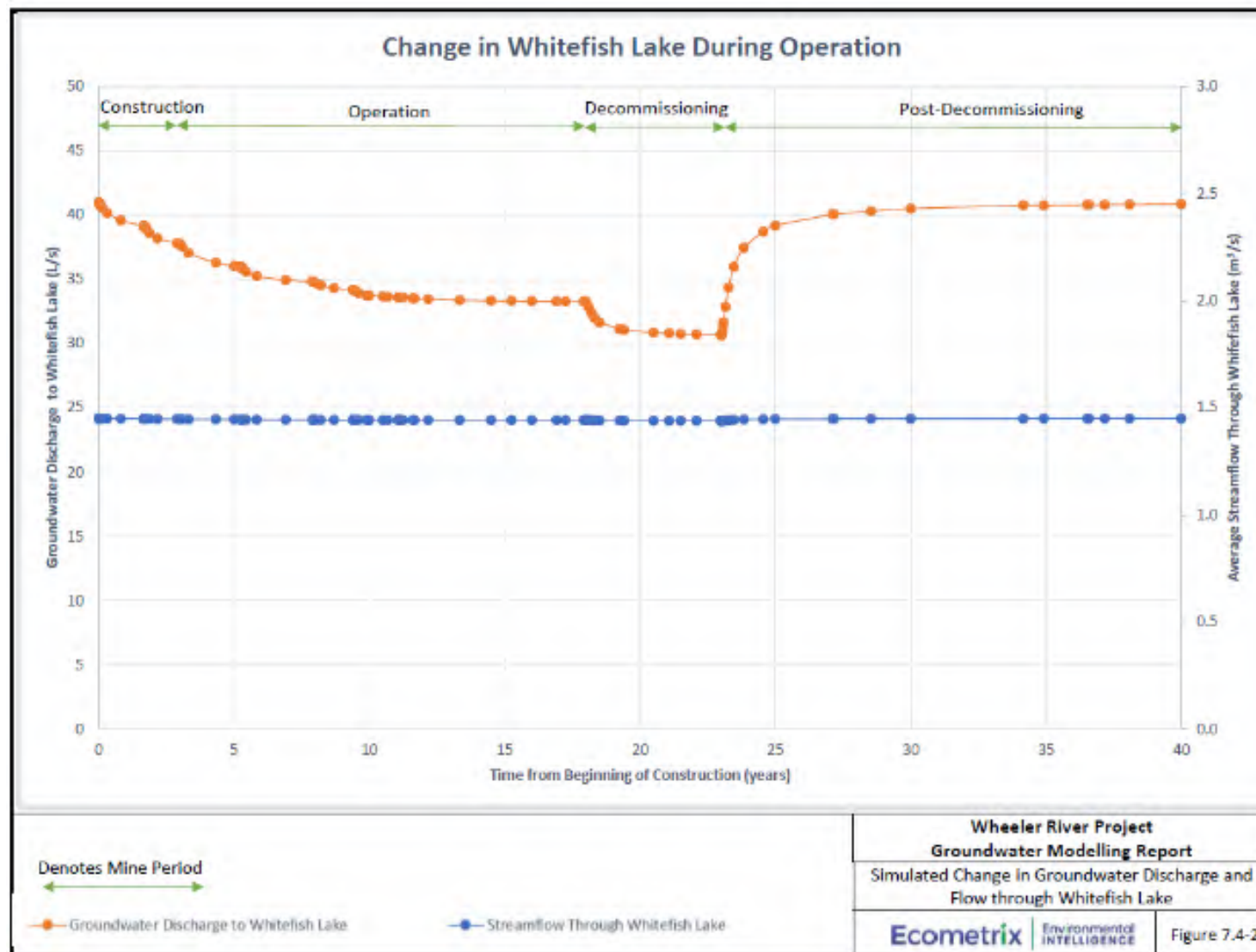
- At the northwest (NW) cluster, the observed and simulated gradients are virtually identical.
- At the southeast (SE) cluster, the gradient from the shallow overburden (OVB) to the intermediate sandstone aquitard (ISA) is under-estimated in the model, however the water level at GWR-007 is believed to be perched above the regional water table, and therefore not a good representation of vertical gradients; regardless both the model and observed data indicate a downward vertical gradient. The gradient between the ISA and the lower sandstone aquifer (LSA) is negligible, which is replicated by the model.
- At the up-gradient cluster, the observed are very well represented by the simulated gradients, including the flow directions.

- At the down-gradient cluster, the gradient between the ISA and the LSA is negligible, which is replicated by the model. The gradient between the OVB and ISA is observed to be downward but given the location of GWR-005 at the shore of Whitefish Lake, the natural hydraulic gradient is expected to generally be upward, as simulated.

## Attachment: IR-59

Number	IR-59
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)
Context and Rationale	<p><b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.</p> <p><b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.</p>
Information Requirement	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.

Supporting figure to the response provided in table:



## Attachment: IR-63

Number	IR-63
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning; Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations
Context and Rationale	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>
Information Requirement	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.

### Response:

The impact of the freeze wall on the local and semi-regional groundwater flow regimes is minor. The footprint of the freeze walled area represents < 0.04% of the area of the regional groundwater flow model, and as such the freeze walled area is a relatively small disruption to the regional groundwater flow system.

The effect of the freeze wall was simulated using the regional groundwater flow model, with results shown below. Hydraulic conductivity of the freeze wall was simulated as a reduction of the baseline hydraulic conductivity by four (4) orders of magnitude, which was consistent with expected hydraulic conductivity changes as reported by

Newmans (2020). The recharge reduction on top of the ore zone was estimated at 50% of the pre-development recharge based on the expected regrading and surface drainage at the site to accommodate all of the surficial operations. The simulated effect of the active freeze walls is illustrated through Figures 1 and 2, which illustrate the change in groundwater flow paths resulting from the freeze wall and operational groundwater pumping.

Figure 1 illustrates the pre-mining (and pre-pumping) groundwater flow paths toward Whitefish Lake. The particle traces shown were released at Whitefish Lake and tracked backward in time / space to their recharge area. The provide an understanding of the west-east groundwater flow toward Whitefish Lake, with local recharge creating the driving force for that groundwater flow. On this figure, the groundwater level contours are shown in black, while the flowlines (particle traces) are shown in blue. Note the flowlines closest to the pumping wells (red circles) and the ore body (light brown outline). The colours in the background reflect the shallow hydraulic conductivity zones, which help to explain inflections in the hydraulic head contours and flowlines.

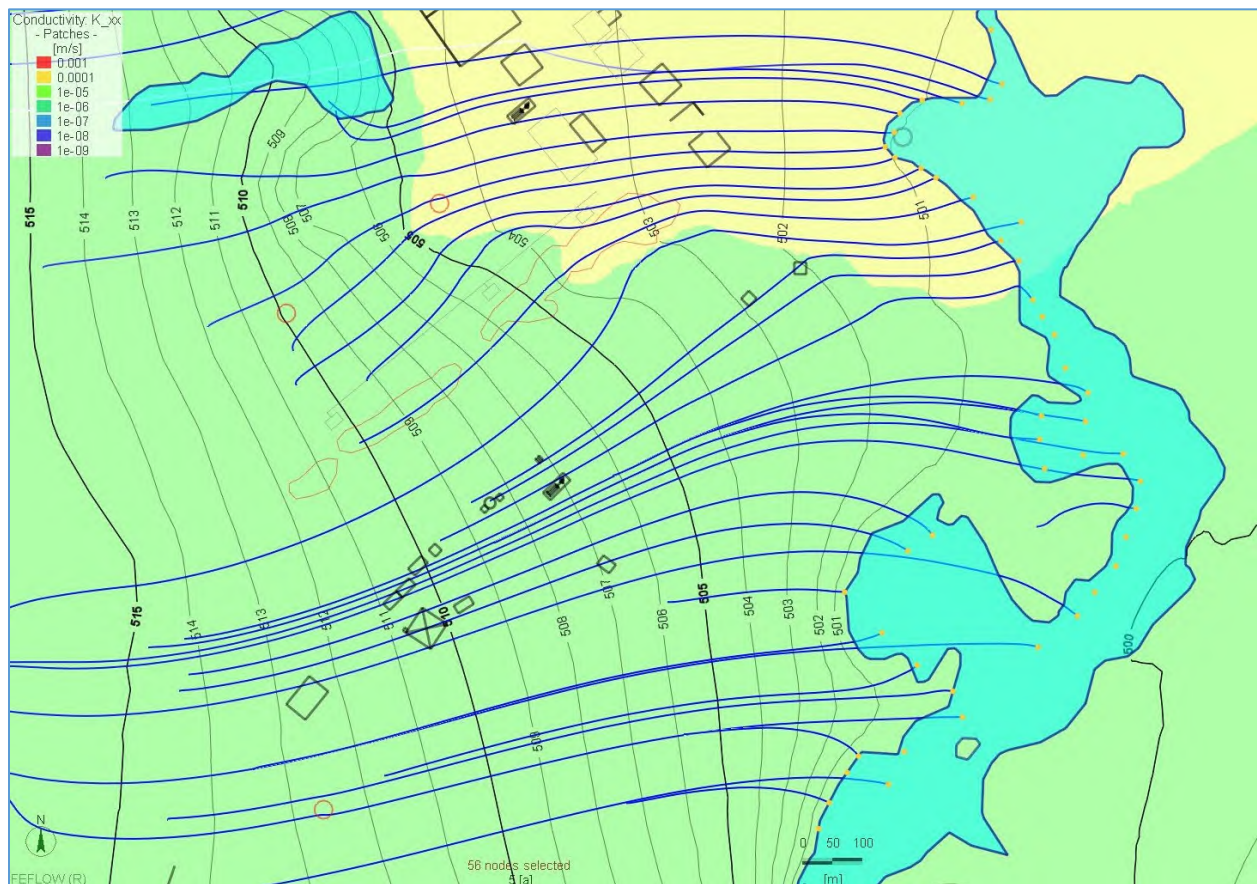


Figure 1: Groundwater Flow Paths Pre-Mining

Figure 2 illustrates the same groundwater flow paths toward Whitefish Lake during mining operations, while pumping was occurring (at red circles) and the freeze walls for phases 1 through 5 are in place. From this figure, the effect of the freeze walls can be seen to be limited to the immediate area around the freeze walls. The addition of the freeze walls creates a cluster of water level contours consistent with the freeze wall locations, representing the change in water levels between the area inside and outside of the freeze wall. Note that the water levels outside the freeze wall are simulated to be relatively unchanged during freeze wall operations.



Also evident on this figure are the water level drawdown contours, which deflect around the pumping wells (3 red circles). Note the additional level of drawdown experienced at wells simulated to pump from the lower hydraulic conductivity zone (i.e., green area, as opposed to the yellow area).

The flowlines in Figure 2 indicate how the groundwater flow patterns will change due to the addition of the freeze wall and the onsite pumping. Flowlines are noted to travel around the freeze wall and in between the pumping wells to discharge at the lake. The pumping wells will capture water flowing from the west which would otherwise discharge to Whitefish Lake.

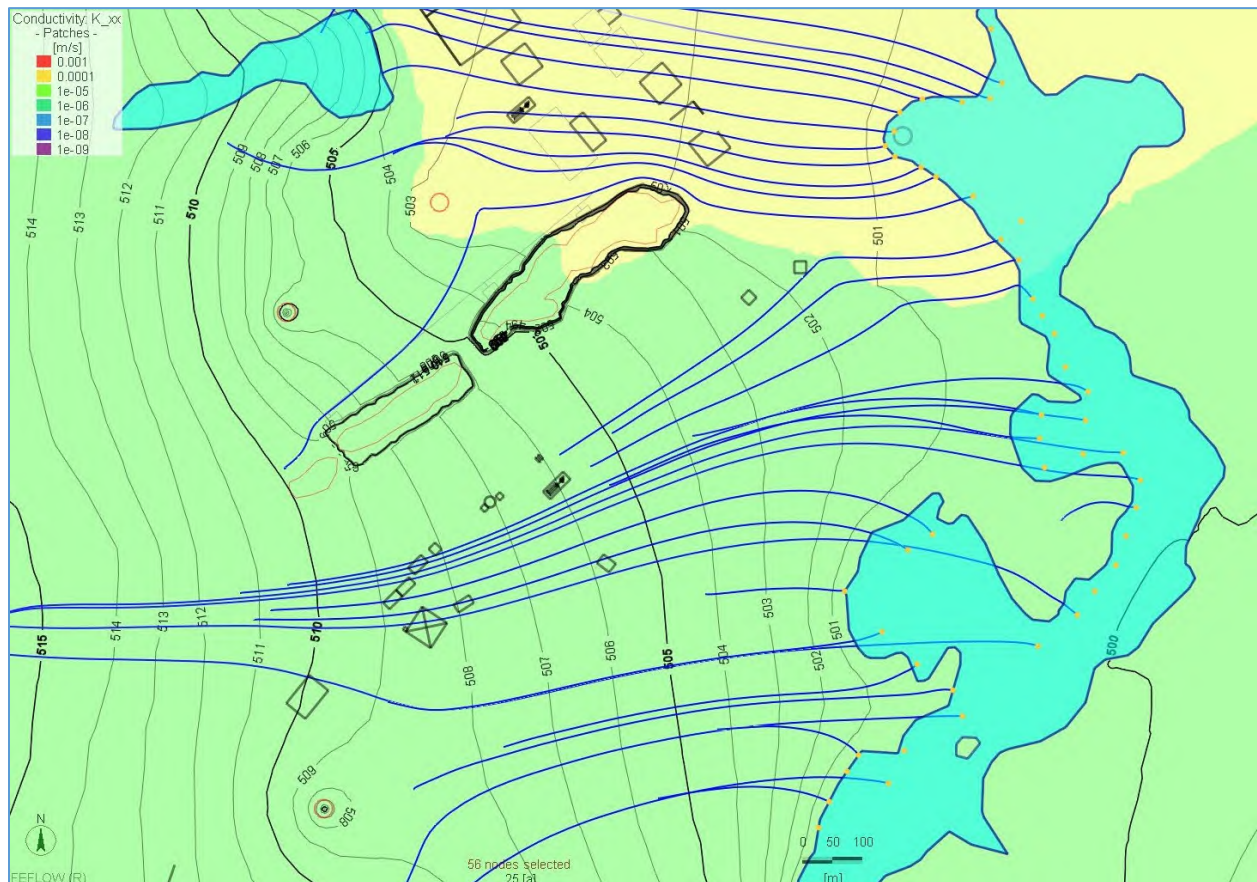


Figure 2: Groundwater Flow Paths During-Mining

Post mining, the groundwater flow path patterns would return to a condition similar to that simulated for pre-mining.

## References

Newmans Geotechnique Inc. (2020). Wheeler River In-Situ Leach Surface Freezing Option Pre-Feasibility. Report to Denison Mines Ltd. August 2020.

## Attachment: IR-68, IR-94, IR-97

Number	IR-68
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3 Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7
Context and Rationale	Context: Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone. Rationale: In NRCAN's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCAN notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCAN's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.
Information Requirement	NRCAN requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.

Number	IR-94
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated
Context and Rationale	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H<sup>+</sup> sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining</p>

	area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.
Information Requirement	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.

Number	IR-97
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b
Context and Rationale	<p>Context: Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.</p> <p>It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.</p> <p>Rationale: The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain and clarify if mining operations will mobilize contaminants beyond operations?</li> <li>2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?</li> <li>3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.</li> </ol>

#### **Response IR-68, IR-94 and Questions 1-3 for IR-97:**

In general, the ISR mining process will be sufficiently aggressive, chemically and through permeability enhancement, to access and remove most dissolvable mineral phases within the ore deposit during the mining operation. Metallurgical testing indicates that the mineralogy of the ore zone post-remediation (see IR-67 response) is made up of clay minerals, unreacted sulfide minerals (including pyrite, galena and chalcopyrite) and a small number of secondary mineral phases, discussed further below.

The decision made in the EIS to model geochemical reactive transport of the restored solution in the pore water of the mining zone post-remediation (i.e., initial conditions) and not a long-term contributions of COPCs from the ore zone for the following reasons:

- Uraninite that is not accessible to the mining process will represent residuals in very low permeability zones that will, likewise, have limited contact with groundwater in the future.

- As was discussed in the draft EIS (page 3.30 of Appendix 7-C), groundwater from the Athabasca sandstone that will flow through the ore zone following removal of the freeze wall will not be oxidizing (groundwater is anoxic and free of oxidants (e.g., O<sub>2</sub>, Fe<sup>3+</sup>), and thus, further oxidative dissolution of the reduced, low-solubility uraninite and sulphide minerals is not expected.
- Diffusion of UBS (containing U, Se and other COPCs), and lixiviant into the rock matrix may occur. However, the process of diffusion into the matrix will be limited over the relatively short timespan of mining in each zone (<10 years). Back-diffusion from the matrix of COPCs will be a slow process and will have a low mass flux rate.

The use of initial conditions in the model continues to be considered as sufficiently bounding for evaluation of potential effects in the EIS.

#### Secondary Minerals – Response to IR-68

The metallurgical testing to date suggests that secondary minerals may form in the ore zone during the operation, including jarosite (KFe<sub>3</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>6</sub>), gypsum (CaCO<sub>3</sub>•2H<sub>2</sub>O), barite (BaSO<sub>4</sub>; which could be Ra-bearing) and anglesite (PbSO<sub>4</sub>), with XRD evidence for these mineral phases in metallurgical testing at the end of the leaching period, and being flushed out of the mining areas as particulates in the UBS (see details in response to IR-67). Jarosite, gypsum and barite, however, were not identified in a QEMSCAN quantitative analysis on similar materials in the 2022 column leach tests that were designed to inform the understanding of mineralogy and solution composition in the mining area with remediation. Anglesite was present in quantifiable concentrations as mineral phase in the solid-phase residuals of those column tests.

Dissolution of anglesite has the potential to be a longer-term source of Pb from the ore zone, post-decommissioning. Testwork is ongoing to refine understanding of expected concentrations and distribution of Pb phases – meaning anglesite and galena – post-mining and post-remediation. Information from that test work will then be used to direct testing and monitoring during the operational phases.

Beyond the bounding scenario presented in the EIS, additional modelling of a Pb source over the long-term is not considered warranted at this time, for the following reasons:

1. Pb has a high affinity to sorb to clay minerals and iron oxide phases along the transport path. The assimilative capacity of the system, as modelled, will mitigate against maximum Pb concentrations at Whitefish Lake above those modelled in the EIS scenario.
2. Without further understanding of the reactivity of the anglesite – meaning, kinetic factors that may affect dissolution to solubility limits, modelling anglesite dissolution to thermodynamic equilibrium is expected to be overly conservative.
3. Mineral phases in the ore zone, including clay minerals and Fe oxides have the potential to sorb Pb mobilized from anglesite dissolution. Ongoing analysis of the results of the metallurgical testing and further test work will support refinement of that sorptive capacity and understanding of the potential for a long-term source of Pb from the remediated ore zone.

## Attachment: IR-80

Number	IR-80
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	Context: This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model. Rationale: The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO <sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO <sub>3</sub> or Ca-SO <sub>4</sub> /Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.
Information Requirement	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.

### Response to #1

Figure 26 of the draft EIS was presented as two panels (panel “a” and panel “b”) in Appendix 7-A to the EIS. To support visual clarity and additional interpretation, Figure 26 has been split into two figures:

Figure 26: Hydrochemical Type: Groundwaters for the Wheeler River Project

Figure 27: Hydrochemical Type: Groundwaters for the Wheeler River, Cigar Lake and Millennium Projects

The figure numbering in Appendix 7-A of the draft EIS will be updated accordingly.

The revised Figures 26 and 27 are provided below. The figures have been updated to include visual support on the Piper plots to the interpretations of groundwater chemistry that are detailed in Section 4.3.3 of Appendix 7-A of the EIS. In addition, the text in Section 4.3.3. of Appendix 7-A of the ESI will be updated to provide additional clarity on the interpretations shown in the Piper plots. The new text is provided herebelow with additions shown in blue. .

On page 4-21... The Lower Sandstone Aquifer is characterized by two distinct hydrochemical types. The first is groundwater with low mineralization. The second groundwater type is much more highly

mineralized water that has Cl<sup>-</sup> as a dominant anion. The distinct nature of the two groundwater types is shown in Figure 25 through comparison of Stiff diagrams for GWR-029 and GWR-012. The mineralization at GWR-012 is much higher than that at GWR-029, and Cl<sup>-</sup>, versus HCO<sub>3</sub><sup>-</sup>, is the dominant anion. The mineralization and groundwater major ion composition of GWR-029 is much more similar to overburden well GWR-006 (shown in Figure 24) than to GWR-012. In the Piper plot shown in Figure 26, the distinct geochemical types are evidenced by:

- clustering of groundwater for 3 wells in the Lower Sandstone aquifer with samples from the Intermediate Sandstone Aquitard and local groundwater flow system. This hydrochemical type (dominantly in the Ca/Mg-HCO<sub>3</sub> quadrant of the central diamond of the Piper Plot) is shown within the purple circle; versus
- the other three wells from Lower Sandstone Aquifer, that show a higher relative dominance of Cl<sup>-</sup> as an anion. This shifts the hydrochemical type of the groundwater to the upper portion of the central diamond in the Piper plot, as shown by the purple arrows in Figures 26. This represents the contribution of leaching of halide salts into the groundwater as it moves along the flow path.

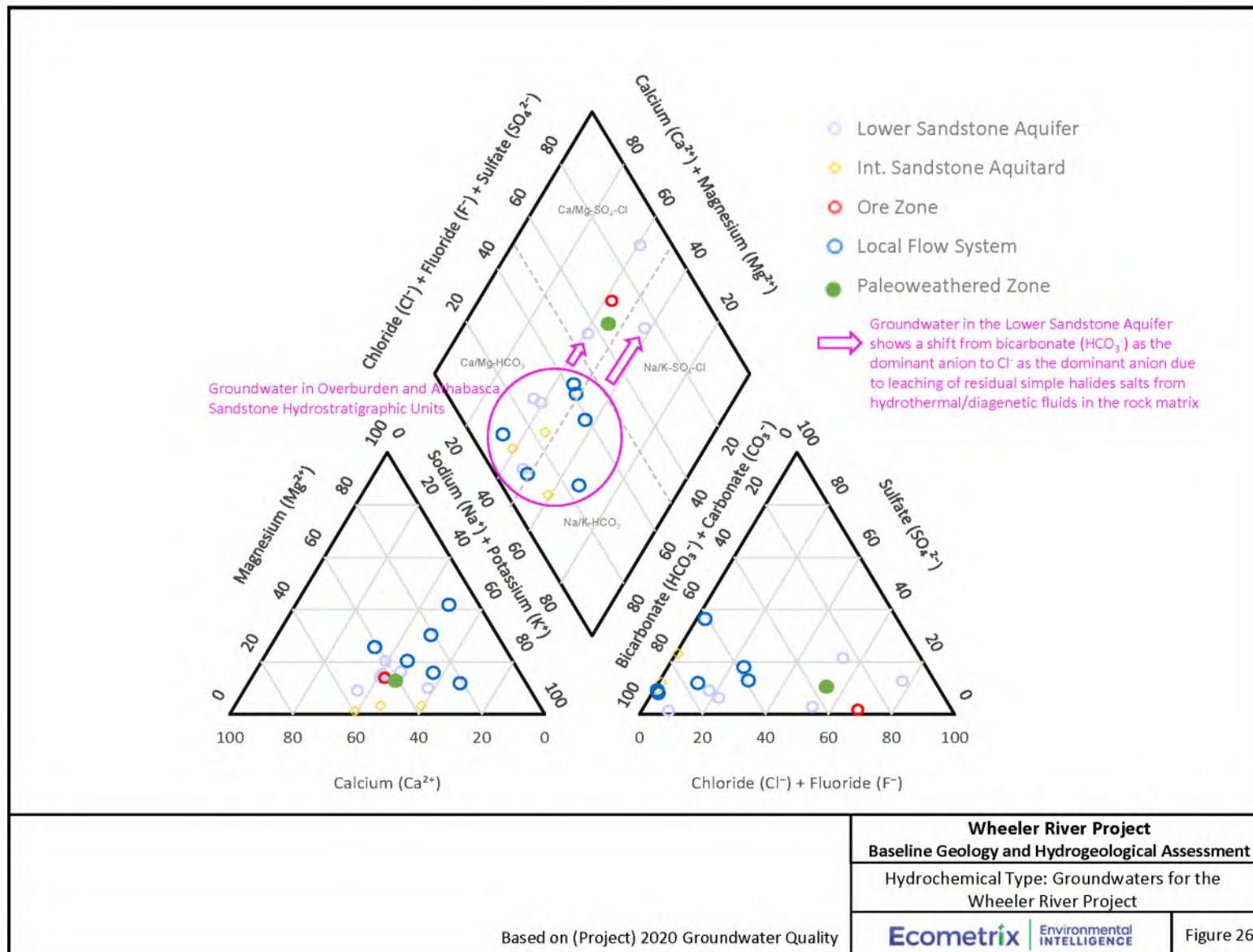
These same two distinct hydrochemical types were also observed in the MFa at Cigar Lake.

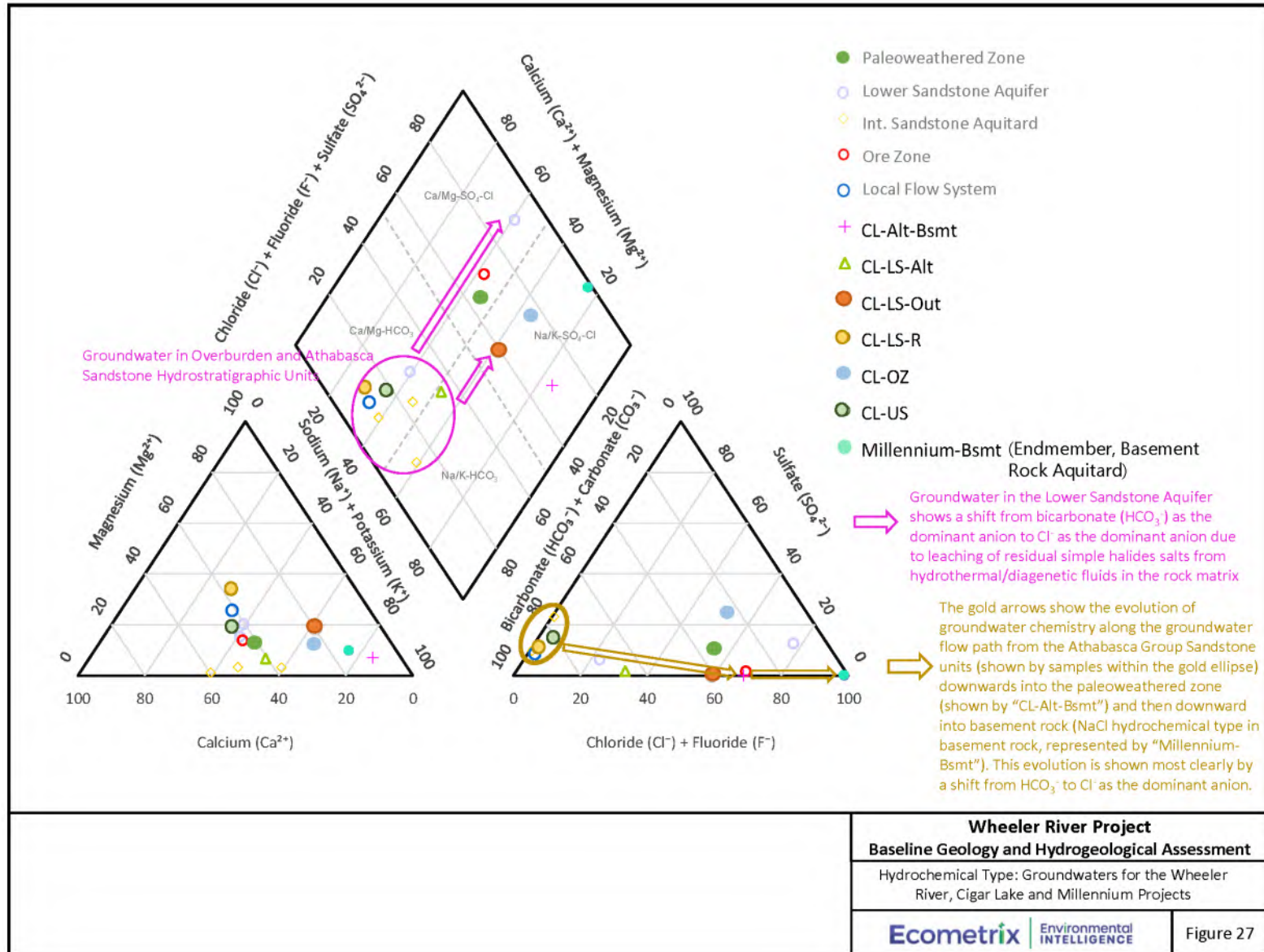
**On page 4.18 - 4.19....** The higher mineralization groundwater with Cl<sup>-</sup> as the dominant anion was observed at Cigar Lake in groundwater collected from a monitoring well located within the zone of thermal alteration and in the inferred downgradient direction of the ore zone. This sample is shown in Figure 27 as “CL-LS-Out” and is of Na-Cl-HCO<sub>3</sub> type. The reasons for the hydrochemical type observed in that monitoring well, and specifically for the source of chloride to the water, was evaluated in some detail in the Cigar Lake studies. One possible explanation explored was that the groundwater reflected mixing of groundwater in the MFa with groundwater from the basement rock. Groundwater in the basement rock is known to be of Na-Cl type, and this is shown in Figure 27 by samples collected from monitoring wells installed in the Basement at Millennium (“Millennium-Bsmt”). This sample represents one endmember hydrochemical type for the basement rock of Na-Cl type. However, the potential for the relatively elevated chloride proportion of anions in groundwater in the MFa to be a result of mixing with groundwater from the basement rocks was ruled out at Cigar Lake as groundwater flow conditions in the MFa were identified as dominantly horizontal, with a component of downward flow to the altered basement.

**On page 4.21...** The paleoweathered zone was sampled at Cigar Lake; analytical results are provided in Appendix J, as samples 199B and 199D. Sample 199D has been referred to in Figure 27 as “CL-Alt-Bsmt”. The hydrochemical type of the Cigar Lake paleoweathered zone is Na-Cl-HCO<sub>3</sub> and of GWR-031 for the Phoenix deposit is a more mixed hydrochemical type (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>). In the Cigar Lake study, the hydrochemistry of the sample in the paleoweathered zone was explained by recharge of the basement waters from the overlying flow regime in the Lower Athabasca Sandstones. Evolution of the groundwater chemistry in the paleoweathered zone is aligned with this flow path. The groundwater quality in the paleoweathered zone represents an intermediate along the hydrochemical evolution of groundwater from the hydrochemical type of the Athabasca Group Sandstone hydrogeological units (Ca-Na-HCO<sub>3</sub> to Na-Ca-HCO<sub>3</sub> type) to one endmember in basement rock (NaCl type). This evolution is a result of water-rock interactions within basement aquitard (including the paleoweathered zone) and is



most clearly visualized in the Piper plot by shifts in relative abundance of anions, shown with gold arrows in Figure 27. The difference in hydrochemical types between groundwater from the paleoweathered zone at Cigar Lake (Na-Cl-HCO<sub>3</sub> type) and associated with the Phoenix deposit (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>) is likely due to the screened interval of the well, which spans the ore zone, and the paleoweathered zone (Appendix A). Groundwater chemistry in GWR-031 is likely influenced by the hydrochemistry of the ore zone.





## Attachment: IR-81

Number	IR-81
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”. Rationale: Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations <15 Bq/L for the 2020 sample, and 0.1 or <0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.
Information Requirement	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., $\delta^2\text{H}$ , $\delta^{18}\text{O}$ ) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.

### Response:

#### **$\delta^2\text{H}$ , $\delta^{18}\text{O}$ Isotopes in Groundwater**

Analysis of  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  Isotopes in groundwater was not performed for the Wheeler River Project baseline work at Ecometrix’s recommendation. Based on our review of the sampling and analysis of isotope data from neighbouring sites, our interpretation was that similar additional sampling at the Wheeler River Project would not add sufficient value. Other projects in the region including Cigar Lake (AECL, 1994) and Millenium (Devine, 2016) analyzed  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  isotopes in groundwater. At Cigar Lake, stable isotopes of water were measured in all Athabasca Group Sandstone units (“upper”, “lower”, “altered sandstone”), the ore zone, and the altered basement. The results were (quoted from AECL, 1994):

- “The waters from the glacial overburden all plot on or near the Cigar Lake meteoric water line...indicating their meteoric origin”;

- “deep groundwaters also plot entirely within the envelope, suggesting that the variations in the isotopic signatures observed for the groundwaters result entirely from variation in meteoric water compositions. The simplest explanation for these isotopic trends is that they reflect (moving) averaged meteoric water compositions of the Cigar Lake area”; and
- “[W]aters from the three [groundwater flow] regimes [in the Athabasca Sandstone group units], basement and mineralization have similar low temperature meteoric  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  values”

Devine, 2016 analyzed stable isotopes in groundwater for shallow groundwater (of depth < 50 m; groundwater in overburden and upper MFD) at the Millenium and McArthur River Projects. It was concluded that “Oxygen and H isotope compositions reveal that the groundwater sampled was meteoric water and has the same  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  as Saskatoon precipitation”.

The potential for analysis of stable isotopes in groundwater to add value to the development of the CSM for the Pheonix project was, as such, considered low.

### **Tritium in Groundwater**

The potential for tritium to support development of the CSM for the Wheeler River program was evaluated using the available information. The conclusion was that, beyond alignment between some samples in the overburden and the upper sandstone aquifer, tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface at the Site. The reasons for this, and information supporting that conclusion are presented below.

Two tables have been presented in this IR to support the discussion below.

- a) Table IR-81-1: Provides tritium concentrations in precipitation over time since the 1950s. The source of the tritium data for Canadian locations, including Churchill, Fort Smith and Ottawa, was from the International Atomic Energy Agency Global Network of Isotopes in Precipitation database (GNIP; <https://nucleus.iaea.org/wiser>). Tritium concentrations over time due to radioactive decay were calculated for examination against tritium concentrations in groundwater concentrations for the Wheeler River Project.
- b) Table IR-87-2: Provides tritium concentrations measured in groundwater under baseline conditions for the Wheeler River Project. The tritium concentrations highlighted in yellow/orange were analyzed at the André E. Lalonde AMS Laboratory, University of Ottawa. The detection limit of < 15 Bq/L at the Saskatchewan Research council does not support interpretation of tritium concentrations with respect to groundwater flow conditions, considering the discussion below. The detection limit at the University of Ottawa is 0.8 TU (0.095 Bq/L). Tritium values measured in groundwater samples in 2021 at the University of Ottawa were examined further in the context of ageing groundwater for the Project.

Tritium concentrations in groundwater measured for the Wheeler River Project must consider several factors. These include:

- a) Tritium concentrations in groundwater can be used to identify recharge to mostly granular aquifers in the last approximately 68-70 years, since the early 1950s (Cherry et al., 2004); water recharged prior to that time will have tritium values below analytical detection limits. This is

shown in Table IR-81-1, where groundwater recharged prior to 1952, extrapolated out more than 60 years, has tritium values that are below the analytical detection limit of 0.1 Bq/L.

- b) Maximum tritium concentrations in the precipitation, associated with “bomb tritium” were observed in the early 1960s. At the present time, tritium concentrations in groundwater recharged at that time would be in the range of 14 Bq/L to 53 Bq/L. Values this high were not observed in groundwater at the Wheeler River Project in 2021, and only in one instance in 2020, which is discussed further below.
- c) Tritium concentrations in precipitation have stabilized from historically high “bomb tritium” values to values of approximately 9-25 Tritium Units (TU), equivalent to 1.1 – 3.0 Bq/L, in the last approximately 20 years (as noted by the CNSC review).
- d) Tritium concentrations may reflect the influence of drilling fluids, which is generally other groundwater from the site.
- e) Tritium is produced within the uranium ore deposits of the Athabasca region; this is evidenced by tritium concentrations at GWR-032 (Table IR-87-1) that were measured to be 950 Bq/L (2020) and 1800 Bq/L (2021) and are higher than can be explained by “bomb tritium” (Table IR-87-3). Tritium production in the ore zone is primarily by neutron capture by <sup>6</sup>Li (AECL, 1994). The groundwater sample from the paleoweathered zone (GWR-031; 910 Bq/L) are also considered to be reflecting tritium generation associated with the deposit.

It is our opinion, based on the above considerations and the discussion that follows, that measurement and analysis of tritium data at the Wheeler River Project is limited in value to conceptual model development, and the current data suggests it raises more questions than can be answered. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.



Table IR-81-2: Calculated Tritium Concentrations in Groundwater based on time period of recharge

Time Periods of Interest for recharge	Tritium concentrations in precipitation		Half-Lives of Tritium				
			1	2	3	4	5
			Years Elapsed				
			12.3	24.6	36.9	49.2	61.5
	TU	Bq/L <sup>a</sup>	Tritium concentration measured in Groundwater (Bq/L) <sup>b,c</sup>				
Recharged Prior to 1952 (Clark and Fritz, 1997)	8.2E+00	9.8E-01	4.9E-01	2.4E-01	1.2E-01	6.1E-02	3.1E-02
1953, annual average, Ottawa	2.7E+01	3.3E+00	1.6E+00	8.1E-01	4.1E-01	2.0E-01	1.0E-01
1956, annual average, Ottawa	1.5E+02	1.7E+01	8.7E+00	4.3E+00	2.2E+00	1.1E+00	5.4E-01
1959, annual average, Ottawa	5.4E+02	6.4E+01	3.2E+01	1.6E+01	8.0E+00	4.0E+00	2.0E+00
1963, monthly maximum, Fort Smith (NWT)	7.1E+03	8.5E+02	4.3E+02	2.1E+02	1.1E+02	5.3E+01	2.7E+01
1963, annual average, Fort Smith (NWT)	3.8E+03	4.6E+02	2.3E+02	1.1E+02	5.7E+01	2.9E+01	1.4E+01
1969, annual average, Fort Smith (NWT)	4.0E+02	4.8E+01	2.4E+01	1.2E+01	6.0E+00	3.0E+00	1.5E+00
1979, annual average, Ottawa	4.8E+01	5.8E+00	2.9E+00	1.4E+00	7.2E-01	3.6E-01	1.8E-01
1992 Average (Churchill, MB)	1.8E+01	2.1E+00	1.1E+00	5.3E-01	2.6E-01	1.3E-01	6.6E-02
2000-2019, Maximum annual average, Ottawa	2.3E+01	2.7E+00	1.3E+00	6.7E-01	3.4E-01	1.7E-01	8.4E-02
2000-2019, Minimum annual average, Ottawa	9.7E+00	1.2E+00	5.8E-01	2.9E-01	1.4E-01	7.2E-02	3.6E-02
Snow (AECL, 1994) (6 TU)	6.0E+00	7.1E-01	3.6E-01	1.8E-01	8.9E-02	4.5E-02	2.2E-02

Notes

a Tritium concentrations in TU were converted to Bq/L using the conversion factor of 0.1191 used by the André E. Lalonde AMS Laboratory at the University of Ottawa

b Yellow Highlighting indicates calculated concentration at approximate present-day (2019-2021)

c The detection limit for tritium at the André E. Lalonde AMS Laboratory, University of Ottawa in the water samples is 0.8 TU (0.095 Bq/L);  
*Values shown in italics are below the detection limit*

Table IR-81-1: Summary of Tritium Concentrations Measured in Groundwater for the Wheeler River EIS

Groundwater Well	Hydrostratigraphic Unit	Sampling Date	Tritium Concentration (Bq/L)
GWR-006	OB	2020-08-22	<15
GWR-006		2021-04-14	0.1
GWR-029	LSA	2020-08-30	<15
GWR-029		2021-04-12	0.1
GWR-003	OB	2020-08-16	<15
GWR-003		2021-04-18	1.1
GWR-025	LSA	2020-08-22	<15
GWR-025		2021-04-17	0.4
GWR-008	LSA/DSZ	2020-09-06	<15
GWR-008		2021-04-09	0.5
GWR-009	ISA/DSZ	2020-09-14	16
GWR-009		2021-04-10	1.2
GWR-033	LSA	2020-11-03	<15
GWR-033		2021-05-25	0.5
GWR-034	ISA	2020-10-30	<15
GWR-034		2021-05-24	1.2
GWR-035	USA	2020-11-03	<15
GWR-035		2021-05-24	0.80
GWR-005	OB	2020-08-29	<15
GWR-005		2021-05-22	<0.1
GWR-014	ISA/DSZ	2020-08-29	19
GWR-014		2021-05-21	0.13
GWR-012	LSA/DSZ	2020-08-29	<15
GWR-012		2021-05-23	<0.1
GWR-036	OB	2020-11-05	<15
GWR-036		2021-04-08	0.8
GWR-037	USA/DSZ	2020-10-24	<15
GWR-037		2021-04-09	0.1
GWR-031	PWZ	2020-08-09	<15
GWR-031		2021-06-04	910
GWR-011	LSA/DSZ	2020-08-08	<15
GWR-011		2021-06-01	0.13
GWR-013	ISA/DSZ	2020-08-09	<15
GWR-013		2021-06-02	0.78
GWR-032	OZ	2020-11-01	-
GWR-032		2020-08-08	950
GWR-032		2021-06-04	1800
GWR-046	ISA	9/14/2021	<40
GWR-047	ISA/DSZ	9/10/2021	<40
GWR-048	LSA	9/10/2021	<40

### **Overburden and Groundwater Wells in the uppermost Upper Sandstone Aquifer**

There are three wells monitored as part of the baseline program that are installed in overburden materials: GWR-006, GWR-003 and GWR-005. Two other wells are installed in the uppermost Athabasca Sandstone Group unit (MFd) immediately beneath the overburden. These wells are GWR-036, GWR-035. Tritium values in groundwater wells installed in the overburden and upper sandstone ranged from <0.1 Bq/L to 1.1 Bq/L. Tritium concentrations were 1.1 Bq/L in GWR-003, 0.8 Bq/L in GWR-036 and 0.8 Bq/L in GWR-035. These tritium concentrations in groundwater sampled in these wells is considered to have been recharged in the last 12-25 years. To check alignment between these results and the 3D hydrogeological model, particle tracking was done to estimate minimum groundwater residence times (in years) at each well cluster location. For the overburden unit, the particle tracking results indicated minimum residence times of between 0.5 and 20 years.

Tritium concentrations were at or below the detection limit of 0.1 Bq/L at GWR-006 and GWR-005. Monitoring well GWR-006 is very shallow (screened from 9-15 mbgs), whereas GWR-005 is the deepest of the overburden wells, with a screened interval from 117-123 mbgs. It is considered plausible that the low tritium values reflects the potential for longer residence groundwater times due to heterogeneity in hydraulic conductivities of till material in the overburden. However, tritium concentrations in snow are also lower than in precipitation (AECL, 1994). Thus, it is possible that in the localized areas to those groundwater monitoring wells, materials are lower hydraulic conductivity, and the tritium concentrations are relatively more influenced by snowmelt. Longer residence times in the overburden materials in wells GWR-006 and GWR-005 is supported by higher specific conductance in those wells GWR-003 and GWR-036. Field-measured specific conductance values in GWR-006 and GWR-005 were approximately 150 µS/cm in 2021, whereas values at GWR-003 and GWR-036 were < 75 µS/cm in 2021 (Table 3-2 of Appendix 7-A to the EIS).

### **Deeper Groundwater**

Interpretation of tritium values for “ageing” of groundwater was considered inappropriate beyond the shallowest units at the Site. This is because of the relatively low values of tritium in the groundwater in all but the ore zone, and the numerous confounding factors/complexities. Several tritium concentrations are within 1-3 times the analytical detection limits and are thus considered at the limits of interpretability.

One possible confounding factor at low tritium concentrations is contamination of the sample with drilling fluids. Influence of drilling fluids is possibly a factor in the tritium concentrations observed in groundwater well GWR-014. In that well, tritium values in 2020 were measured as 16 Bq/L at SRC. This is the highest value of tritium detected in groundwater in the Athabasca Sandstone hydrogeologic units and was not reproduced when the well was sampled in 2021; the tritium concentration fell significantly to 0.13 Bq/L. The higher relative concentration of tritium in that well is not considered to reflect “bomb tritium” because of the significant change upon resampling, and it is considered possible that the groundwater quality in that well was influenced by drilling fluids/well construction materials, which was also noted for this well in terms of groundwater quality in the Baseline Report (Appendix 7-A of the EIS). Influence of drilling fluids is also considered the likely explanation for the tritium concentration of 1.2

Bq/L in monitoring well GWR-034. As was noted in the Baseline Report, the water quality in GRW-034 is considered to reflect influence from drilling fluids and additives and is not considered reliable.

Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

### References

AECL (Atomic Energy of Canada Ltd.), 1994. Final Report for the AECL/ SKB Cigar Lake Analog Study. Report No. AECL-10851. July.

Cherry, J.A., Parker, B.L., Bradbury, K.R., Eaton, T.T., Gotkowitz, M.G., Hart, D.J., and Borchardt, M.A., 2004, Role of aquitards in the protection of aquifers from contamination: a “state of the science” report: Awwa Research Foundation, Denver, Colorado.

Clark, I.D., and Fritz P. 1997. Environmental isotopes in hydrogeology. Lewis Publishers: New York. 328pp.

Devine, 2016. Sources and Pathways of Radiogenic Elements in Surface Media Above the Millennium and McArthur River Uranium Deposits in the Athabasca Basin, Saskatchewan, Canada. Ph.D. Thesis, Department of Earth Sciences, Faculty of Science, University of Ottawa.

## Attachment: IR-82

Number	IR-82
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit Appendix 7-C, Section 3.5
Context and Rationale	<p>Context: A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p>Rationale: A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p>Reference:  [1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.</p>
Information Requirement	1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2]

	<p>below provide an example of simplified framework for characterizing redox conditions in aquifers.</p> <p>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</p> <p>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</p> <p>Reference:  [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>
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### Response to #1

Redox conditions within the different hydrostratigraphic units at the site, which addresses spatial heterogeneity, was provided as part of Section 4.3.3 of Appendix 7-A of the draft EIS. As was noted by the CNSC reviewer in this IR (IR-82), the measurement of ORP in the system is qualitative at best, and this is also true of field-measured dissolved oxygen, which, upon exposure of groundwater to the atmosphere will quickly equilibrate with atmospheric oxygen. For the project, where concentrations of nitrate are low in all hydrostratigraphic units, the primary indicators of redox conditions are dissolved iron and sulphate concentrations. At the circumneutral pH range observed in groundwater in all hydrostratigraphic units at the site, concentrations of dissolved iron in groundwater above approximately 0.1 mg/L indicate definitively that the system is anoxic. Ferric oxyhydroxide solid control dissolved ferric iron ( $\text{Fe}^{3+}$ ) concentrations to values less than 0.1 mg/L in near neutral pH water, whereas ferrous iron ( $\text{Fe}^{2+}$ ) is very soluble and mobile in groundwater that is anoxic. The presence of sulphate and qualitative absence of detectable sulphide (based on absence of odour;  $\text{H}_2\text{S}_{(\text{g})}$ ) can typically be detected by odour down to 10  $\mu\text{g/L}$  in the groundwater is also an indicator that the system is not currently highly reducing. Sulphate reduction is typically tied to organic matter oxidation and the system does not appear to have organic carbon sources at this time.

As discussed in Section 4.3.3. of Appendix 7A of the draft EIS, the exception to the above is within the ore zone, where more reducing conditions are evidenced by the mineralogy and the persistence of sulphide minerals and uraninite for more than 1 billion years. In this zone, any oxidant will be scavenged by pyrite, maintaining a reducing environment. This is reflected qualitatively by the ORP measurements in the ore zone which was measured to be -265 mV (page 4.20 of Appendix 7A of the draft EIS).

The technical team acknowledges that there are other redox pairs or species, and specifically As(V)/As(III) and the measurement of dissolved reduced sulphur species sulphide species, that may support the interpretation of redox in groundwater. Holm (1989) concluded on the basis of his work calculating redox potentials from As(V)/As(III), Fe(III)/Fe(II) that the arsenic redox pairs provides supplementary information to that provided by dissolved iron, but is considered qualitative in nature. For the As(V)/As(III) pair, the solution phase speciation of the arsenic ions also has to be considered and may affect the accuracy of calculation of redox potentials from their analytical quantification in groundwater.



It is generally understood that groundwaters are typically not at redox equilibrium (e.g., Lindberg and Runnells, 1984). Thus, in this work, our primary reliance on the concentrations of dissolved iron and sulphate in the groundwater, as well as the mineralogy of the system was considered adequately robust for interpretation of baseline redox conditions in the hydrostratigraphic units for the Wheeler River project. Use of tools like the Jurgen et al., (2009) excel spreadsheet referenced by the CNSC reviewer requires careful consideration and qualification of the results provided, as it based on measured redox indicator ion concentrations and empirical relationships between them. The tool was applied to the available data on groundwater and returns interpretation that is aligned with what was discussed in the draft EIS and herein.

#### Response to #2

The redox conditions assumed for the 3D modelling, using PiChem, were the same for all scenarios as in the 1D modelling in PHREEQC. This includes the equilibration of the groundwater with atmospheric concentrations of oxygen for most of the modelling scenarios. The one exception was the “Redox Scenario” (page 3.48 of Appendix 7-C of the EIS), in which the solution was equilibrated with pyrite, resulting in reducing conditions controlled by the iron sulphide mineral.

It is noted that this equilibration of the groundwater solutions with atmospheric concentrations of oxygen affects only the speciation of elements that are redox sensitive and is a modelling approach that is used to force redox sensitive species to be in their most oxidized form. As noted above, groundwaters are seldom at equilibrium with respect to the speciation of redox sensitive species and thus, using thermodynamic considerations alone can results in elements being present in the model as species that are not observed in the environment. This was mitigated by forcing the conditions in the model to oxidized conditions. As was discussed in Appendix 7-C of the draft EIS (page 3.29), this is a conservative approach because the important redox-active constituents of concern are more mobile in their oxidized forms, including uranium as U(VI).

#### Response to #3

The “Redox” scenario model (page 3.48 of Appendix 7-C of the draft EIS) was run iteratively to evaluate the minimum amount of pyrite that would be required to reduce dissolved-phase U(VI) associated with remediation of the mining zone (i.e., the restored solutions). As was outlined on page 3.49 of Appendix 7-C of the draft EIS, the information available included quantification of total iron through wet chemical extraction in core samples, and observations recorded by Denison personnel during core logging. Specifically, pyrite was observed associated with hydrothermally altered materials between an approximate depth interval of 240-390 mbgs (page 3.49 of Appendix 7-C of the draft EIS).

Total (wet chemical) extraction of iron content of the core materials does not provide speciation of iron. The maximum, minimum, and median total iron concentration, expressed as Fe<sub>2</sub>O<sub>3</sub> weight %, in the MFa are provided in Table 3-2 of Appendix 7-C of the draft EIS. Not indicated in that table is that these statistics are based on 10,436 elemental analyses of core samples. *(Noted is that as part of the response to IR-92, Table 3-2 is being updated to indicate the total number of samples from which the statistics were derived).*

A sample from the MFa downgradient of the mining zone was recently submitted to the Saskatchewan Research Council (SRC) for analysis of total iron and mineralogy by XRD. The sample was taken from location GWR-062 (located within Phase 1 of mining) at a depth of 398.7 mbgs in sandstone and was

named “Altered Pyrite”. The total iron content of the sample was determined in the whole rock assay (by lithium metaborate fusion) to be 13% by weight; the analytical results are provided in Appendix A. The certification of analysis for the whole rock assay is attached to this IR. Pyrite and marcasite were identified as the iron phases in the sample by XRD; the XRD results are attached to this IR in Appendix A.

*Pyrite Content Assumed in the “Redox Scenario”*

In the numeric model for the sensitivity “Redox Scenario”, the total iron content was considered was the median value in the MFA. The Median total iron value in the MFA is 1.4 wt % (1.4 g) of  $\text{Fe}_2\text{O}_3$  per kg of sediment/rock, which is equivalent to 0.0175 moles of Fe per kg of soil. Because of the stoichiometry of pyrite ( $\text{FeS}_2$ ), this is equivalent to 0.0175 moles of pyrite per kg of soil. This value was then converted to moles of Fe per litre of water, as is the convention for PHREEQC. To do this conversion, it was assumed that the groundwater flow was predominantly through the desilicified/hydrothermally altered portion of the MFA, with a porosity of 0.2 and a bulk density of  $2.12 \text{ g/cm}^3$ . The total moles of pyrite per litre of soil was calculated as 0.186 moles/L.

Determined through the reactive transport modelling in PHREEQC was that only 0.0001 moles of pyrite per litre of water was required to oxidize the mass of U(VI) transported from the mining zone. This amount of pyrite represents 0.054% of the median total moles of iron present in the MFA.

The pyrite content measured in the “Altered pyrite” sample by XRD, presented herein, exceeds that assumed in the reactive transport modelling.

References

Holm, T.R. and Curtiss, C.D., 1989. A comparison of oxidation-reduction potentials calculated from the As(V)/As(III) and Fe(III)/Fe(II) couples with measured platinum-electrode potentials in groundwater. J. Contam. Hydrol., 5: 67-81.

Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.

Lindberg, R.D. and Runnells, D.D., 1984. Ground water redox reactions: an analysis of equilibrium state applied to Eh measurements and geochemical modeling. Science, 225:925 927.

Attachment IR-82 Appendix A

**SRC Mineral Processing**  
Attention: Jack Zhang  
PO #/Project: 15475  
Samples: 3

**SRC Geoanalytical Laboratories**  
2901 Cleveland Avenue, Saskatoon, Saskatchewan, S7K 8A9  
Tel: (306) 933-8118 Fax: (306) 933-5656 Email: geolab@src.sk.ca

Report No: G-2023-1281

Date of Report: Jun 28, 2023

**ICP Whole Rock Assay**  
**Lithium Metaborate Fusion**

Column Header Details

Aluminum in wt % (Al<sub>2</sub>O<sub>3</sub>)  
Calcium in wt % (CaO)  
Iron in wt % (Fe<sub>2</sub>O<sub>3</sub>)  
Potassium in wt % (K<sub>2</sub>O)  
Magnesium in wt % (MgO)

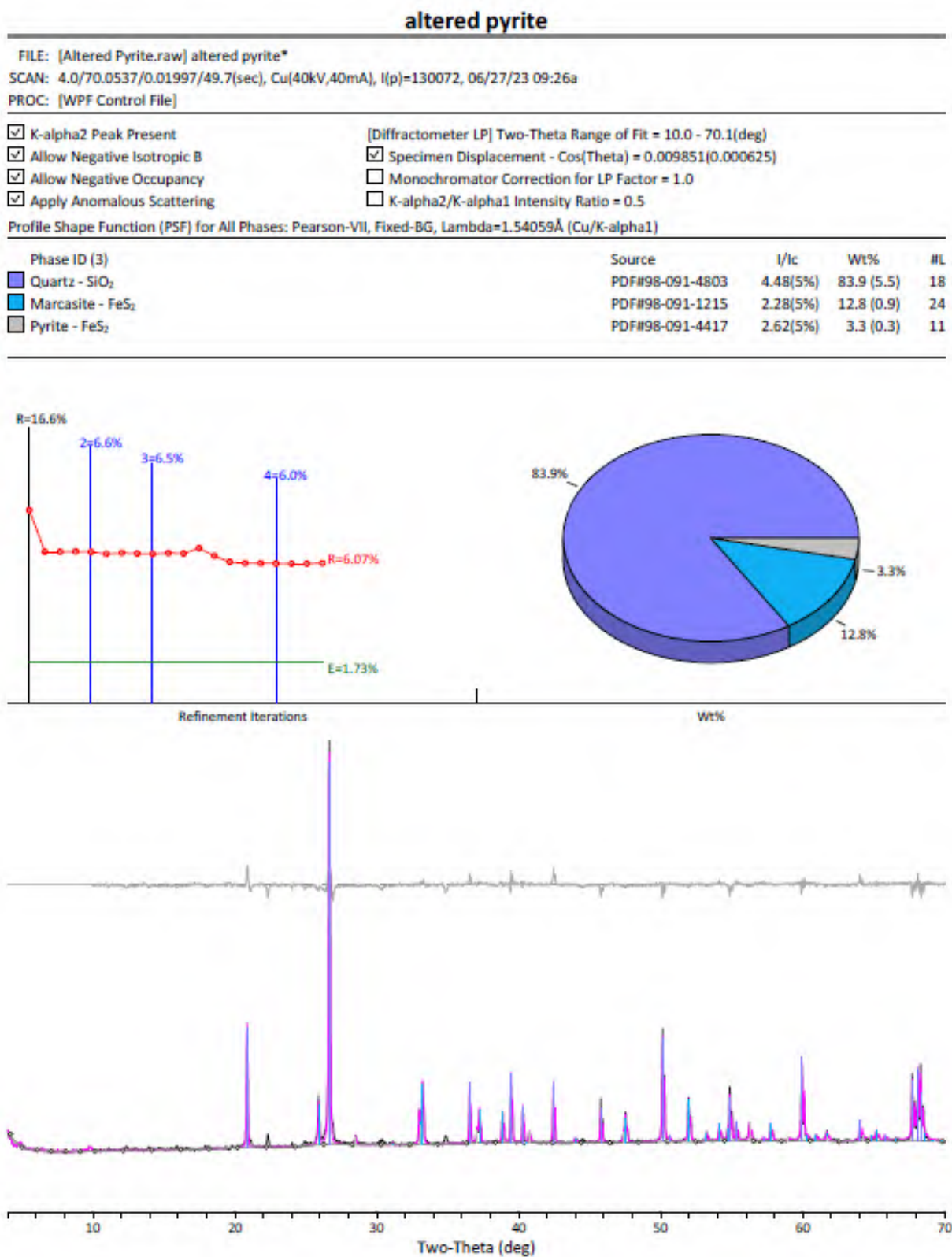
Manganese in wt % (MnO)  
Sodium in wt % (Na<sub>2</sub>O)  
Phosphorus in wt % (P<sub>2</sub>O<sub>5</sub>)  
Titanium in wt % (TiO<sub>2</sub>)  
SiO<sub>2</sub> by ICP in wt % (SiO<sub>2</sub>)

Barium in ppm (Ba)  
Chromium in ppm (Cr)  
Scandium in ppm (Sc)  
Strontium in ppm (Sr)  
Yttrium in ppm (Y)

Zirconium in ppm (Zr)  
Loss on Ignition in wt % (LOI)  
SUM in (SUM)

Sample Number	Al <sub>2</sub> O <sub>3</sub> wt %	CaO wt %	Fe <sub>2</sub> O <sub>3</sub> wt %	K <sub>2</sub> O wt %	MgO wt %	MnO wt %	Na <sub>2</sub> O wt %	P <sub>2</sub> O <sub>5</sub> wt %	TiO <sub>2</sub> wt %	SiO <sub>2</sub> wt %	Ba ppm	Cr ppm	Sc ppm	Sr ppm	Y ppm	Zr ppm	LOI wt %	SUM
SY5	14.5	7.16	10.6	4.23	3.27	0.13	4.18	2.05	1.82	49.9	6410	147	13	3130	57	743	N/R	97.84
ALTERED PYRITE	2.23	0.02	13.0	0.05	0.41	<0.01	0.04	0.05	0.08	67.5	9	49	<2	151	37	176	16.9	100.58
ALTERED PYRITE R	2.16	0.02	13.0	0.05	0.40	<0.01	0.04	0.04	0.10	67.2	9	48	<2	148	36	178	17.5	100.50

Whole Rock Analysis: A 0.1 gram pulp is fused at 1000 C with lithium metaborate then dissolved in dilute HNO<sub>3</sub>.  
The standard is SY5.



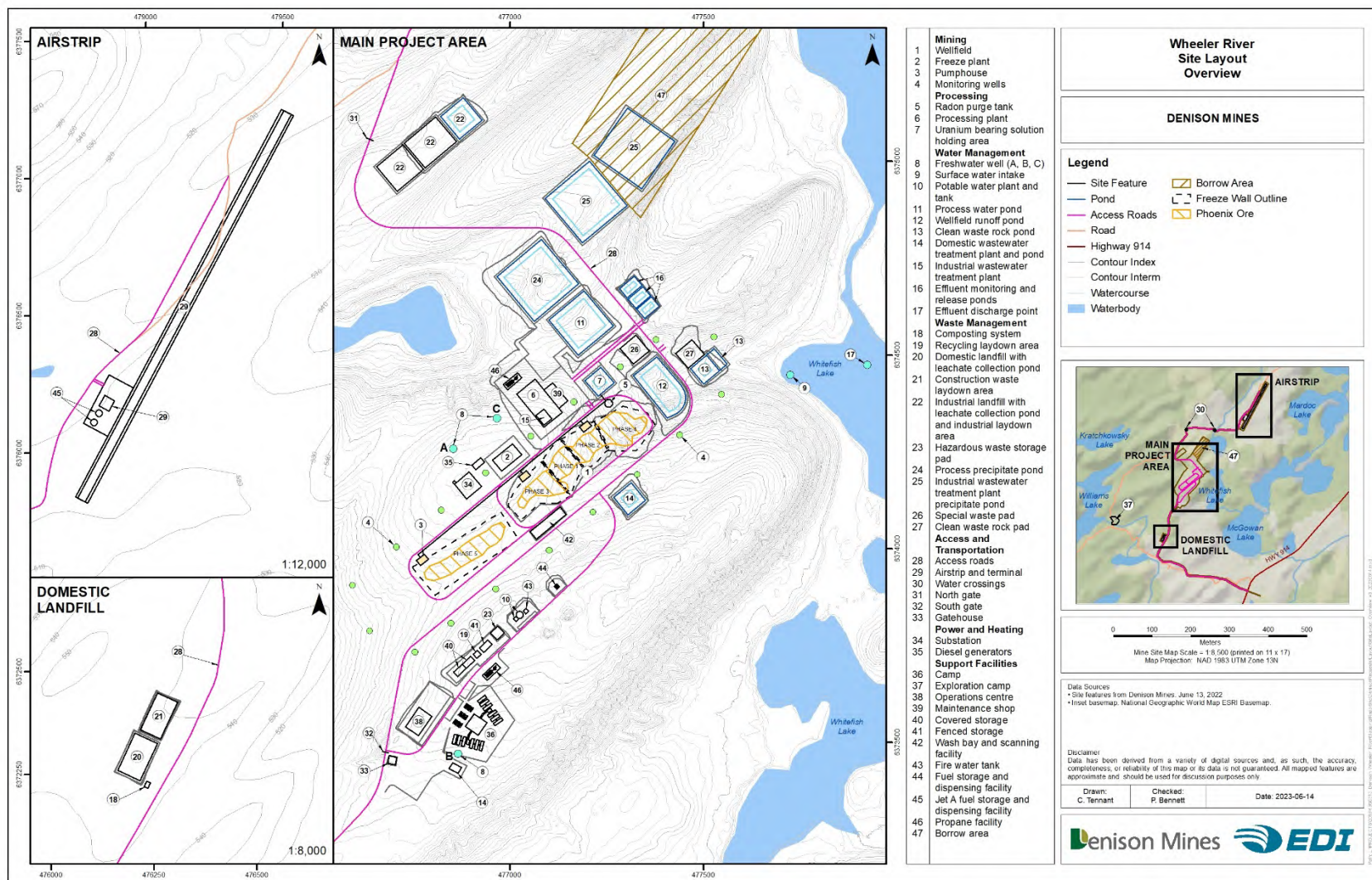
## Attachment: IR-85

Number	IR-85
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C
Context and Rationale	Context: Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C. Rationale: It is not clear where Well A, Well B and Well C are located.
Information Requirement	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.



Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Supporting figure to the response provided in table:

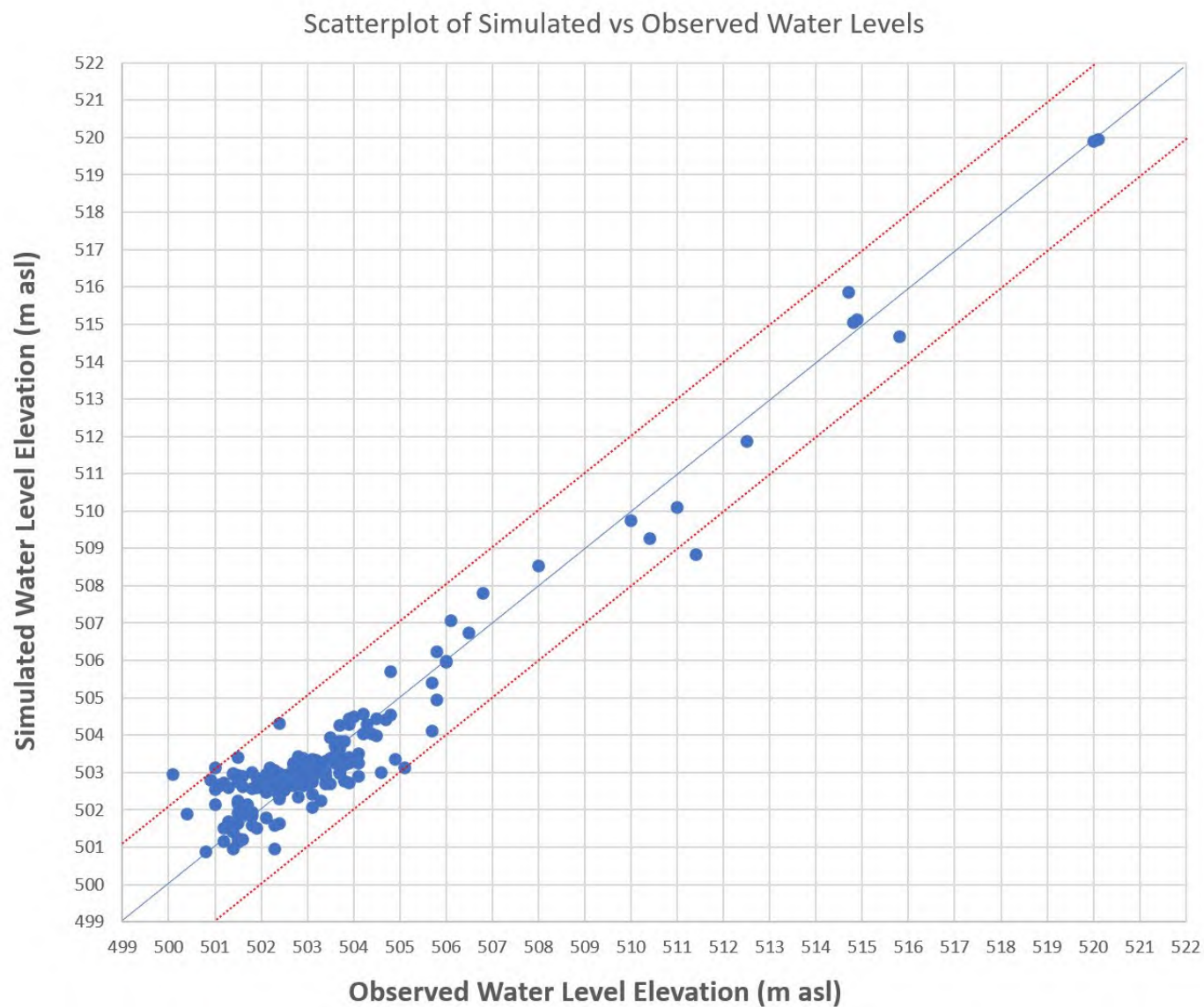




## Attachment: IR-91

Number	IR-91
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, section 2.5.2
Context and Rationale	<p>Context: The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p>Rationale: As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>
Information Requirement	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.

Supporting figure to the response provided in table:



## Attachment: IR-92

Number	IR-92
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 3.2.1, Mineralogical Composition
Context and Rationale	<p>Context: Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca</p> <p>Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p>Rationale: Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported. The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li> <li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is</li> </ol>

	conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. dichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).
--	--

#### Response to #1

Table 3-2 in Appendix 7C of the draft EIS has been updated to indicate the number of samples analyzed and arithmetic average and (one) standard deviation values as a measure of sample variability, in addition to the maximum, median and minimum values that had already been provided. Results from Portable Infrared Mineral Analyzer (PIMA) have also been included for the paleoweathered zone. The updated Table 3-2 is included on the next page.

Note that in Table 3-2 in Appendix 7C of the draft EIS, the normative clay content for kaolinite, illite and ditrichlorite in the paleoweathered zone had been entered erroneously as the % of total clay and had not been converted to wt% in the sediment/rock. This was corrected and the updated values represent wt% of kaolinite, illite and ditrichlorite in the sediment/rock.

#### Response to #2

Unlike the iron oxide minerals goethite and ferrihydrite and gibbsite, for which there is an existing compilation of thermodynamic surface complexation constants for sorption of metals, metalloids, and anions to a single, laboratory-produced mineral phase (Dzombak and Morel, 1991; Mathur and Dzombak, 2006; Karamalidis and Dzombak, 2006), such a compilation does not exist for clay minerals. Rather, to develop the database of surface complexation constants for metals and metalloids to illite clay for the modelling work presented in Appendix 7-C of the draft EIS took an extensive review of the literature to make decisions on the most defensible constants to include in the work. For kaolinite, a similarly comprehensive databased could have been developed, but not for chlorite, where the number of studies identified in the literature for sorption characteristics is much more limited.

The decision was made to use illite to represent the clays present in the Athabasca Sandstone group units because:

- for the reasons give above and the discussion provided below, it was not practicable to develop a database of surface complexation constants for more than one clay mineral phase;
- using the updated Table 3-2 provided as part of this IR response, the median illite content (weight %, based on normative clay calculations) of the Athabasca Sandstone Group units is, with only one exception, always more than twice (2x) the median kaolinite content, and three times (3x) the median chlorite content. The exception is the “MFa in downgradient DSZ”, where the median illite content is lower, than the median kaolinite and chlorite contents.

In the model, the choice was made to represent the clays assemblage as a whole as 3.9% illite/kg of sediments/rock (wt %, based on normative clay calculations). Median normative clay contents in the Athabasca Sandstone Units (MFa, MFb, MFC, and MFD) and overburden materials ranged from 1.74-5.85 wt %, and for the locations downgradient of the mining zone (“Downgradient Desilicified Zone, All Units”) was 4.14 %. The robustness of selection of illite to represent the clay assemblage is discussed here below using CEC as an important characteristic of the sorption behaviour of the clays present in the system (illite, kaolinite and chlorite).

Updated Table 3-2 in Appendix 7-C of the draft EIS: CaO, Fe Oxide and Clay Contents of the Athabasca Group Sandstones and Paleoweathered Zone

Lithologic Unit	Number of Samples (CaO and Fe2O3, %)	Number of Samples (Clay %)	Statistic	Elemental Analysis (wt % in sediment/rock)		Normative Clay (wt % in sediments/rock) <sup>b</sup>					PIMA (% of total clay content) <sup>c</sup>			
				CaO (% Total)	Fe2O3 (% Total) <sup>a</sup>	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite (%)	Illite (%)	Chlorite (%)	Kaolinite (%)	Dravite <sup>1</sup> (%)
Overburden	8	84	Max	0.21	0.38	6.7	3.63	5.23	2.17	0.62	Data Not Collected			
			Min	0.005	0.03	0.20	0.00	0.06	0.00	0.01				
			Median	0.165	0.28	1.74	0.29	1.06	0.04	0.03				
			Average	0.14	0.26	1.94	0.47	1.22	0.25	0.08				
			Standard Deviation	0.063	0.10	1.23	0.52	0.94	0.47	0.11				
MFd	3077	3556	Max	0.71	1.7	39.6	17.2	24.4	15.2	8.03				
			Min	0.005	0.02	0.02	0.00	0.00	0.00	0.00				
			Median	0.005	0.05	2.05	0.32	1.45	0.00	0.28				
			Average	0.009	0.085	2.27	0.47	1.49	0.30	0.45				
			Standard Deviation	0.014	0.120	1.45	0.76	1.20	0.66	0.53				
MFc	8532	9065	Max	1.44	9.1	60.5	18.9	46.1	27.8	16.3				
			Min	0.005	0.02	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.29	3.76	0.44	2.60	0.08	0.30				
			Average	0.02	0.52	4.08	0.84	2.73	0.49	0.66				
			Standard Deviation	0.02	0.60	2.50	1.23	1.96	1.17	0.99				
MFb	6086	7115	Max	2.48	7.23	64.3	32.61	31.95	52.59	21.60				
			Min	0.005	0.04	0.03	0.00	0.00	0.00	0.00				
			Median	0.02	0.89	5.85	0.95	4.17	0.00	0.17				
			Average	0.02	1.10	6.23	1.56	4.24	0.41	0.51				
			Standard Deviation	0.06	0.87	3.28	1.99	2.20	2.12	1.07				
MFa	10436	10817	Max	3.74	25.8	68.0	34.2	38.2	63.7	45.0				
			Min	0.005	0.01	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.14	3.53	0.67	1.74	0.20	0.33				
			Average	0.021	0.52	4.76	1.16	2.67	0.93	1.00				
			Standard Deviation	0.056	1.08	4.73	1.94	2.95	2.79	2.03				
MFa in Downgradient DSZ	510	542	Max	0.28	5.77	41.3	28.8	17.0	20.9	9.22				
			Min	0.005	0.03	0.40	0.00	0.00	0.00	0.01				
			Median	0.02	0.09	2.62	0.51	0.42	1.18	0.15				
			Average	0.021	0.30	3.96	0.78	1.66	1.52	0.52				
			Standard Deviation	0.022	0.64	3.95	1.70	2.55	1.89	1.23				
Downgradient Desilicified Zone, All Units	1376	1459	Max	0.28	6.73	41.3	28.8	17.0	20.9	9.2				
			Min	0.005	0.03	0.30	0.00	0.00	0.00	0.01				
			Median	0.02	0.23	4.14	0.47	2.42	0.64	0.17				
			Average	0.019	0.58	4.63	0.79	2.94	0.90	0.47				
			Standard Deviation	0.017	0.78	3.05	1.28	2.60	1.36	0.89				
Paleoweathered Zone	109	109	Max	10.1	23.598	67.1	17.9	36.0	65.3	43.3	98.5	95.4	21.1	11.1
			Min	0.1	0	2.81	0.00	0.00	0.00	0.06	0	1.5	0	0
			Median	0.29	2.05	47.1	0.00	9.20	35.5	0.97	13.1	69.5	NC <sup>d</sup>	NC <sup>e</sup>
			Average	0.61	3.4	48.5	1.70	10.10	36.7	1.67	28.1	64.5	NC <sup>d</sup>	NC <sup>e</sup>
			Standard Deviation	1.51	4.2	10.4	3.60	7.60	12.60	4.10	33.2	30	NC <sup>d</sup>	NC <sup>e</sup>

Notes

<sup>a</sup> Iron oxide content for the paleoweathered zone is % Hematite (vs. total iron as Fe<sub>2</sub>O<sub>3</sub>)  
<sup>b</sup> Normative clay values for predominantly basement-hosted paleoweathered zone may be erroneous due to variable host lithology chemistry  
<sup>c</sup> The number of samples analyzed by PIMA for the paleoweathered zone was 9 (i.e., n= 9)  
<sup>d</sup> Kaolinite was only detected in 3 samples in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.  
<sup>e</sup> Dravite was only detected in 1 sample in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.

### Cation Exchange Capacity (CEC) in the Overburden and Athabasca Sandstone Group Units

Literature ranges for cation exchange capacity for kaolinite, illite and chlorite are shown below in Table IR-92-1. Because there is a range of CEC values for each clay mineral in the literature, the maximum and minimum CEC value in the range provided in the literature was used to evaluate the CEC of the overburden and Athabasca Sandstone Group units for the Wheeler River Project. The range of calculated CECs based on the clay mineral assemblage in each sample is given in Table IR-92-2. Note that the number of samples used for each of the lithologic units is the same as that provided in the updated Table 3-2.

In Table IR-92-2, the “Kaolinite+Illite+Dichlorite CEC – Minimum” and “Kaolinite+Illite+Dichlorite CEC- Maximum” were calculated in the following way, to estimate the range of CEC that may be expected by lithologic unit.

*Kaolinite + Illite + Dichlorite CEC – Minimum*

$$= \frac{\text{wt\% kaolinite } (\frac{kg}{kg})}{100} * 10 \frac{meq}{kg} + \frac{\text{wt\% illite } (\frac{kg}{kg})}{100} * 100 \frac{meq}{kg} + \frac{\text{wt\% dichlorite } (\frac{kg}{kg})}{100} * 14 \frac{meq}{kg}$$

*Kaolinite + Illite + Dichlorite CEC – Maximum*

$$= \frac{\text{wt\% kaolinite } (\frac{kg}{kg})}{100} * 150 \frac{meq}{kg} + \frac{\text{wt\% illite } (\frac{kg}{kg})}{100} * 400 \frac{meq}{kg} + \frac{\text{wt\% dichlorite } (\frac{kg}{kg})}{100} * 100 \frac{meq}{kg}$$

This was then compared to the CEC used in the reactive transport modelling presented in Appendix 7-C of the draft EIS. The CEC of illite assumed was 225 meq/kg (Baeyans and Bradbury, 2009), which is a value intermediate to range in the literature sources (Table IR-92-1). At 3.9% illite, which was the illite content assumed in the base case of the modelling scenarios, the CEC assumed for the overburden and Athabasca Sandstones was (3.9 wt % (kg/kg)/100 \* 225 meq/kg = 8.87 meq/kg of sediments/bedrock). In the modelling sensitivity analysis, 1/10 of the reactive phases, including illite, were assumed to be accessible to solution, so that the CEC of the bedrock/sediments was assumed to be 0.887 meq/kg.

The CEC values evaluated in the modelling (0.887 and 8.87 meq/kg) are within the range of median CECs that are represented for the lithologic units for the project. Because groundwater movement from the mining zone is understood to be preferentially through the desilicified zone (DSZ), as presented in Appendix 7-C of the draft EIS, it is important that the CEC assumed in the model is reflective of conditions in that unit. The calculated CEC for the “Downgradient Desilicified Zone, All Units” ranged from 2.7-11.8 meq/kg (Table IR-92-2). The CEC value assumed in the base case of the model (8.87 meq/kg) is intermediate to this range, and the sensitivity analysis value of 0.887 meq/kg is reflective of not all cation exchange sites being accessible for reaction with constituents in groundwater.

Further, three core samples from the desilicified zone at depth were submitted for CEC analysis. Details of the samples, the normative clay content, and the measured CEC using the ammonium-saturation method are provided in Table IR-92-3.



Table IR-92-1: CEC values from the Literature

Clay Mineral	Cation Exchange Capacity (meq/kg)		
	Kaolinite	Illite	(DiTri)Chlorite
Minimum CEC Applied	10	100	14
Maximum CEC Applied	150	400	100
Ranges in Literature (meq/kg)			
Drever (1982)	10-100	100-400	<100
Bain et al., (1994)	30-150	100-400	100-400
Zazzi, 2009	-	-	14-40
Bradbury and Baeyens (2009)		225	

Applied for geochemical reactive transport modelling in Appendix 7-C of the draft EIS

Table IR-92-2: Calculated CEC ranges for the Lithologic Units for the Wheeler River Project

Lithologic Unit	Statistic	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite1 (%)	Kaolinite+Illite +Dichlorite CEC - Minimum	Kaolinite+Illite +Dichlorite CEC - Maximum
Overburden	Max	6.7	3.63	5.23	2.17	0.62	5.4	22.2
	Min	0.20	0.00	0.06	0.00	0.01	0.076	0.39
	Median	1.74	0.29	1.06	0.04	0.03	1.1	4.9
MFd	Max	39.6	17.2	24.4	15.2	8.03	26.6	112.9
	Min	0.02	0.00	0.00	0.00	0.00	0	0
	Median	2.05	0.32	1.45	0.00	0.28	1.5	6.3
MFc	Max	60.5	18.9	46.1	27.8	16.3	48.1	198.7
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.76	0.44	2.60	0.08	0.30	2.8	11.7
MFb	Max	64.3	32.61	31.95	52.59	21.60	34.9	149.2
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	5.85	0.95	4.17	0.00	0.17	4.4	18.6
MFa	Max	68.0	34.2	38.2	63.7	45.0	38.8	157.1
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.53	0.67	1.74	0.20	0.33	2.0	9.0
MFa in Downgradient DSZ	Max	41.3	28.8	17.0	20.9	9.22	19.6	92.3
	Min	0.40	0.00	0.00	0.00	0.01	0.11	0.64
	Median	2.62	0.51	0.42	1.18	0.15	0.7	3.9
Downgradient Desilicified Zone, All Units	Max	41.3	28.8	17.0	20.9	9.2	19.6	92.3
	Min	0.30	0.00	0.00	0.00	0.01	0.11	0.64
	Median	4.14	0.47	2.42	0.64	0.17	2.7	11.8

Table IR-92-3: Normative Clay and Measured CEC for Desilicified Zone Samples

Sample Name	Corehole Location	Normative Clay Content					CEC (meq/kg)
		Clays (wt %)	Kaolinite (wt %)	Illite (wt %)	DiTriChlorite (wt %)	Dravite (%)	
DS-1	GWR-054	10.16	0.14	9.5	0.49	0.24	21
DS-2	GWR-059	5.74	0.40	6.2	3.6	0.743	26
DS-3	GWR-060	12.12	0.89	6.7	2.6	0.312	25
DS-Feed	Composite of DS-1, DS-2, DS-3	7.91	0.61	7.4	2.2	0.404	21

### The Paleoweathered Zone

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz, as was described on page 3-29 of Appendix 7-C of the draft EIS. For the paleoweathered zone, there is a smaller dataset and the normative clay content in this unit can be inaccurate due to the host (basement) mineralogy. This is because the normative clay percentages for kaolinite, illite, dravite and chlorites are calculated from the bulk total geochemical composition of the sandstones using an in-house set of linear equations that govern the distribution of oxides into minerals of interest. Key oxide inputs are Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, and MgO in percent and B in ppm. Unlike the sandstones, that contain little parent basement rock material, calculation of clay content in samples from the paleoweathered zone – because this unit is basement-hosted – can be influenced by the presence of parent rock material that has the same/similar chemical composition. In the paleoweathered zone, portable infrared mineral analysis (PIMA) was used to support the information from the normative clay content in terms of the relative abundance of the clay mineral phases. PIMA does not quantify the total clay in the rock sample (i.e., clay as a wt% of rock), but it does provide the relative abundances of the clay minerals present.

The conceptualization of the paleoweathered zone with respect to reactive mineral phases in the numeric modelling presented in Appendix 7-C of the draft EIS is considered conservative and robust based on the alignment of the following:

- The normative clay content, which as shown in the updated Table 3-2 presented above in this IR has a median value of 47.1 wt % clay content, with median illite and chlorite contents of 9.20 wt %, and 35.3 wt %, respectively.

- The PIMA results, presented in the updated Table 3-2. The PIMA results support the normative clay content results in that the dominant clay is chlorite (median of 69.5% relative abundance) followed by illite (median 13.1% relative abundance).
- Characteristics of the paleoweathered zone have been discussed for the Cigar Lake program (AECL, 1994) and for other study areas in the Athabasca Basin by Macdonald (1980) and by Wilson (1986). Macdonald (1980) studied the Precambrian regolith in areas of the Athabasca Basin that were not mineralized – meaning away from areas of hydrothermal alteration. The mineralogy of the regolith depended on the depth in the regolith and on the specific parent basement rock (Meta-arkose, meta-semipelite, and meta-pelite). The quartz content of the regolith ranged from 5-40 volume % with values generally close to 25 volume %.
- In Wilson (1996), the author identifies zones of hydrothermal alteration overprinting the regolith that are dominated by quartz, illite, and kaolinite.
- In the Cigar Lake study (AELC, 1994) the paleoweathered zone beneath the ore body is described in the following way: *“A noticeable feature is the funnel-shaped zone of hydrothermally altered basement rock which also overprints the older regolithic alteration immediately underneath the unconformity. This hydrothermal alteration is characterized by a weakening of the rock strength through shearing and foliation dominated by clay-mineral development”*.

#### *Support from CEC and XRD Analyses*

Using the same calculation method as above, the CEC of the paleoweathered materials would be 20.25 meq/kg assuming 9% wt% illite.

Recently, a composite sample of 4 core samples taken from the paleoweathered zone (“PW-Feed”) was analyzed by XRD for mineralogy and the CEC was measured. Details of the samples included in the “PW-Feed” sample are provided below in Table IR-92-4. The CEC for PW-Feed is also included in that table, and was 72 meq/kg, and is aligned with a higher content of illite in the PW-Feed sample than is assumed for the numerical modelling and suggests a contribution to the CEC from the chlorite. The XRD results are provided as Appendix A of this IR response. The results indicate that the mineralogical makeup of PW-feed is: 24.4 wt% quartz (which aligns very well with the assumptions of 25 wt% in the conceptualization), 31.4 wt% illite, and 40.5 wt% chlorite. There is also a small amount of basement rock/parent material present in the sample (3.7wt% biotite).

The measured CEC was substantively (~3x) higher than assumed in the numeric model. It was understood in representing the clay mineral phases in the paleoweathered zone by 9% illite that the sorptive capacity may be underestimated. The decision was made to take a conservative approach because the dataset of surface complexation constants developed for the project was for illite, and it was considered inappropriate to apply the same sorptive reactivity to the much larger relative content of chlorite in this zone. The results of the XRD and the measured CEC provide support to the approach in the reactive transport modelling of assuming illite as the sorptive clay mineral as a conservative one.

Table IR-92-4: Measured CEC for PW-Feed Sample

Sample Name	Corehole Location	CEC (meq/kg)
PW-1	GWR-054	-
PW-2	GWR-061	-
PW-3	GWR-057	-
PW-4	GWR-060	-
PW-Feed	Composite of PW-1 through PW-4	72

#### Changes to the draft EIS text

To reflect the discussion above and updates to Table 3-2 of Appendix 7-C of the draft EIS, the following changes will be made to the text on page 3.29-3.20 of Appendix 7-C of the EIS.

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.

#### References

AECL (Atomic Energy of Canada Ltd.), 1994. Final Report for the AECL/ SKB Cigar Lake Analog Study. Report No. AECL-10851. July.

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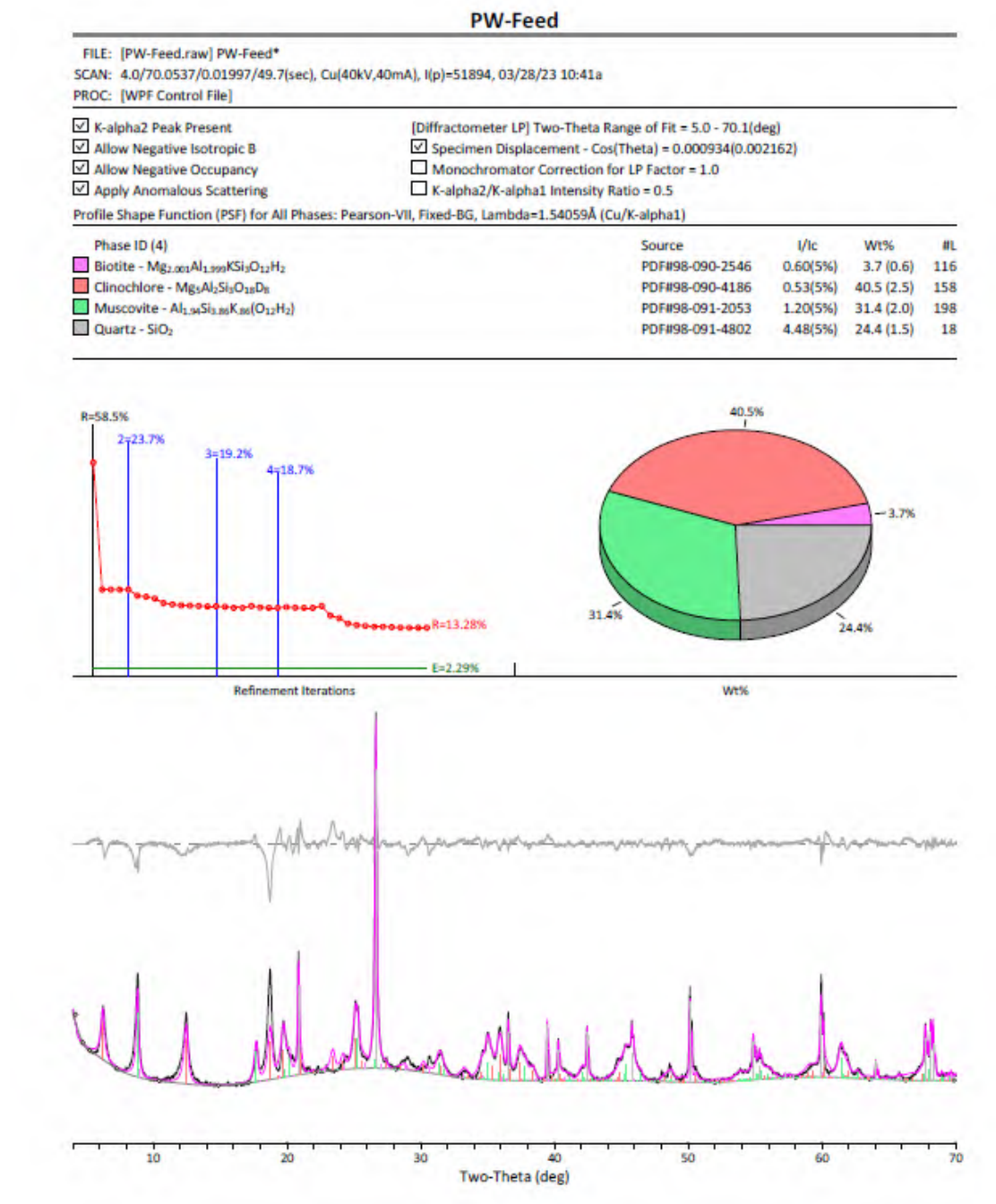
Mathur, S.S., Dzombak, D.A., 2006. Surface Complexation: Goethite, in: Surface Complexation Modelling. Elsevier, p. 443.

Wilson, J.A., 1986, Geology of the basement beneath the Athabasca Basin in Alberta. Bulletin 55. Geological Survey Department, Alberta Research Council, Edmonton, Alberta, Canada.

## Attachment IR-92 Appendix A

Note the following on the XRD results for the PW-Feed sample:

- Chlinochlore is part of the chlorite group of minerals.
- The diffraction patterns for illite and muscovite are nearly identical, and thus, muscovite is interpreted as illite in this sample.





## Attachment: IR-93

Number	IR-93
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-10: Properties of Adsorbing Mineral Phases
Context and Rationale	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Goethite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m<sup>2</sup>/g, this equals to 1600/6E4 mol/m<sup>2</sup>, or 0.0266 mol/m<sup>2</sup>, 1.6e4 sites/nm<sup>2</sup>. This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm<sup>2</sup>. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters. The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>
Information Requirement	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport modelling should be re-run to update the contents presented in the EIS report.

### Response:

The value provided in Table 3-10 for site density on goethite was a typographical error. The correct value for the density of reactive sites for goethite is 0.203 moles/kg. This value is derived below.

Equation for site density on goethite per kg of goethite:

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = \text{Site Density} \left( \frac{\text{mole sites}}{\text{mole Fe}} \right) \times \text{MW Goethite} \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{kg}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.018 \left( \frac{\text{mole sites}}{\text{moles Fe}} \right) \times 88.8517 \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{mol}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.203 \left( \frac{\text{mol}}{\text{kg}} \right)$$

The values for site density of 0.018 mole sites/mole Fe and the was given by Mathur and Dzombak (2006). The formula of goethite is FeOOH (also given by Mathur and Dzombak, 2006) and has a molecular weight ("MW") of 88.8517 g/mol.

The corrected table 3-10 is provided here below. Noted is that the value for site density for quartz has also been corrected. Please see the discussion below.

Table 3-10: Properties of Adsorbing Mineral Phases

Sorbent Phase	Site Density (mol/kg)	Specific Area (m <sup>2</sup> /g)	Reference
Goethite (FeOOH)	0.203	60	Mathur and Dzombak, 2006
Quartz (SiO <sub>2</sub> )	0.00118	0.31	Prikryl et al., 2001
Illite	Strong Sites: 0.002 (metals and protons sorb); Weak Sites: 0.04 (protons only sorb)	97	Bradbury and Baeyans, 2009

### Properties of Sorbent Phases used in PHREEQC/piChem modelling

The erroneous values reported in Table 3-10 were not used in the modelling. Below, example calculations are given for goethite to derive the total number of binding sites, in moles, for the mineral phase. The total number of sites for the clay, quartz and goethite were provided in the example PHREEQC file given in Appendix E of Appendix 7C of the EIS.

In PHREEQC, the default assumption is that a reaction occurs within 1L of the aqueous phase. This aqueous phase is pore water in the calculations of geochemical reactive transport through rocks and soils. Thus, the total moles of reactive sites associated with goethite (and other reactive phases) is expressed as that which is present in contact with 1L of pore water.

For total density of reactive sites on the goethite surface in the model, the following information was used:

- Site density: 0.018 mole of sites/mole Fe
- Fe<sub>2</sub>O<sub>3</sub> content of sediment/rock: 0.29 wt % in whole rock (from rock core)  
(equivalent to 2.9 g/kg in whole rock)
- MW of Fe<sub>2</sub>O<sub>3</sub> 159.6882
- MW of FeOOH (goethite) 88.8517
- Specific Area of goethite 60 m<sup>2</sup>/g
- (Rock) Effective Porosity 0.2 (Desilicified Zone; Appendix 7C, Table 2-4)
- Bulk Density of sediment/rock 2.12 g/cm<sup>3</sup> (calculated) (equivalent to 2.12 kg/L)
- Density of quartz 2.65 g/cm<sup>3</sup>

### Step 1: Total moles of reactive sites on goethite per kg of soil

*Total moles reactive sites on goethite per kg of soil*

$$= \text{mass Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{kg soil}} \right) \div \text{MW Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right) \times 0.018 \left( \frac{\text{mole reactive sites}}{\text{mole Fe}} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 2.9 \left( \frac{\text{g}}{\text{kg soil}} \right) \div 159.6882 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right)$$

## Step 2: Bulk Density of the sediment/soil

Quartz is the predominant mineral present in the Athabasca Sandstones. Thus, the bulk density of the sediment/rock was first calculated for the modelling purposes using the density of quartz, for a given effective porosity.

Density of Quartz ( $\rho_{\text{quartz}}$ ) = 2.65 kg/L (Appelo and Postma)

Effective porosity ( $\epsilon$ ) = 0.2 (Desilificied zone, as above)

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{(1 - \epsilon)}{\left( \frac{1}{\rho_{\text{quartz}} \left( \frac{\text{kg}}{\text{L}} \right)} \right)}$$

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{1 - 0.2 \text{ (unitless)}}{\frac{1}{2.65 \left( \frac{\text{kg}}{\text{L}} \right)}}$$

$$\text{Bulk Density of soil} = 2.12 \text{ kg/L}$$

## Step 3: Reactive sites per 1L of aqueous solution (groundwater)

*Total moles reactive sites on goethite per 1L porewater*

$$\begin{aligned} &= \text{Total moles of reactive sites on goethite per kg of soil} \left( \frac{\text{moles}}{\text{kg}} \right) \times \text{soil bulk density} \left( \frac{\text{kg}}{\text{L}} \right) \\ &\div \text{soil effective porosity (unitless)} \end{aligned}$$

*Total moles of reactive sites on goethite per 1L porewater*

$$= 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right) * 2.12 \div 0.2$$

$$\text{Total moles of reactive sites on goethite per 1L pore water} = 0.00693 \text{ moles/L}$$

This is the value for reactive sites on goethite provided in the example PHREEQC File “**#PHREEQC Input File\_Transport\_PWZ\_DSZ and Sediments2\_Chlorite2.phr**” provided in Appendix E of Appendix 7-C of the EIS. Goethite in the model was indicated by “Hfo\_”. The values “60” and “32.4” are the specific surface area of goethite (60 m<sup>2</sup>/g) and mass of goethite in contact with 1 L of porewater, respectively. The specific area and mass of goethite are not used in the model calculations, as the reactive sites are provided as the absolute number of moles (0.00693 moles reactive sites per 1 L of porewater).

(Excerpted from the PHREEQC input file provided)

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Surface 56-145 #Mineral Assemblage, reactive sites, Desilicified zone			
-equilibrate with solution 96-145			
Hfo	0.00693	60	34.2
-no_edl			
Hao_s	0.0008268	97	413.4
Hao_w	0.0165		
Hao_ww	0.0165		
-no_edl			
QOH	0.0119	0.31	10017
-no_edl			

## References

Appelo, C.A.J, and Postma, D. Geochemistry, groundwater and pollution, 2<sup>nd</sup> edition. CRC Press, Boca Raton, Florida. 649 pages.

## Attachment: IR-95

Number	IR-95
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-11
Context and Rationale	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated. Rationale: It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these K<sub>d</sub> analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients. In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of K<sub>d</sub> value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>
Information Requirement	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.

### Response:

Solid-liquid partition coefficients (K<sub>d</sub> values) were not used in the geochemical reactive transport modelling for groundwater except for the lake bottom sediments of Whitefish Lake, as described in Appendix 7-C, Sections 4.5.1 and 4.5.6.2.3 of the draft EIS. The lake bottom sediments are encountered only at the very end of the (much longer; approximately 1000 m) transport pathway from the mining area to Whitefish Lake and were conceptualized as a 1 m zone between the overburden soils and the lake (page 4.6 of Appendix 7-C of the draft EIS).

For reactive transport of groundwater through all subsurface hydrogeologic units (paleoweathered zone, Athabasca Group Sandstone units, and overburden materials), the geochemical code PHREEQC was incorporated for geochemical reactive transport modelling, and sorption reactions included cation exchange and adsorption of constituents from solution to reactive sites at the surface of mineral phases as surface complexes (i.e. using the Surface Complexation Model). The Surface Complexation Model accounts for:

- non-linear sorption of metals and other constituents

- competition amongst these constituents for reactive sites at mineral surfaces
- pH-dependent sorption.

$K_d$  values were presented in Appendix 7-C, Section 3.5.6.2.3 of the draft EIS as a check on the reasonableness of the modelled. COPC adsorption that was conceptualized in the model as occurring at quartz, illite and goethite mineral surfaces. It was important, *as a check*, to demonstrate that modelled sorption to these surfaces was not overpredicting COPC concentrations in the solid phase under initial/baseline conditions. To do this, measured concentrations of COPCs in core material were compared to predicted solids concentrations in the model. Further, using concentrations of COPCs in representative groundwater,  $K_d$  values were calculated from both the measured COPC concentrations and those modelled.

#### **Supplemental Information – calculation of $K_d$ s**

Information supplemental to the response above is presented herein to detail how the  $K_d$  values provided in Appendix 7-C, Section 3.5.6.2.3 and Table 3-11 of the draft EIS were calculated.

The  $K_d$  (L/kg) is calculated as the solid phase concentration of an element, divided by the dissolved-phase concentration of that element.

##### *Measured Solid-Phase COPC Concentrations:*

- “Desilicified Zone” refers to solid phase elemental concentrations in core from wells indicated in Figure 3-1 of Appendix 7-C of the draft EIS. Elemental concentrations were measured on total and partial digestions. The total number of samples used in the calculation of the maximum, minimum and median values of the solid phase concentrations was 1,459 for samples for which total digestion results were presented. This includes all elements presented other than arsenic (As) and selenium (Se). For these elements, only partial digestion results were available. The total number of samples used to calculate maximum, minimum and median solid phase concentrations for As and Se was 843.
- Elemental Analysis for the Paleoweathered Zone represents a total of 108 samples, as provided in Appendix E of Appendix 7C, Table E-1.

*Measured Solution-Phase Concentrations:* Representative groundwater concentrations of COPCs were those used in the model, and are presented in Appendix 7-C, Table 3-5.

An example  $K_d$  calculation is provided here below for chromium in the Desilicified Zone, using the measured median solid-phase concentration and the Cr concentration in groundwater:

$$K_d \text{ (L/kg)} = \frac{\text{Median Solid phase Cr concentration (total digestion; mg/kg)}}{\text{Concentration of Cr in Representative Solution for Desilicified Zone (mg/L)}}$$

$$K_d \text{ (L/kg)} = 8 \text{ mg/kg} \div 0.0005 \text{ mg/L}$$

$$K_d \text{ (L/kg)} = 1.6 \times 10^4 \text{ L/kg}$$

Calculating  $K_d$  values in this way is appropriate because it is calculated using measured data. Thus, no assumptions were made with respect to pH. The pH of groundwater in the system is circumneutral (i.e., pH = 6-7) and the measured solid-phase concentrations are from rock material that was in equilibrium with the groundwater when collected and analyzed.



In the PHREEQC and, likewise, piChem models, solid phase concentrations are yielded by assuming equilibrium occurs between the solution phase concentrations of COPCs, which are the inputs to the model, and the sorbing phases. As is described in Appendix 7C, Section 3.5.6.2.3, within the model the solid sorbent phases (quartz, illite and goethite) are “pre-loaded” (pre-equilibrated) with COPCs to bring the solid phase concentrations into equilibrium with the dissolved phase, groundwater, concentrations before the transport simulation is started. Outside of the model, an “Apparent  $K_d$ ” was then calculated by dividing the modelled solid phase concentration for each COPC by its solution phase concentration. These  $K_d$  values are referred to as “apparent” because they are modelled and because they are derived from the modelled concentrations metals sorbed to mineral surfaces and the modelled solution phase concentrations of those metals; they do not account, for example, for metals that are present within the crystal structure of the minerals in the bedrock.

The  $K_d$ s derived from the core and groundwater data were compared to the Apparent  $K_d$ s. For the majority of the COPCs and for both the Desilicified and paleoweathered zones, the modelled solid phase concentrations and apparent  $K_d$  values were below those measured, and calculated from measured values, respectively. This indicates that the model is not overpredicting solid-phase concentrations based on sorption, nor are the apparent  $K_d$  values exceeding those reported in the literature.”

It was noted that there a few were minor transcription errors in the results presented for the Desilicified Zone in Table 3-11 of Appendix 7-C. None of the corrections affect the interpretation above. The corrected table is given here (below), and will be updated in the final EIS.

Table 3-11: Solid-Phase Concentrations and Partitioning Constants for COPCs, measured and simulated (Updated)

Desilicified Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	8.46E+00	7.00E-01	2.25E+01	1.09E+02	1.09E+02	4.51E+00	1.58E+02	7.33E+01	4.00E-01	2.13E+02	3.71E+02	9.30E+01
Solid Phase Concentration - Minimum	mg/kg	9.00E-02	5.00E-02	1.20E-01	2.00E+00	2.00E-01	4.00E-02	1.00E+00	7.80E-01	1.00E-01	5.00E-01	1.40E+00	5.00E-01
Solid Phase Concentration - Median	mg/kg	5.60E-01	1.00E-01	4.90E-01	8.00E+00	2.00E+00	1.70E-01	6.00E+00	2.95E+00	1.00E-01	1.77E+00	7.70E+00	3.00E+00
Concentration in Representative Groundwater	mg/L	1.30E-03	1.00E-05	1.00E-04	5.00E-04	1.80E-03	4.20E-03	1.00E-04	1.00E-04	1.00E-04	7.00E-04	1.00E-04	1.20E-02
K <sub>d</sub> - maximum value	L/kg	6.51E+03	7.00E+04	2.25E+05	2.18E+05	6.06E+04	1.07E+03	1.58E+06	7.33E+05	4.00E+03	3.04E+05	3.71E+06	7.75E+03
K <sub>d</sub> - minimum value	L/kg	6.92E+01	5.00E+03	1.20E+03	4.00E+03	1.11E+02	9.52E+00	1.00E+04	7.80E+03	1.00E+03	7.14E+02	1.40E+04	4.17E+01
K <sub>d</sub> - median value	L/kg	4.30E+02	1.00E+04	4.90E+03	1.60E+04	1.11E+03	4.05E+01	6.00E+03	2.95E+04	1.00E+03	2.53E+03	7.70E+04	2.50E+02
Modelled Solids Concentration <b>Base Case</b>	mg/kg	7.70E-03	1.11E-04	5.62E-03	1.90E+00	3.57E+00	5.51E-07	1.30E-02	8.68E-02	6.60E-06	7.25E-02	3.90E-07	1.37E+00
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	5.92E+00	1.11E+01	5.62E+01	3.81E+03	1.98E+03	1.31E-04	1.30E+02	8.68E+02	6.60E-02	1.04E+02	3.90E-03	1.14E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	5.92E-01	1.11E+00	5.62E+00	3.81E+02	1.98E+02	1.31E-05	1.30E+01	8.68E+01	6.60E-03	1.04E+01	3.90E-04	1.14E+01
Paleoweathered Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	5.66E+02	8.00E+00	4.23E+02	4.41E+02	5.24E+04	3.93E+03	5.88E+02	5.15E+03	2.00E+02	5.56E+04	6.05E+03	1.58E+03
Solid Phase Concentration - Minimum	mg/kg	5.00E-01	1.00E-01	6.00E+00	6.00E+00	5.00E+00	5.00E-01	4.40E+01	1.00E+00	5.00E-01	9.00E+00	2.20E+01	7.00E+00
Solid Phase Concentration - Median	mg/kg	2.40E+01	1.00E+00	2.80E+01	1.55E+02	2.28E+02	5.00E+00	1.67E+02	4.60E+01	1.00E+00	4.03E+02	3.10E+02	3.10E+01
Concentration in Representative Groundwater	mg/L	5.00E-02	1.00E-05	1.00E-02	4.50E-03	5.00E-03	1.28E-02	1.50E-02	1.00E-04	1.00E-04	1.24E-02	1.00E-04	4.25E-03
K <sub>d</sub> - maximum value	L/kg	1.13E+04	8.00E+05	4.23E+04	9.80E+04	1.05E+07	3.07E+05	3.92E+04	5.92E+07	2.00E+06	4.49E+06	6.05E+07	3.72E+05
K <sub>d</sub> - minimum value	L/kg	1.00E+01	1.00E+04	6.00E+02	1.33E+03	1.00E+03	3.91E+01	2.93E+03	7.00E+04	5.00E+03	7.26E+02	2.20E+05	1.65E+03
K <sub>d</sub> - median value	L/kg	4.80E+02	1.00E+05	2.80E+03	3.44E+04	4.56E+04	3.91E+02	1.11E+04	8.30E+05	1.00E+04	3.25E+04	3.10E+06	7.29E+03
Modelled Solids Concentration <b>Base Case</b>	mg/kg	1.87E-01	9.80E-05	4.69E-01	0.00E+00	5.30E+00	0.00E+00	2.34E+00	6.34E-02	2.87E-06	3.63E-01	0.00E+00	4.41E-01
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	3.74E+00	9.80E+00	4.69E+01	0.00E+00	1.06E+03	0.00E+00	1.56E+02	6.34E+02	2.87E-02	2.93E+01	0.00E+00	1.04E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	3.74E-01	9.80E-01	4.69E+00	0.00E+00	1.06E+02	0.00E+00	1.56E+01	6.34E+01	2.87E-03	2.93E+00	0.00E+00	1.04E+01
Literature K <sub>d</sub> values (mean value and range) <sup>a,b</sup>	L/kg	550 (25-3000)	15 (2.0-250)	1.9x10 <sup>3</sup> (29-99,000)	18 (1.0-1600)	530 (760-2700)	40 (7-130)	58 (7.0-1100)	2000 (25- 130,000)	56 (4-1600)	740 (2.6 - 6.2x10 <sup>4</sup> )	1.1-2.7	1.6x10 <sup>3</sup> (6.2- 30,000)

**Notes**

<sup>a</sup> Literature K<sub>d</sub> values are for pH values ranging from 5-8 from IAEA, 2010. These values show mean values (and range). Value for Cd is for soils with pH < 6.5. Where pH dependent K<sub>d</sub> values were not available, the mineral soil texture values were obtained. Where a K<sub>d</sub> was not available for mineral soil, the value for "All soil" texture or "Sand" was used.

<sup>b</sup> Literature range of K<sub>d</sub> values for Vanadium taken from US EPA, 2005

<sup>c</sup> Literature value of maximum K<sub>d</sub> for pH values ranging from 5-7 from IAEA, 2010.

## Attachment: IR-96

Number	IR-96
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions
Context and Rationale	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (<math>1 \times 10^{-9}</math> m<sup>2</sup>/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)”. The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport. Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p>Reference: [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>
Information Requirement	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large- scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89</p>

### **Response Part 1:**

The transport parameters applied in the model were not calibrated and that is why they were: a) selected to be conservative, and b) why more conservative parameters were selected for prediction uncertainty analyses.

Diffusion rates are unknown, as is commonly the case at most sites, and so a representative literature value was selected. Matrix diffusion of mass into lower permeability zones is considered the most relevant area for diffusion; migration to Whitefish Lake is advection-dominated such that diffusion along

the flow path would not appreciably enhance transport timing. Matrix diffusion was accounted for in the set-up of transport simulation parameters using PHREEQC.

Longitudinal and transverse dispersivity rates can vary greatly and are generally scale dependent. Literature references for dispersivity are noted below and used to estimate longitudinal and transverse dispersivity rates for the plume, which is estimated to have a length of 0.9 to 1.7 km. Graphic representation of the values suggested by the literature are appended.

- Gelhar et al. (1992), as quoted in the B.C. guidance (BC MOE, 2012), suggests a representative longitudinal dispersivity of approximately 40 m (with a range from 10 to 150 m), and a transverse dispersivity of 5 m.
- Neuman (1995) suggests a “best fit” longitudinal dispersivity of 350 m to be consistent with field observed values (note the range of model-calibrated values was 10 to 350 m).
- Schulze-Makuch (2005), suggests a best fit value for sandstone units of 10 to 20 m.
- Chapman et al (2014) found a longitudinal dispersivity for a site in a similar fractured sandstone environment to be 10 m for a plume 1.2 km in length. Martin et al. (2019) found the equivalent longitudinal dispersivity appropriate under dual porosity and EPM simulations was 10.7 m for the same site.

Recognizing all of this, the longitudinal dispersivity applied (i.e., 10 m) is considered reasonable, and the more conservative value of 5 m represents a reasonable lower bounding limit. Similarly, the literature supports the transverse dispersivity value of 5 m applied. It was noted that minor exceedances were noted under the lower dispersivity simulations; however, these simulations more importantly also contain conservative geochemical assumptions, such that we feel such breakthrough is unlikely.

## **Response Part 2:**

As noted in the literature (e.g., Neuman et al., 2003; Neuman, 2006) dispersivity is expected to increase as a plume encounters heterogeneities of increasing length-scales. This is the foundation of scale-dependent dispersivity. As such, large-scale heterogeneity will enhance dispersion of the plume, and reduction of solute concentrations, as the plume gets larger and encounters heterogeneities of increasing length-scales. At the Phoenix site, an example of such large-scale features is the desilicified zone, wherein dispersion is simulated to play a role in reducing transported solute concentrations. The dispersion of solute concentrations is coupled with geochemical reactions along the plume trajectory. The plume dispersion exposes concentrations to a greater surface area of the geologic materials, which enhances the ability of geochemical processes to curtail plume migration.

## **References**

- British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.
- Chapman, S.W., B. Parker, J. Cherry, P. Martin, D. Abbey, S.D. McDonald. 2014. Combined EPM-DFN Modelling Approach for Plume in Sedimentary Bedrock Aquifers. DFNE 2014-236.
- Gelhar, L.W., Welty, C., & Rehfeldt, K.R. (1992). A critical review of data on field-scale dispersion in aquifers. *Water Resources Research* 28, no. 7, 1955-1974.
- Martin, P.J., B. Parker, S. Chapman, and K. Walton. 2019. Utilizing the DFN-M Framework to Inform Transport Modelling. Presentation to the American Geophysical Union (AGU).

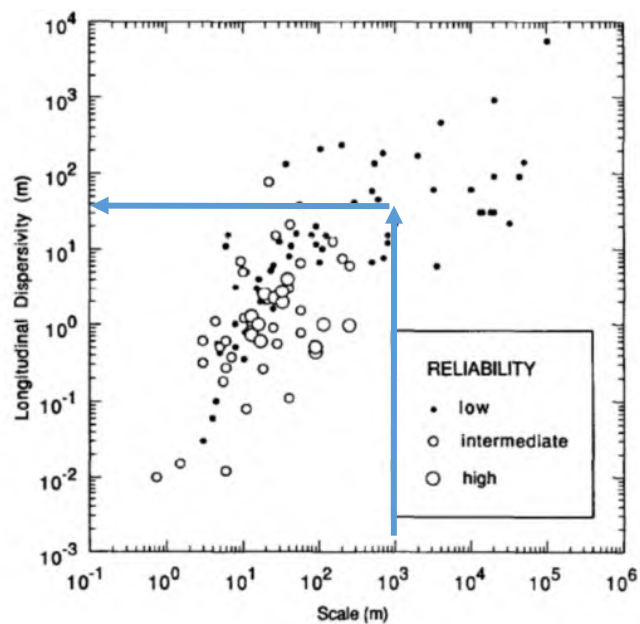
Neuman, S.P. 1990. Universal scaling of hydraulic conductivities and dispersivities in geologic media. *Water Resources Research* 26, no. 8: 1749–1758.

Neuman, S.P. 1995. On advective dispersion in fractal velocity and permeability fields. *Water Resources Research* 31, no. 6: 1455–1460.

Neuman, S.P., and V. Di Federico. 2003. Multifaceted nature of hydrogeologic scaling and its interpretation. *Reviews of Geophysics* 41, no. 3: 1014.

Neuman, S.P. 2006. Response to paper: Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 44, no. 2: 139–141.

Schulze-Makuch, D. 2005. Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 43, no. 3: 443–456.



(b)

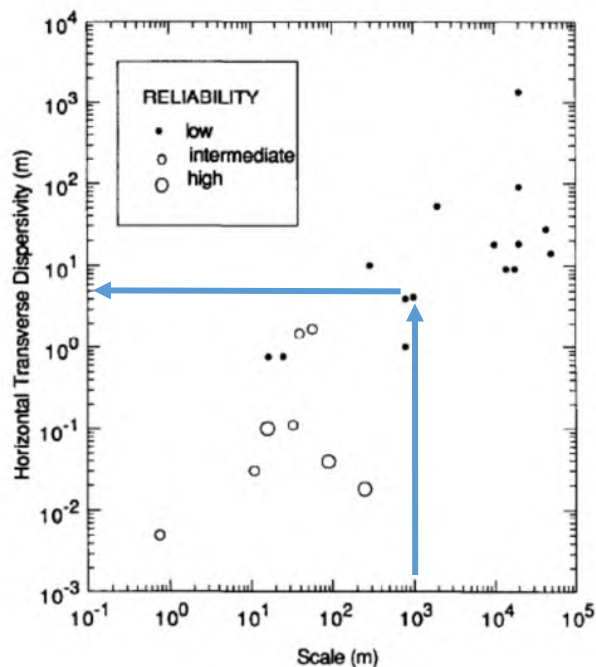
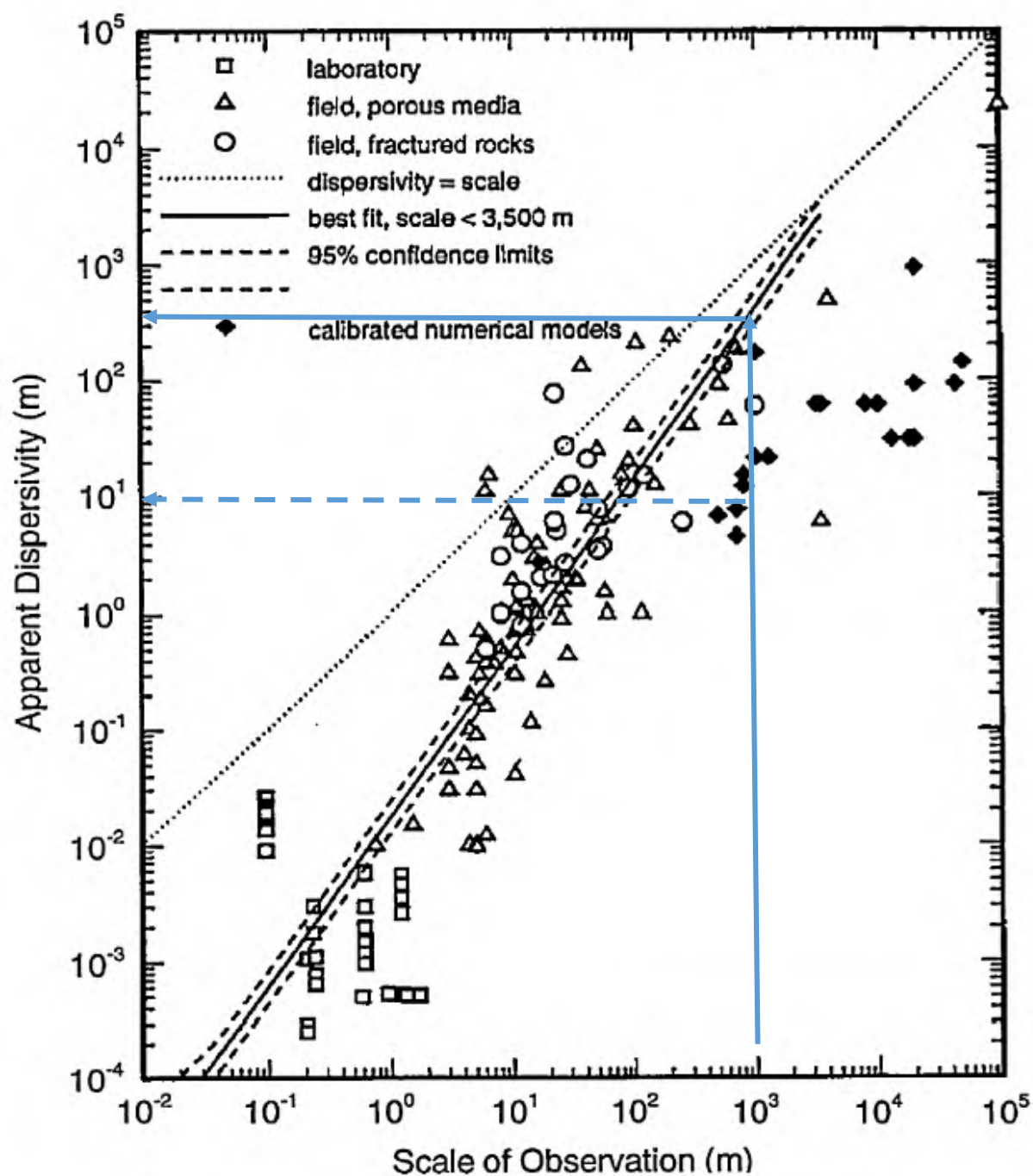
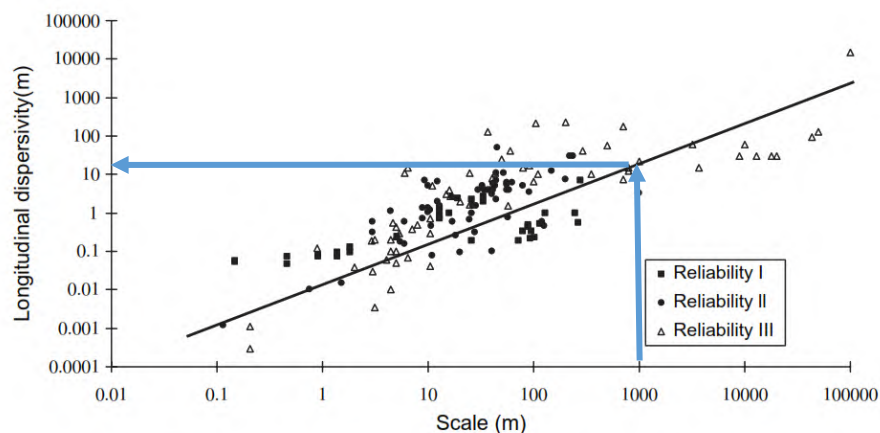


Figure 9-5: (a) Longitudinal dispersivity versus scale with data classified by reliability and (b) horizontal transverse dispersivity as a function of observation scale (from Gelhar et al., 1992).

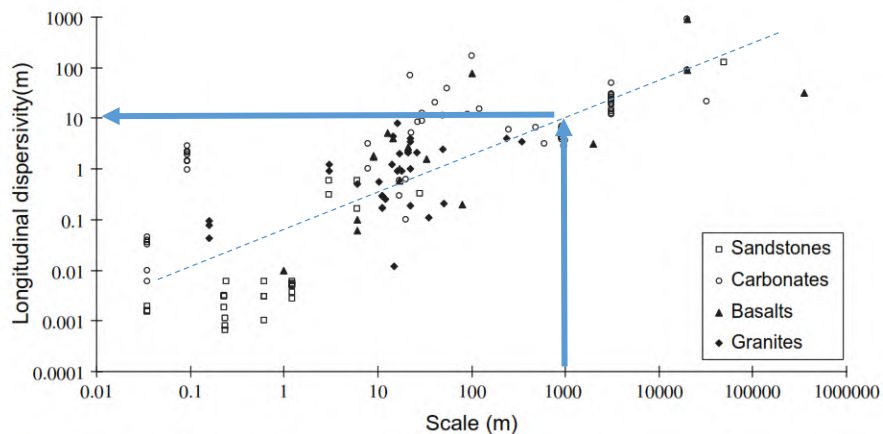




**Figure 1. Apparent longitudinal dispersivities vs. scale of observation based on worldwide tracer studies (after Neuman 1995).**



**Figure 1. Relationship of longitudinal dispersivity to scale of measurement for unconsolidated sediments. The line represents the regression line for all data points (regardless of assigned reliability class) with a scaling exponent of 0.81 and a  $c$  value of 0.085 m.**



**Figure 2. Relationship of longitudinal dispersivity to scale of measurement for various rock types. The scaling behavior for each rock type is quantified in Table 3.**

## Attachment: IR-99

Number	IR-99
Dept.	CNSC
Project effects link	Aquatic environment
Reference to EIS, appendices, or supporting documentation	Section 8, Water Quality, Table 8.2-13
Context and Rationale	<p>Context: Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.</p> <p>Rationale: It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L.</p>
Information Requirement	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.

Revised Table 8.2-13 to support response in IR table:

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated)

Location	Maximum Concentration (mg/L) of Non-radionuclides in Surface Waters During Project Phases										
	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	8.40E-04
Location	Maximum Concentration (Bq/L) of Radionuclides in Surface Waters During Project Phases										
	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-210	Polonium-210					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03					
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03					
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03					
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03					
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03					
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03					
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03					

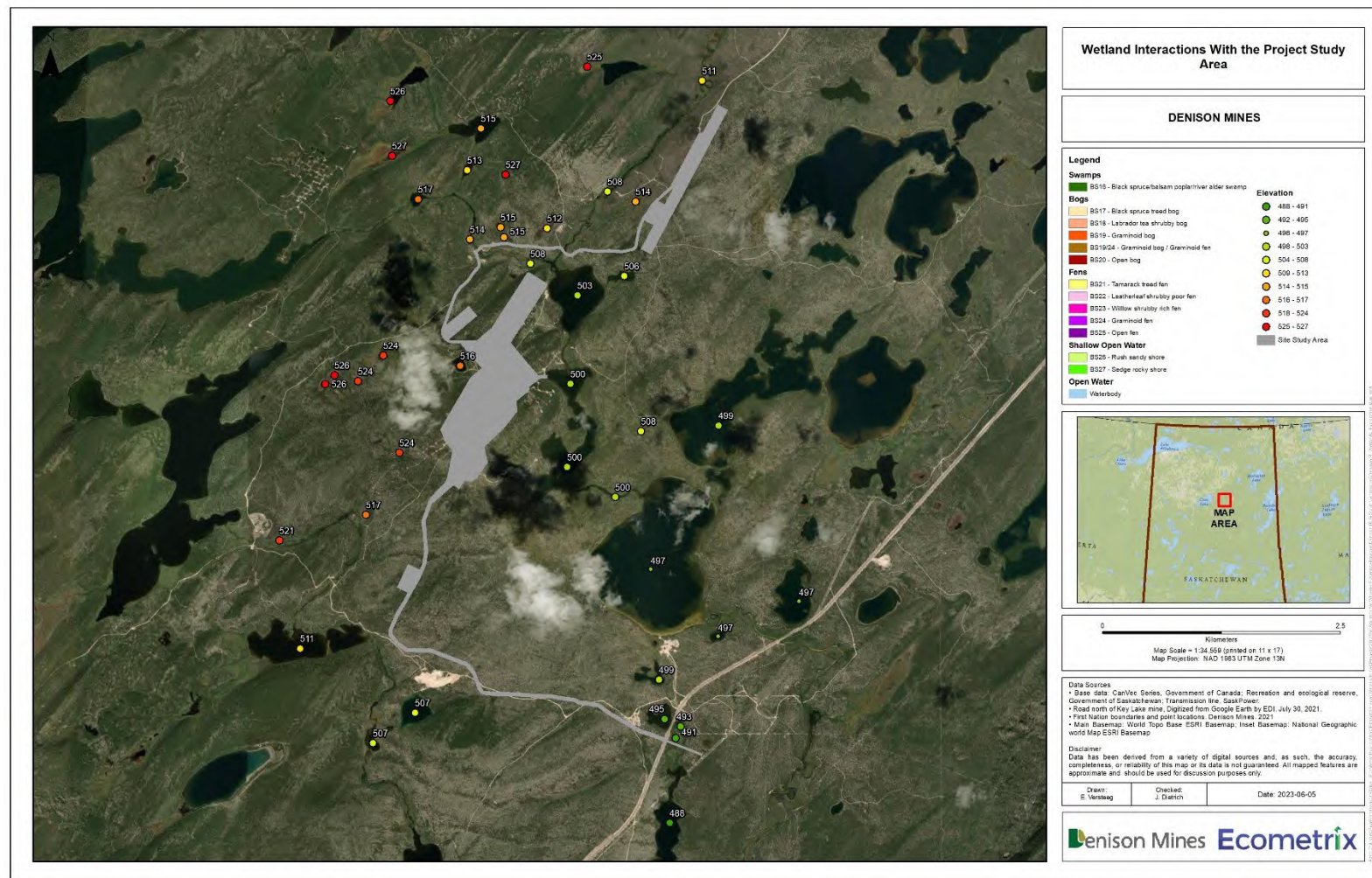
## Attachment: IR-101

Number	IR-101
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment
Context and Rationale	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>
Information Requirement	1) Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of

	<p>wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <ol style="list-style-type: none"><li>2) Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</li><li>3) Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</li><li>4) Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</li></ol>
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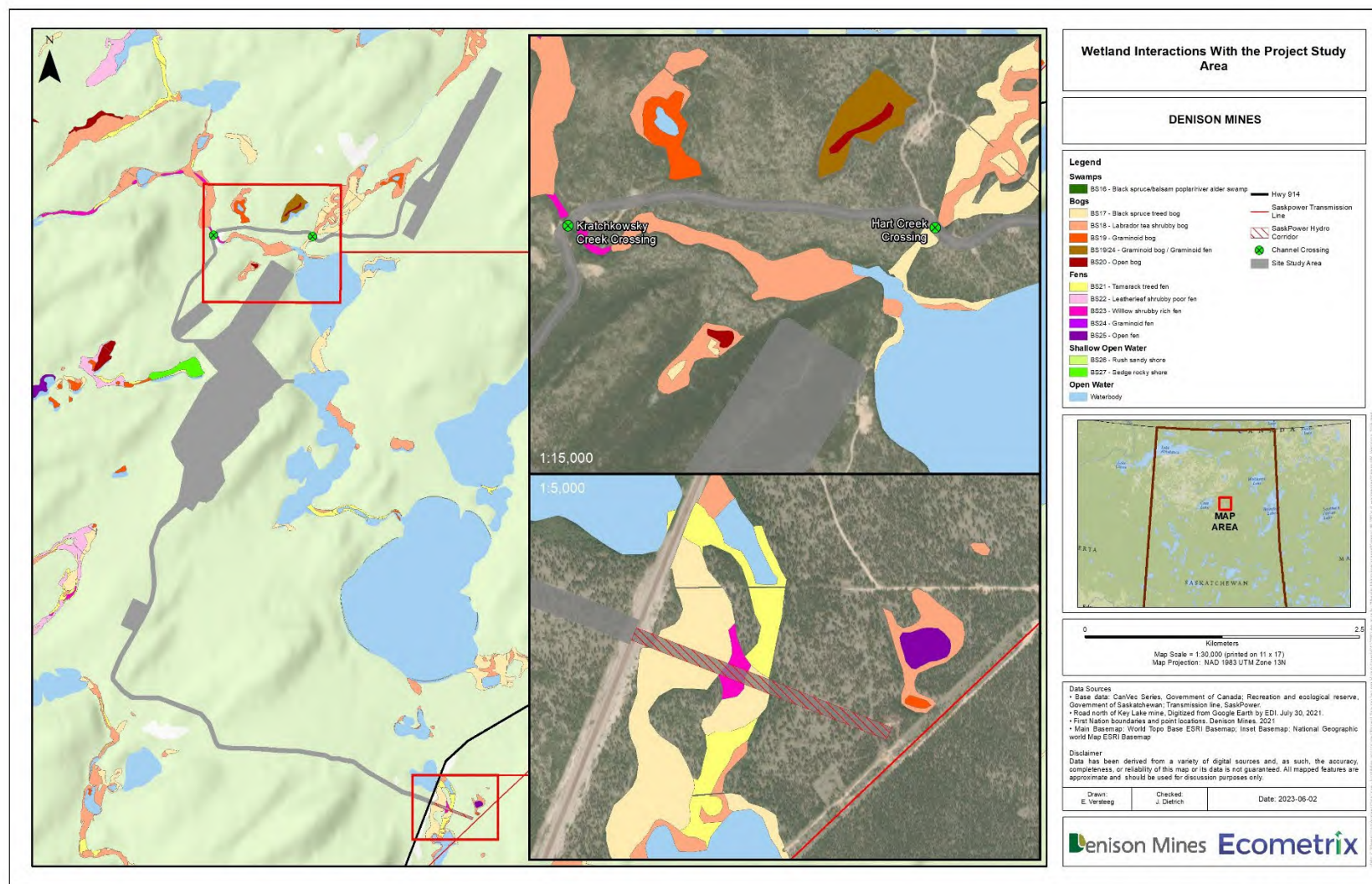
Supporting figures to the response provided in table:





Attachment IR-101 Figure 1 – Elevations of Wetland Features in the LSA.





Attachment IR-101 Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution

## Attachment: IR-102

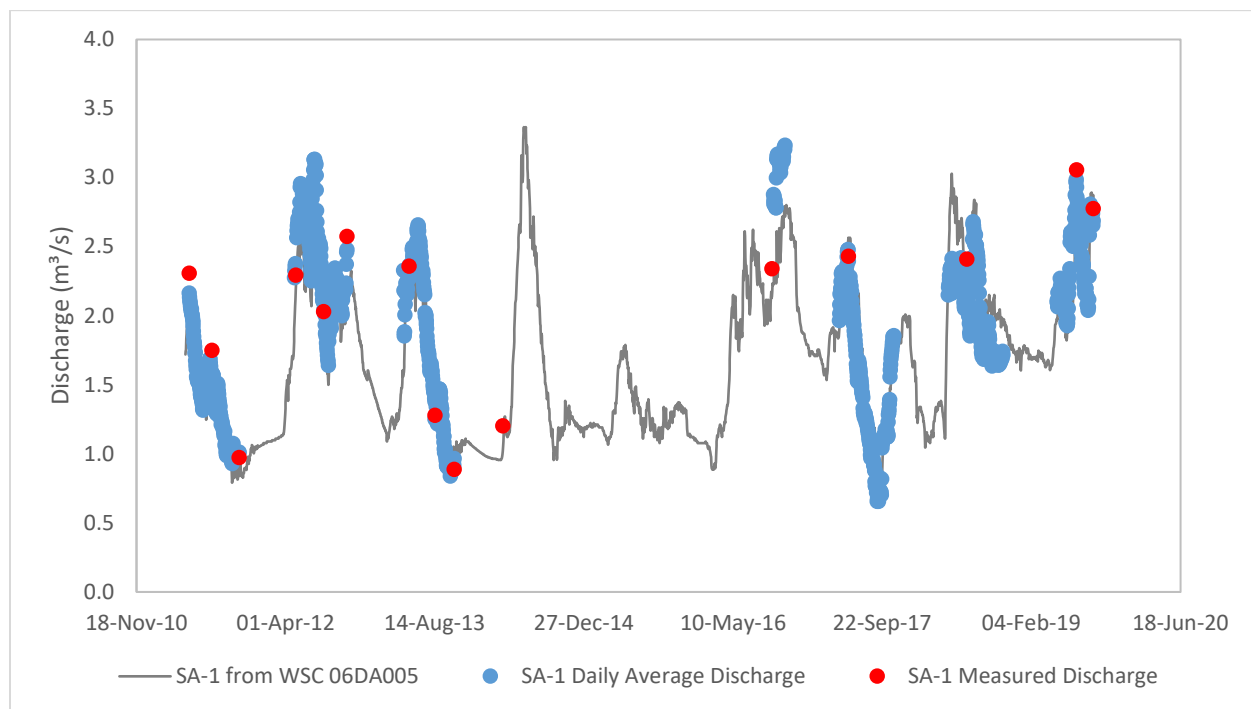
Number	IR-102
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	8.1.3.1 Appendix 8-C, including Appendix II, Table 1 (p. 2)
Context and Rationale	<p><b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent's estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.</li> <li>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</li> <li>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</li> </ol>

Supporting information to the response provided in table:

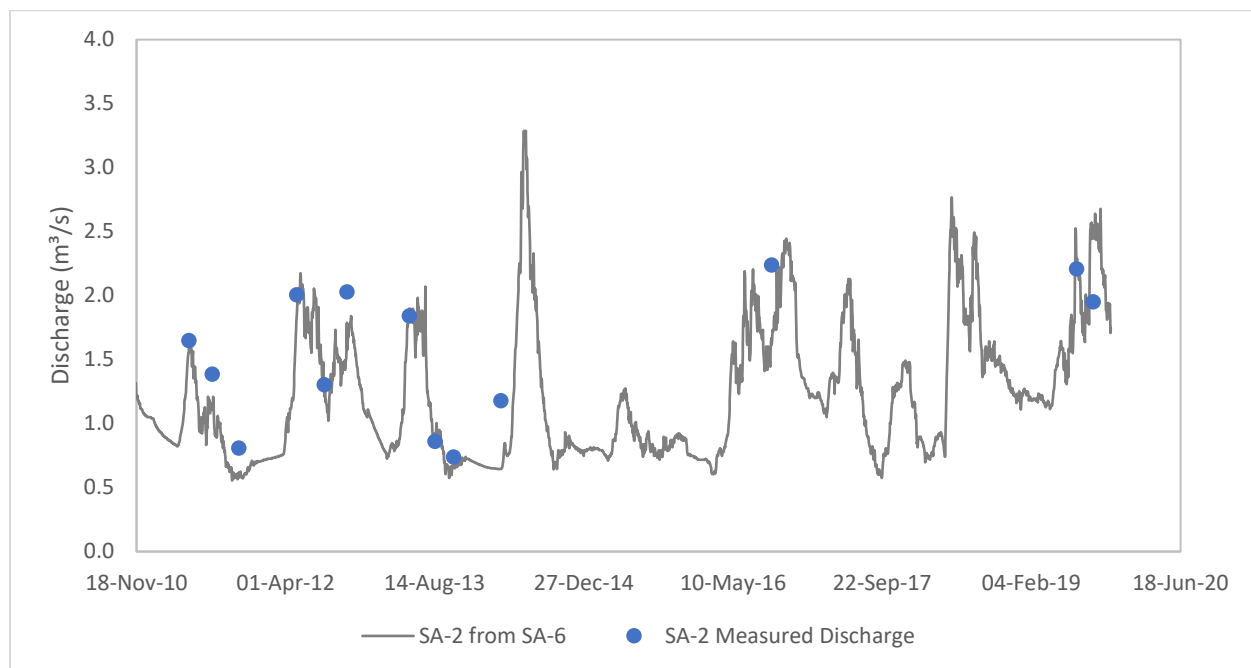
Attachment IR-102 Table 1: Record Extension Variables

Assessment Node (AN)	Assessment Node Drainage Area (km <sup>2</sup> )	Source Station (SS)	Source Station Drainage Area (km <sup>2</sup> )	Extension Method	Equation Parameters: $QAN = A(B+C(QSS+D)E)$				
					A	B	C	D	E
SA-1	280.55	06DA005	3030	Correlation	7.1250E-01	0.0000E+00	1.3029E-01	0.0000E+00	1.0599E+00
SA-2	257.36	SA-6	251.69	Unit Area Runoff with Scaling and Offset	1.0000E+00	-6.2600E-02	1.0708E+00	0.0000E+00	1.0000E+00
SA-3	15.537	SA-1	280.55	Unit Area Runoff with Scaling	1.0000E+00	0.0000E+00	2.3453E-01	0.0000E+00	1.0000E+00
SA-4	80.498	SA-6	251.69	Correlation	7.6738E-01	0.0000E+00	3.4997E-01	0.0000E+00	9.0494E-01
SA-5	167.32	SA-6	251.69	Unit Area Runoff	6.6479E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
SA-6/LA-6	251.69	SA-1	280.55	Correlation	8.0221E-01	3.3463E-01	2.1528E-01	5.3078E-01	2.0643E+00
SB-3	24.869	SA-1	280.55	Unit Area Runoff	8.8644E-02	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-1	277.52	SA-1	280.55	Unit Area Runoff	9.8920E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-5	257.18	SA-2	257.36	Unit Area Runoff	9.9930E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00

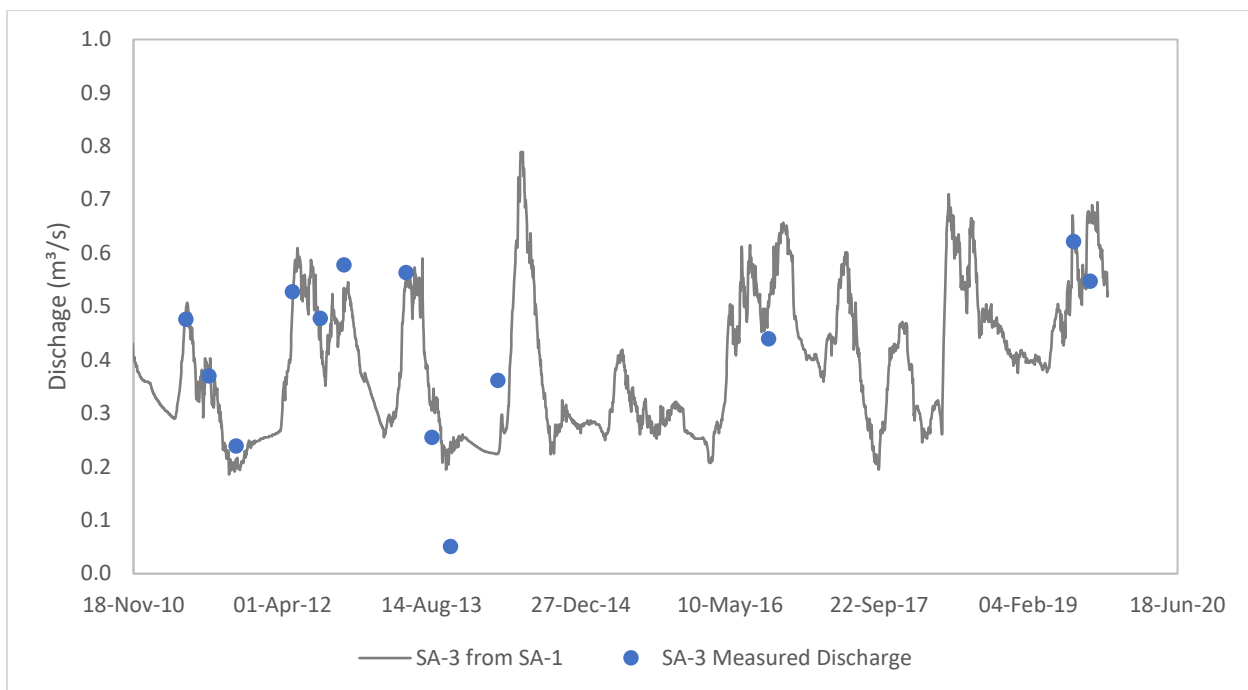
Attachment IR-102 Figure 1: SA-1 from WSC 06DA005



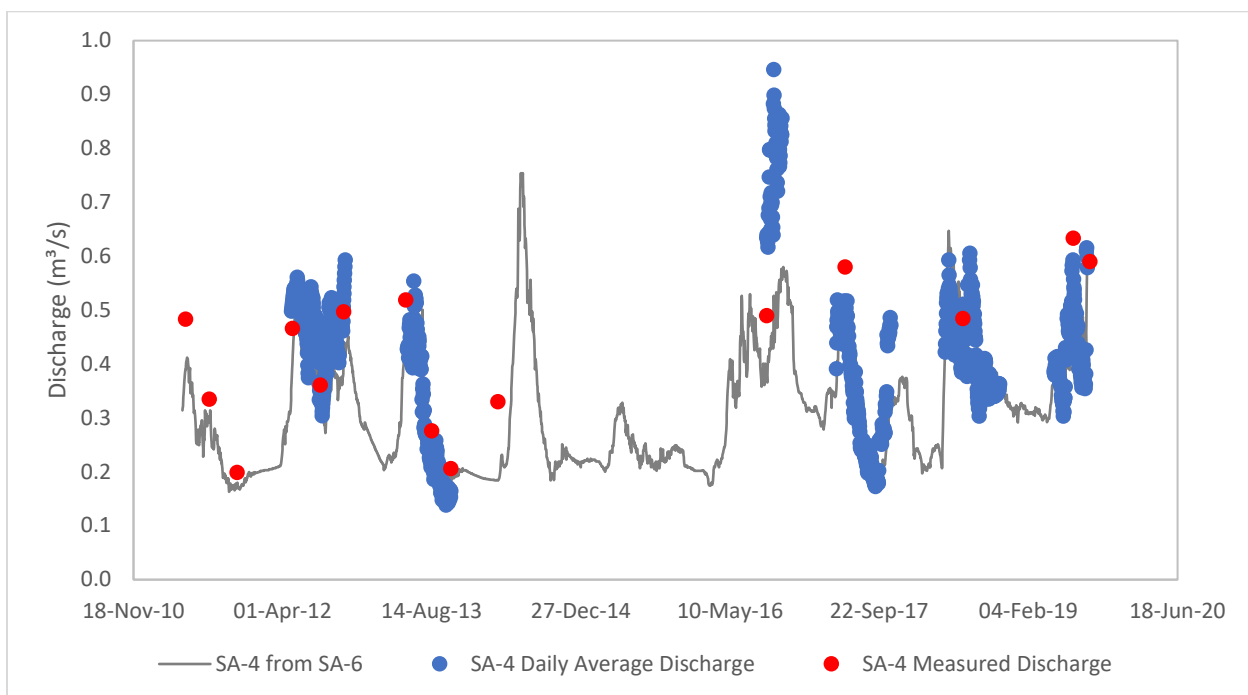
Attachment IR-102 Figure 2: SA-2 from SA-6



Attachment IR-102 Figure 3: SA-3 from SA-1

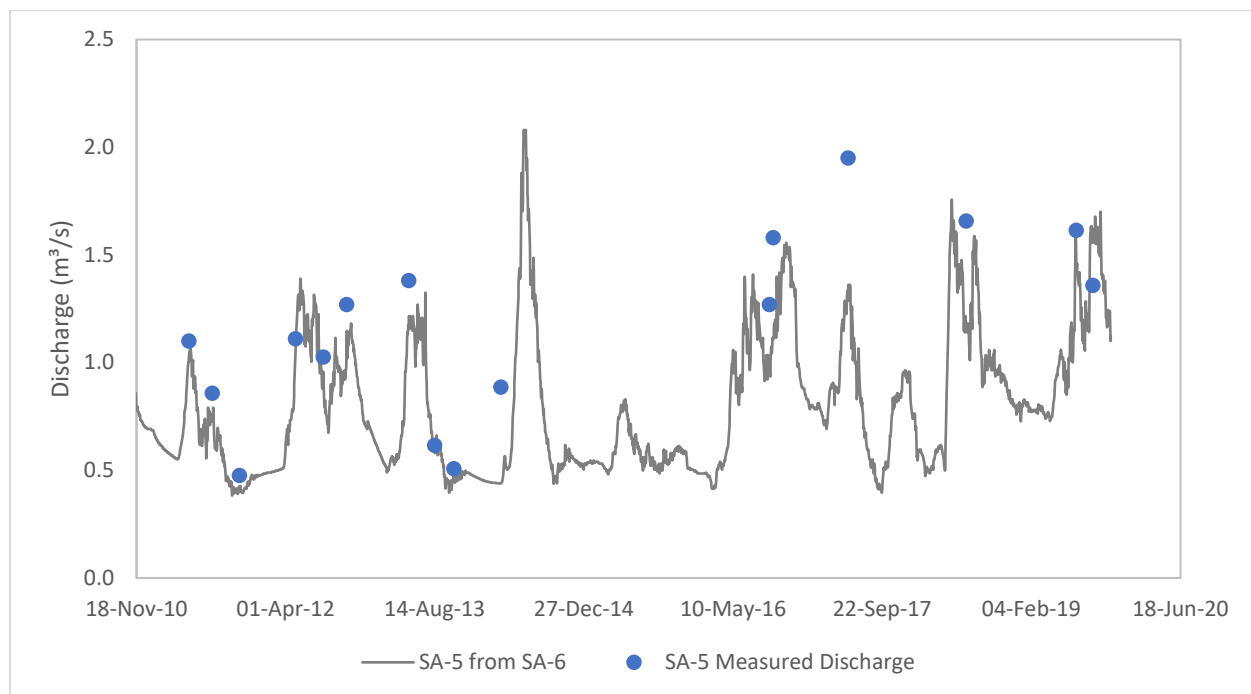


Attachment IR-102 Figure 4: SA-4 from SA-6

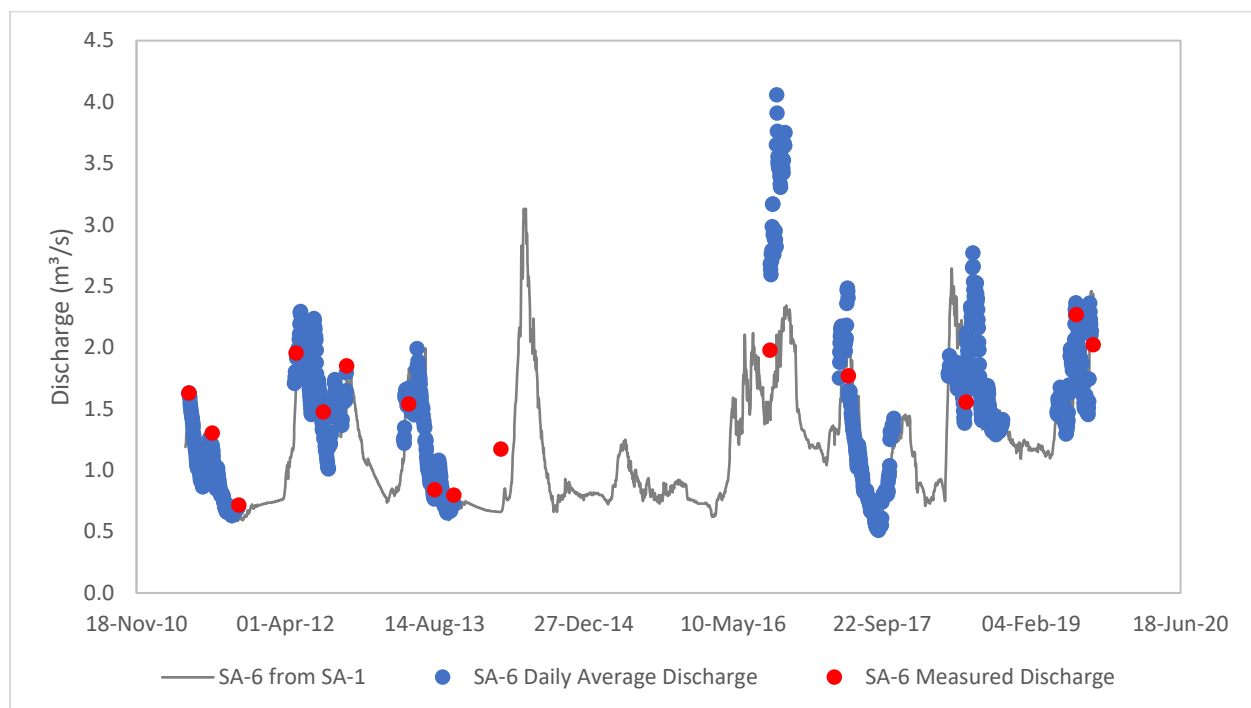




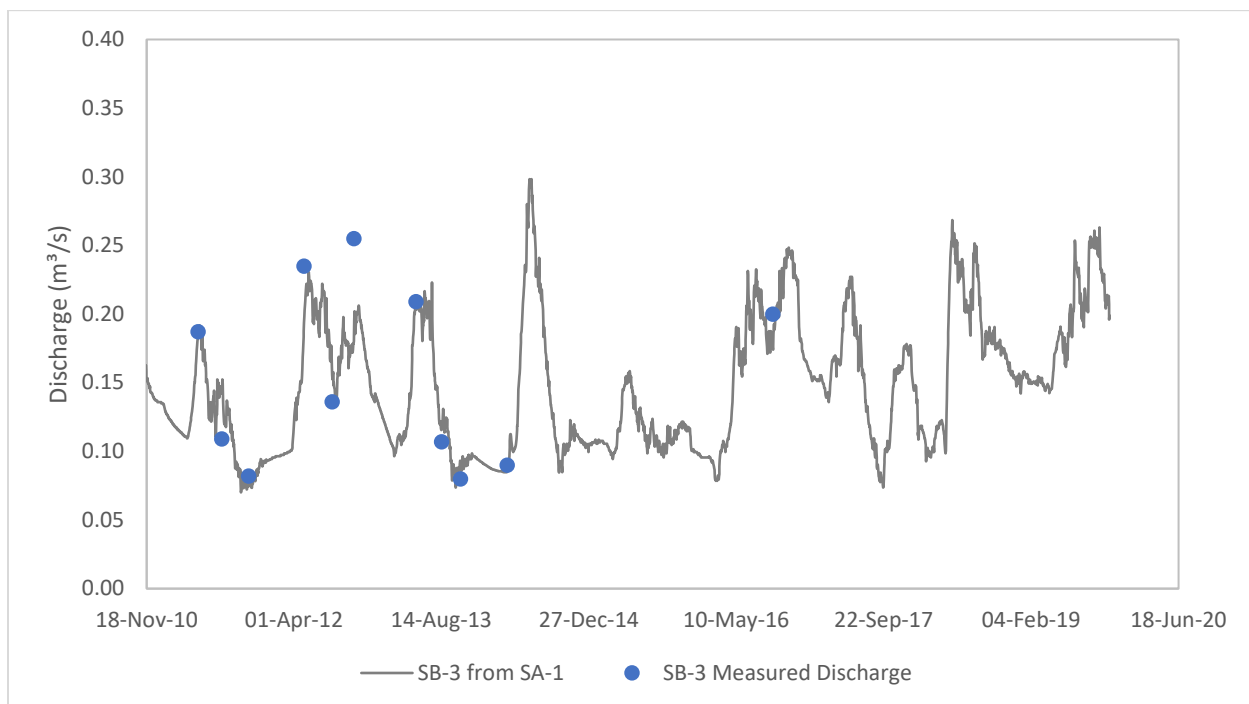
Attachment IR-102 Figure 5: SA-5 from SA-6



Attachment IR-102 Figure 6: SA-6 from SA-1



Attachment IR-102 Figure 7: SB-3 from SA-1



## Attachment: IR-108

Number	IR-108
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.3.3 Aquatic Environment
Context and Rationale	<p>Context: Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><u>Rationale:</u> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>
Information Requirement	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>

### Response:

Tables 8.2-2 and 8.2-3 will be updated in the final EIS to include 1) all COPCs that require effluent characterization and receiving environment monitoring under the MDMER and 2) missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters. The updated EIS tables are provided below for completeness.

**Table 8.2-2: Baseline Surface Water Quality in Local Study Area Lakes and Russell Lake (Updated)**

Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Alkalinity	mg/L			2	10	6	3	13	7.7	3	38	15
Aluminum	mg/L	0.005	SEQG	0.001	<b>0.0051</b>	0.0034	0.0048	<b>0.0078</b>	<b>0.0061</b>	0.005	<b>0.073</b>	<b>0.0201</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.09	0.0266	<0.01	0.07	0.043	<0.01	0.05	0.026
Ammonia, *unionized	ug/L	19	CWQG	0.008	0.072	0.0229	0.013	0.105	0.0543	0.005	0.036	0.0164
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.000233	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0023	0.0038	0.003	0.0021	0.0032	0.0027	0.0024	0.0051	0.00328
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	12	7.8	4	16	9.3	4	46	13.4
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	0.00003	0.000015	<0.00001	0.00002	0.000013	<0.00001	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.35	1.2	1.6	1.4	1.1	1.5	1.24
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.5	0.43	0.3	0.4	0.33	0.3	0.4	0.32
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.00024
DOC	mg/L			2	2.6	2.23	2	2.5	2.2	2	2.5	2.22
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	<0.01	0.08	0.03166	0.02	0.07	0.037	0.02	0.08	0.042
Hardness	mg/L			5	6	5.5	5	6	5.3	5	5	5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.037	0.27	0.12	0.04	0.19	0.11	0.031	0.21	0.1064
Lead	mg/L	0.001	CWQG	<0.0001	0.0004	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	<b>0.0012</b>	0.00032
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.42	0.4	0.4	0.4	0.2	0.4	0.36

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Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Manganese	mg/L			0.0039	0.029	0.016	0.0046	0.02	0.0142	0.0024	0.019	0.01232
Mercury	mg/L	2.60E-05	CWQG	1.00E-07	1.00E-05	6.00E-06	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-05	6.00E-06
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.00016
Nitrate	mg/L	13.29	SEQG	<0.04	0.49	0.18	<0.04	0.26	0.15	<0.04	0.31	0.1725
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.52	6.94	6.77	6.6	7	6.8	<b>5.71</b>	6.79	6.502
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	0.008	0.006	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.37	0.2	0.4	0.33	0.2	0.4	0.32
Radium-226	Bq/L	0.11	SSWQO	<0.005	<0.005	<0.005	<0.005	0.01	0.0076667	<0.005	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.8	1.5	1.4	1.7	1.5	1.4	1.8	1.52
Conductivity	µS/cm			9	24	16.8	16	22	19	9	21	15.2
Strontium	mg/L			0.012	0.016	0.014	0.012	0.015	0.013	0.011	0.014	0.0126
Sulphate	mg/L	128	SEQG	0.7	0.8	0.75	0.6	0.7	0.63	0.5	0.7	0.64
Sum of Ions				6	18	12.5	8	22	14	8	51	18
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.0133	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	0.0013	0.0004	<0.0001	0.0008	0.00033	<0.0001	0.0011	0.0003
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			18	26	22.167	22	29	24	14	29	22.2
TKN	mg/L			0.17	0.38	0.27333	0.14	0.34	0.22	0.24	0.43	0.306
TOC	mg/L			2.2	2.6	2.3667	1.9	4.3	2.8	2.2	2.9	2.36
TSS	mg/L			<1	4	2.5	<1	4	2.66	<1	4	2

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Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.001	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	0.02	0.00474

**Table 8.2-2 (Continued)**

Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			2	14	7.7	8	8	8	7	12	9.5
Aluminum	mg/L	0.005	SEQG	0.0023	0.0025	0.0024	0.0029	0.0029	0.0029	<b>0.0067</b>	<b>0.0096</b>	<b>0.0082</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.0233	<0.01	<0.01	<0.01	<0.01	0.04	0.025
Ammonia, *unionized	ug/L			0.016	0.055	0.0303	0.033	0.033	0.033	0.011	0.028	0.0195
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium	mg/L			0.0033	0.0039	0.0036	0.0034	0.0034	0.0034	0.0033	0.0046	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	17	9	10	10	10	8	15	12
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L			2.7	3.9	3.5	3.5	3.5	3.5	1.3	1.8	1.6
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	<0.1	0.5	0.3333333	0.4	0.4	0.4	0.2	0.2	0.2
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.1	2.5	2.3	2.2	2.2	2.2	2.6	3.5	3.1
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02
Fluoride	mg/L	0.12	CWQG	0.02	0.07	0.04	0.03	0.03	0.03	<0.01	0.07	0.04



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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Hardness	mg/L			9	13	11	12	12	12	5	6	5.5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.056	0.08	0.070667	0.039	0.039	0.039	0.15	0.15	0.15
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.5	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4
Manganese	mg/L			0.029	0.064	0.045	0.019	0.019	0.019	0.0094	0.037	0.0232
Mercury	mg/L	2.60E-05	CWQG	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-07	1.00E-07	1.00E-06	1.00E-05	5.50E-06
Molybdenum	mg/L	26	SEQG	0.0003	0.0013	0.00077	0.0011	0.0011	0.0011	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.00015
Nitrate	mg/L	13.29	SEQG	0.05	0.44	0.25	0.05	0.05	0.05	<0.04	0.66	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.7	7	6.9	7.2	7.2	7.2	6.7	6.8	6.8
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	mg/L			0.3	0.6	0.5	0.8	0.8	0.8	0.2	0.4	0.3
Radium-226	Bq/L	0.11	SSWQO	<0.005	0.006	0.0053333	0.007	0.007	0.007	<0.005	0.008	0.0065
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.7	2	1.8	1.7	1.7	1.7	1.4	1.6	1.5
Conductivity	µS/cm			30	47	38	42	42	42	20	22	21
Strontium	mg/L			0.017	0.018	0.017	0.016	0.016	0.016	0.013	0.016	0.0145
Sulphate	mg/L	128	SEQG	3.7	8.1	6.5	8.3	8.3	8.3	0.5	0.8	0.65
Sum of Ions				18	28	23	25	25	25	12	21	16.5
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Tin	mg/L			<0.0001	0.001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.00045
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			30	35	32	35	35	35	19	30	24.5
TKN	mg/L			0.14	0.22	0.17	0.29	0.29	0.29	0.13	0.35	0.24
TOC	mg/L			2.2	2.6	2.4	2.2	2.2	2.2	2.7	3.6	3.2
TSS	mg/L			1	1	<1.0	4	4	4	<1	<1	<1
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.00115

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

**Table 8.2-3: Baseline Surface Water Quality in Local Study Area Watercourses (Updated)**

Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	13	5.5	2	11	6.75	1	23
Aluminum	mg/L	0.005	SEQG	0.0022	<b>0.0056</b>	0.0037	0.0039	<b>0.081</b>	<b>0.015</b>	0.0013	<b>0.006</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.014	<0.01	0.04	0.01375	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.005	0.036	0.0143	0.006	0.024	0.013	0.004	0.036
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0022	0.0035	0.00267	0.0019	0.0041	0.0026625	0.0025	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	16	6.7	2	13	8.125	1	28
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	0.000012	<1.0E-05	0.00002	0.0000125	1.00E-05	0.00002
Calcium	mg/L			1.3	1.7	1.4	1.2	1.7	1.3375	1.5	1.9
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.4	0.3125	0.5	0.7
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.000275	<0.0002	<0.0002
DOC	mg/L			1.7	2.4	2.13	1.9	2.5	2.225	1.7	2.6
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.026	0.01	0.03	0.01625	<0.01	0.07
Hardness	mg/L			5	6	5.3	4	6	4.75	5	7
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.031	<b>0.31</b>	0.1215	0.041	0.11	0.073875	0.036	0.13
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.000125	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	0.05	0.02375	<0.02	0.03
Magnesium	mg/L			0.3	0.7	0.43	0.3	0.6	0.375	0.4	0.5

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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Manganese	mg/L			0.0041	0.025	0.01467	0.0044	0.017	0.010325	0.0066	0.023
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.26	0.0714286	<0.04	0.31	0.094	<0.04	0.26
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.34</b>	6.99	6.75	6.58	7.01	6.7775	<b>6.42</b>	7.02
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.01	0.0054999	<0.005	<0.005	<0.005	<0.005	0.01
Potassium	mg/L			0.2	0.5	0.36	0.1	0.4	0.3375	0.3	0.5
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.0061	<0.005	0.01	0.006125	<0.005	0.01
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.7	1.53	1.2	1.8	1.45	1.4	1.8
Conductivity	µS/cm			16	22	18.2	14	22	17	18	24
Strontium	mg/L			0.011	0.015	0.0127	0.011	0.015	0.012125	0.013	0.018
Sulphate	mg/L	128	SSWQO	0.4	0.9	0.71	<0.2	0.7	0.5875	0.4	0.8
Sum of Ions				6	22	11.5	6	19	12.5	6	33
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.01125	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0015	0.000375	<0.0002	<0.0002
TDS	mg/L			18	25	21.7	13	30	21.25	17	26
TKN	mg/L			0.11	0.3	0.241	<0.05	0.31	<0.195	0.13	0.3
TOC	mg/L			1.8	2.6	2.25	2.1	2.4	2.2875	1.8	2.6
TSS	mg/L			<1	3	2.2	1	3	1.5	<1	2

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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0028	0.00074	<0.0005	0.0096	0.001675	<0.0005	0.0011

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	15	7.5	2	8	5.2222	3	13
Aluminum	mg/L	0.005	SEQG	0.0025	<b>0.0099</b>	<b>0.0053</b>	0.004	<b>0.014</b>	<b>0.0065</b>	0.0032	<b>0.02</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.015	<0.01	0.05	0.01444	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.007	0.065	0.0194	0.002	0.04	0.0137	0.006	0.04
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0021	0.0032	0.0025625	0.0021	0.0031	0.0025556	0.0023	0.0032
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	18	9.125	2	10	6.2222	4	16
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	1.00E-05	<b>0.00007</b>	0.0000175	1.00E-05	0.00004	1.44E-05	1.00E-05	<b>0.00005</b>
Calcium	mg/L			1.3	2	1.5625	1.2	1.4	1.2444	1.2	1.8
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.3	0.23333	0.3	0.5
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2	2.4	2.275	1.8	2.5	2.2667	1.9	2.5
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.02625	0.01	0.08	0.0233	<0.01	0.07

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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Hardness	mg/L			5	7	5.625	4	5	4.56	4	6
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.034	0.13	0.077375	0.03	0.11	0.071222	0.036	0.16
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	0.03	0.02125	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.4	0.6	0.4375	0.2	0.4	0.33333	0.3	0.5
Manganese	mg/L			0.0029	0.019	0.010625	0.0025	0.018	0.0083333	0.0037	0.029
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.35	0.112	<0.04	0.31	0.093	<0.04	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.58	7.16	6.8488	<b>6.17</b>	6.97	6.7233	<b>6.48</b>	7.07
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.007	0.0052	<0.005	<0.005	<0.005	<0.005	0.006
Potassium	mg/L			0.2	0.6	0.375	0.2	0.4	0.32222	0.2	0.4
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.00625	<0.005	0.007	0.00544	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	2.1	1.63	1.3	1.6	1.41	1.3	1.9
Conductivity	µS/cm			17	25	19.375	14	20	16.111	14	23
Strontium	mg/L			0.012	0.018	0.0141	0.011	0.013	0.0113	0.011	0.016
Sulphate	mg/L	128	SSWQO	0.4	0.7	0.525	0.4	0.8	0.63333	0.3	0.8
Sum of Ions				7	25	14.125	6	14	10.667	8	22
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Tin	mg/L			<0.0001	0.0002	0.0001125	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
TDS	mg/L			21	32	25	13	28	20	15	28
TKN	mg/L			0.13	0.3	0.215	0.11	0.29	0.213	0.15	0.41
TOC	mg/L			2	2.6	2.325	1.9	2.7	2.3111	1.9	2.6
TSS	mg/L			1	3	2	<1	3	1.89	1	6
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.0006	<0.0005	0.0017	0.0007445	<0.0005	0.0006

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			<1	24	<6.7778	3	13	7.375
Aluminum	mg/L	0.005	SEQG	<b>0.0052</b>	<b>0.012</b>	<b>0.0089</b>	0.0016	<b>0.0086</b>	<b>0.0054</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.01333	<0.01	0.04	0.0138
Ammonia, *unionized	ug/L			0.003	0.024	0.012	0.005	0.032	0.0134
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0025	0.0041	0.0031111	0.0026	0.004	0.0030625
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			<1	29	<8.3333	4	16	9
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	1.11E-05	<1.0E-05	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.3778	1.2	1.7	1.3625
Carbonate	mg/L			<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.1	0.2	0.17778	<0.1	0.2	<0.175

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.2	3.4	3.0222	2.6	3.2	2.975
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.023333	0.01	0.07	0.02375
Hardness	mg/L			4	6	5.11	4	6	4.88
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.042	0.22	0.095111	0.036	0.16	0.098375
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.38889	0.2	0.5	0.375
Manganese	mg/L			0.0053	0.02	0.010633	0.0071	0.016	0.010325
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.4	0.115	<0.04	0.4	0.13
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.18</b>	6.99	6.7044	<b>6.47</b>	6.99	6.7288
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.008	0.0058	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.33333	0.2	0.5	0.3625
Radium-226	Bq/L	0.11	SEQG	<0.005	0.01	0.0059	<0.005	0.006	0.0051
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.2	1.7	1.4	1.3	1.7	1.44
Conductivity	µS/cm			15	22	16.778	15	23	17.25
Strontium	mg/L			0.011	0.015	0.0124	0.011	0.015	0.0119

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Sulphate	mg/L	128	SSWQO	0.3	0.9	0.68889	0.5	1	0.725
Sum of Ions				4	34	12.667	8	22	13.375
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			14	26	20.556	16	26	20.125
TKN	mg/L			0.16	0.34	0.256	0.18	0.33	0.27
TOC	mg/L			2.4	3.6	3.1111	2.7	3.2	3
TSS	mg/L			<1	4	2.56	<1	3	1.875
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.00059	<0.0005	0.0016	0.00065

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

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TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

## Attachment: IR-114

Number	IR-114
Dept.	ECCC, CNSC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 and Section 8.2.4.2.4
Context and Rationale	<p>Context: Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field.</p> <p>General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p>Rationale: A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>

	<p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water.</p> <p>Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li> <li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li> <li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li> </ol>

Response:

1) Please see updated Tables 8.2-9 and 8.2-10 from the draft EIS below. Water quality predictions for the well mixed portion of LA-5 for each of the three flow scenarios (described in Section 8.2.4.2.3 and Table 8.2-7 of the draft EIS) are provided in the updated Table 8.2-10 below. Predicted site discharge concentrations that exceed respective receiver WQOs are bolded. Chloride, sulphate, TDS, arsenic, cadmium, chromium, cobalt, copper, selenium, and uranium, thorium-230, radium-226, lead-210, and polonium-210 predicted discharge concentrations are above receiver WQOs. However, under all three flow scenarios, the predicted water quality for all constituents is below respective WQOs within the well mixed portion of LA-5, indicating that sufficient dilution is present within LA-5 to meet objectives. Updated Table 8.2-13 is provided below. Water quality predictions have been added for MDMER constituents listed under Schedule 4 and Schedule 5. There are no predicted exceedances of water quality guidelines for any of the COPCs during Construction, Operation, or Decommissioning

2) The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The



effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.

3) The table below (IR-114 Table 1) shows a summary of baseline concentrations of total mercury in surface water within the LSA. Sediment was not analyzed for mercury during previous baseline surveys. Baseline water quality in the LSA and RSA showed no indication of total mercury present above detectable limits and as such, the potential for methyl-mercury to be detected was unlikely. Generally, 60 to 95% of total mercury concentrations in fish muscle tissues are present in the form of methyl-mercury. Table 8.5-2 of Section 8.5 of the EIS provides a full summary of tissue constituent concentrations for key species from the Icelander River and Russell Lake. A conservative approach of assuming 95% of mercury in the tissues is present in the methylated form could be used for comparative purposes. These data supplemented with more current baseline data for water, sediment and fish tissues specific to total and methyl-mercury prior to the onset of site development will provide a robust database for comparative purposes during the subsequent development and operation on site.

4) Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."

As baseline surface water did not identify measurable concentrations of total mercury in the LSA or RSA (See IR-114 Table 1 below) and deposition to large water bodies such as lakes is not likely to contribute to the methyl mercury concentration in the Wheeler River receiving waters, it is most reasonable to conclude that changes in total and methyl mercury can be adequately monitored in relation to sulphate inputs. Denison will undertake monitoring of total and methyl mercury as it relates to the discharge of sulphate to Whitefish Lake.

#### References:

Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I

Table 8.2-9: Predicted Effluent Water Quality (Updated to include MDMER Constituents)

Constituent	Unit	Discharge Concentration
		(max predicted)
Chloride	mg/L	<b>600</b>
Sulphate (Hardness)	mg/L	<b>3915</b>
Sulphate	mg/L	<b>3915</b>
TDS	mg/L	<b>6420</b>
TSS	mg/L	6
Arsenic	mg/L	<b>0.006</b>
Cadmium	mg/L	<b>0.0018</b>
Chromium	mg/L	<b>0.025</b>
Cobalt	mg/L	<b>0.0030</b>
Copper	mg/L	<b>0.022</b>
Lead	mg/L	0.0003
Molybdenum	mg/L	2.5
Nickel	mg/L	0.014
Selenium	mg/L	<b>0.042</b>
Uranium	mg/L	<b>0.057</b>
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Mercury	mg/L	0.000001
Ammonia (as N)	mg/L	3.9
Un-ionized Ammonia*	mg/L	0.0078
Phosphorus	mg/L	N/A
Thorium-230	Bq/L	<b>0.9</b>
Radium-226	Bq/L	<b>0.15</b>
Lead-210	Bq/L	<b>0.419</b>
Polonium-210	Bq/L	<b>0.15</b>

Note:

\* - Calculated value

Table 8.2-10: Near-field Receiving Water Quality Results (Updated to include MDMER Constituents)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
Chloride	mg/L	120	SEQG/CCME	<b>600</b>	10.06	6.18	4.69
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>	63.83	38.51	28.76
Sulphate	mg/L	128	BC MOE	<b>3915</b>	63.83	38.51	28.76
TDS	mg/L	500	SEQG	<b>6420</b>	131.41	90.06	74.13
TSS	mg/L	15	Schd 4 - MDMER	6	3.9	3.9	3.9
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>	0.00020	0.00016	0.00014
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>	0.00005	0.00004	0.00003
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>	0.00090	0.001	0.00068
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>	0.00015	0.00013	0.00012
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>	0.00055	0.00041	0.00036
Lead	mg/L	0.005	CCME	0.0003	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.07	WHO	2.5	0.040	0.024	0.018
Nickel	mg/L	0.07	WHO	0.014	0.0003	0.0002	0.0002
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>	0.0008	0.001	0.0004
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>	0.0010	0.0006	0.0005
Vanadium	mg/L	0.12	FEQG	0.059	0.0011	0.0007	0.0005
Zinc	mg/L	0.1	FEQG**	0.042	0.0018	0.0015	0.0014
Mercury	mg/L	0.000026	SEQG/CCME	0.000001	0.00001	0.00001	0.00001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9	0.13	0.11	0.10
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078	0.00008	0.00006	0.00006
Phosphorus	mg/L	0.015	BC MOE	N/A	0.01	0.01	0.01
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>	0.024	0.019	0.016
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>	0.008	0.007	0.007
Lead-210	Bq/L	0.2	HC	<b>0.419</b>	0.026	0.024	0.023
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>	0.007	0.006	0.006
Notes							

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
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Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
<p>(1) <b>Bolded values</b> are those that exceed the screening concentrations</p> <p>Un-ionized ammonia calculated value</p> <p>* Hardness induced guideline, assuming hardness &gt;250 mg/L</p> <p>** Hardness induced guideline, assuming hardness &gt;250 mg/L, pH=7.0, DOC = 5.26 mg/L</p>							

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated to include available MDMER Constituents)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Iceland River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	6.14	6.11	4.20	4.16	3.26	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.01	SEQG/CCME
Cadmium	mg/L	0.000024	0.000023	0.000040	0.000039	0.000033	0.000033	0.000030	0.0003	SEQG/CCME*
Chromium	mg/L	0.000530	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*
Lead	mg/L	0.000124	0.000114	0.000118	0.000130	0.000114	0.000114	0.000116	0.005	CCME
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.0240	0.0158	0.0156	0.0118	0.07	WHO
Nickel	mg/L	0.00039	0.00038	0.00051	0.00050	0.00046	0.00046	0.00044	0.07	WHO
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.00020	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG
Zinc	mg/L	0.00070	0.00069	0.00106	0.00103	0.00090	0.00090	0.00084	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.03950	0.03368	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.01430	0.6	HC
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelandic River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia represented by calculated values										



IR-114 Table 1: Total and Dissolved Mercury Concentrations in the LSA and RSA

Parameter	Total Mercury, Dissolved	Total Mercury
Units	mg/L	mg/L
Total Count	40	59
Count (<RDL)	39	46
Minimum	<1.00E-05	<1.00E-07
5th Percentile	<1.00E-05	<8.20E-07
50th Percentile	<1.00E-05	<1.00E-05
95th Percentile	<1.00E-05	<1.00E-05
Maximum	<1.00E-05	<1.00E-05
Arithmetic Mean	<1.00E-05	<7.63E-06
StdDev	2.76E-12	3.70E-06
Std Error	0	4.81E-07
Geometric Mean	<1.00E-05	<5.38E-06
Geometric StdDev	1.	3.281

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.
2. The reporting locations are: "LA-1", "LA-1-Bottom", "LA-5", "LA-6", "LAB-1", "LAB-2", "SA-1", "SA-2", "SA-3", "SA-6".

## Attachment: IR-115

Number	IR-115
Dept.	ECCC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 Aquatic Environment Appendix 10-A (ERA), Section 3.1.1.1
Context and Rationale	<p>Context: Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p>Rationale: ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li> <li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li> </ol>

### Table to support response:

Table 8.2-8 has been updated and provided below.

Constituent	Unit	LA-5 Background Concentration (95th percentile)	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.39	120	SEQG/CCME
Sulphate (Hardness)	mg/L	0.69	429	BC MOE*
Sulphate	mg/L	0.69	128	BC MOE
TDS	mg/L	28.3	500	SEQG
TSS	mg/L	3.9	15	Schd 4 - MDMER
Arsenic	mg/L	0.0001	0.01	SEQG/CCME
Cadmium	mg/L	0.000019	0.0003	SEQG/CCME*
Chromium	mg/L	<0.0005	0.001	SEQG/CCME
Cobalt	mg/L	<0.0001	0.0003	FEQG
Copper	mg/L	<0.0002	0.004	SEQG/CCME*
Lead	mg/L	<0.0001	0.005	CCME
Molybdenum	mg/L	<0.0001	0.07	WHO
Nickel	mg/L	<0.0001	0.07	WHO
Selenium	mg/L	<0.0001	0.001	SEQG/CCME
Uranium	mg/L	<0.0001	0.02	SEQG/CCME
Vanadium	mg/L	<0.0001	0.12	FEQG
Zinc	mg/L	0.0011	0.1	FEQG**
Mercury	mg/L	<0.00001	0.000026	SEQG/CCME
Ammonia (as N)	mg/L	0.068	5.74	SEQG/CCME
Phosphorus	mg/L	<0.01	0.015	BC MOE
Thorium-230	Bq/L	<0.01	0.6	HC
Radium-226	Bq/L	<0.0059	0.11	SEQG
Lead-210	Bq/L	<0.02	0.2	HC
Polonium-210	Bq/L	<0.005	0.1	HC

Notes

\* Hardness induced guideline, assuming hardness >250 mg/L

\*\* Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L

## Attachment: IR-116

Number	IR-116
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3
Context and Rationale	<p>Context: Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p>Rationale: It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>
Information Requirement	<p>Information Requirement:</p> <ol style="list-style-type: none"> <li>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</li> <li>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</li> </ol>

### Response:

- 1) The maximum concentrations of COPCs in surface water and sediment during the Future Centuries period are provided in IR-116 Table 1 and IR-116 Table 2, respectively.
- 2) The suite of COPCs that are provided in IR-116 Table 1 and IR-116 Table 2 are generally inclusive of those that have the potential for elevated concentrations in groundwater. However, estimates for pH, iron and manganese have not currently been modelled. These three parameters were identified in

Section 7.6.2.2.3 and Appendix 7-C as having the potential to be present in groundwater above the groundwater quality screening criteria (see Table 7.6-1 in the EIS and Table 3-4 in Appendix 7-C [existing conditions groundwater quality]).

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a pH ranging from 6.39 to 6.47, which is slightly below the screening criteria of 6.5 to 9. However, the range predicted is within the range of the local groundwater flow system of 5.9 to 7.5 (median of 6.5, as provided in Table 3-4 of Appendix 7-C). Therefore, no change from the current existing conditions is expected during future centuries.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have an iron concentration ranging from 0.0065 mg/L and 2.91 mg/L. The upper range of concentrations will exceed the Groundwater quality guideline of 0.3 mg/L. However, the range predicted is within the range of dissolved iron concentrations measured for groundwater in the local groundwater flow system, of 0.01 mg/L to 4.8 mg/L (median of 0.41). Therefore, no change from the current existing conditions is expected.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a manganese concentration ranging from 0.279 mg/L and 0.289 mg/L. The range of predicted concentrations will exceed the Groundwater quality guideline of 0.230 mg/L. However, the range predicted is only marginally above that of the local groundwater flow system of 0.04 mg/L and 0.2 mg/L (median of 0.1) and within a similar magnitude.

Arsenic concentrations in sediment have also been predicted based on mass-flux in a conservative manner and indicate potential exceedance of the CCME ISQG.

The modelled predictions of the future centuries groundwater are highly conservative. Continued monitoring of groundwater through the period of construction and initial operation will allow for refinement of the predictions for the future centuries scenario, thereby providing information for adaptive management.

IR-116 Table 1: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water During Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	0.41	0.41	0.39	0.39	0.38	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	0.72	0.72	0.71	0.71	0.71	128	BC MOE
Arsenic	mg/L	0.000103	0.000103	0.000107	0.000107	0.000105	0.000105	0.000104	0.01	SEQG/CCME
Cadmium	mg/L	0.0000232	0.0000232	0.0000233	0.0000233	0.0000233	0.0000233	0.0000232	0.0003	SEQG/CCME*
Chromium	mg/L	0.00052	0.00052	0.00053	0.00053	0.00052	0.00052	0.00052	0.001	SEQG/CCME
Cobalt	mg/L	0.00010	0.00010	0.00011	0.00011	0.00011	0.00010	0.00010	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00063	0.00063	0.00062	0.00062	0.00062	0.004	SEQG/CCME*
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.005	CCME
Molybdenum	mg/L	0.00011	0.00011	0.00012	0.00012	0.00011	0.00011	0.00011	0.07	WHO
Nickel	mg/L	0.00038	0.00038	0.00041	0.00041	0.00040	0.00040	0.00039	0.07	WHO
Selenium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00003	0.00003	0.00003	0.02	SEQG/CCME
Vanadium	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.12	FEQG
Zinc	mg/L	0.00068	0.00068	0.00074	0.00074	0.00072	0.00072	0.00071	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01010	0.01010	0.01036	0.01036	0.01030	0.01030	0.01025	0.6	HC
Radium-226	Bq/L	0.00557	0.00557	0.00639	0.00637	0.00615	0.00614	0.00600	0.11	SEQG
Lead-210	Bq/L	0.00527	0.00527	0.00605	0.00592	0.00557	0.00556	0.00545	0.2	HC
Polonium-210	Bq/L	0.00536	0.00536	0.00615	0.00602	0.00566	0.00564	0.00553	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5



Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L										

IR-116 Table 2: Predicted Maximum Sediment Quality during Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake Inlet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Chloride	mg/kg(dw)	2.81	2.81	3.62	3.61	3.43	3.29	--	--	--	--	--	--
Sulphate	mg/kg(dw)	6.00	6.00	6.29	6.29	6.22	6.17	--	--	--	--	--	--
Arsenic	mg/kg(dw)	<b>8.35</b>	<b>8.35</b>	<b>8.66</b>	<b>8.62</b>	<b>8.48</b>	<b>8.43</b>	21	522	9.8	346.4	5.9	17
Cadmium	mg/kg(dw)	0.34	0.34	0.34	0.34	0.34	0.34	--	--	--	--	0.6	3.5
Chromium	mg/kg(dw)	5.86	5.86	5.94	5.93	5.91	5.90	31.5	26.2	47.6	115.4	37.3	90
Cobalt	mg/kg(dw)	0.25	0.25	0.27	0.26	0.26	0.26	--	--	--	--	--	--
Copper	mg/kg(dw)	1.85	1.85	1.87	1.87	1.87	1.86	9.1	11.3	22.2	268.8	35.7	197
Lead	mg/kg(dw)	10.21	10.21	10.34	10.31	10.26	10.24	16.3	19.7	36.7	412.4	35	91.3
Molybdenum	mg/kg(dw)	0.34	0.34	0.37	0.37	0.36	0.35	23	245	13.8	1,239	--	--
Nickel	mg/kg(dw)	3.32	3.32	3.53	3.52	3.47	3.43	21	326	23.4	484	--	--

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake InLet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Selenium	mg/kg(dw)	0.62	0.62	0.83	0.82	0.76	0.72	3.6	30	1.9	16.1	--	--
Uranium	mg/kg(dw)	0.58	0.58	0.71	0.70	0.66	0.64	97	2,296	104.4	5,874	--	--
Zinc	mg/kg(dw)	9.93	9.93	10.79	10.76	10.52	10.37	--	--	--	--	123	315
Total Ammonia (N)	mg/kg(dw)	0.13	0.13	0.13	0.13	0.13	0.13	--	--	--	--	--	--
Thorium-230	Bq/kg(dw)	23.19	23.19	23.80	23.79	23.64	23.54	--	--	--	--	--	--
Radium-226	Bq/kg(dw)	65.14	65.14	74.67	74.39	71.82	70.13	--	--	600	14,400	--	--
Lead-210	Bq/kg(dw)	373.84	373.84	428.83	419.39	394.66	386.43	--	--	900	20,800	--	--
Polonium-210	Bq/kg(dw)	380.31	380.31	436.25	426.65	401.49	393.07	--	--	800	12,100	--	--
Mercury	mg/kg(dw)	No background information or effluent concentration to model											
Aluminum	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Iron	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Thallium	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Manganese	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Phosphorus	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											

**Note:**

bolded values indicate exceedance of the CCME ISQG

## Attachment: IR-123

Number	IR-123
Dept.	ECCC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.4.3.2.3, Aquatic Environment Appendix 8-D, Table 3-5
Context and Rationale	<p><b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.</p> <p><b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.</li> <li>2. Provide data on baseline concentrations of mercury in sediment.</li> <li>3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.</li> </ol>

Table 1 is provided below to support the text response to IR-123 in the IR table:

Table 1: Baseline Sediment Quality Summary

Category	Parameter	Units	Total Count	Count (<RDL)	Min	5th Percentile	50th Percentile	95th Percentile	Max	Arithmetic Mean	StdDev	Std Error	Geometric Mean	Geometric StdDev	Sediment Quality Guidelines					
															Burnett-Seidel and Liber		Thompson et al.		CCME	
															REF	NE2	LEL	SEL	ISQG	PEL
Physical Tests	Moisture	%	22	0	24.59	28.934	94.81	96.858	97.24	74.715	31.256	6.6637	66.042	1.7444						
Total Metals	Aluminum	ug/g	22	0	920	1144	4645	9110.	9300	4391.82	2321.67	494.98	3723.16	1.8908	n/d	n/d	n/d	n/d	n/d	n/d
	Antimony	ug/g	22	17	<0.2	0.2	0.2	0.295	0.3	<0.20909	0.029425	0.0062733	<0.20751	1.1267	n/d	n/d	n/d	n/d	n/d	n/d
	Arsenic	ug/g	22	0	0.4	0.505	3.35	5.695	7.2	3.1909	2.0128	0.42913	2.3379	2.5249	21	522	9.8	346.4	5.9	17
	Barium	ug/g	22	0	19	21.25	42.5	70.45	100	43.727	17.694	3.7723	40.761	1.4647	n/d	n/d	n/d	n/d	n/d	n/d
	Beryllium	ug/g	22	7	<0.1	<0.1	0.3	0.395	0.5	<0.24545	0.11434	0.024377	<0.21531	1.747	n/d	n/d	n/d	n/d	n/d	n/d
	Boron	ug/g	22	7	<1	<1	5.5	11	12	<5.0455	3.5787	0.76299	<3.5672	2.5755	n/d	n/d	n/d	n/d	n/d	n/d
	Cadmium	ug/g	22	2	<0.1	<0.1	0.4	0.595	0.7	<0.35909	0.16521	0.035223	<0.31108	1.8383	n/d	n/d	n/d	n/d	0.6	3.5
	Chromium	ug/g	22	3	<0.5	<0.5	8.15	14.9	16	<7.55	4.7699	1.017	<5.0365	3.1656	31.5	26.2	47.6	115.4	37.3	90
	Cobalt	ug/g	22	5	<0.2	0.2	1.65	2.68	3.8	<1.4591	1.0051	0.21428	<0.96852	2.9677	n/d	n/d	n/d	n/d	n/d	n/d
	Copper	ug/g	22	7	<0.5	<0.5	1.65	4.565	5	<1.9136	1.3981	0.29807	<1.4281	2.2783	9.1	11.3	22.2	268.8	35.7	197
	Iron	ug/g	22	0	1410	1590.5	12650	32699.99	91300	16020	18960.23	4042.33	9545.32	3.0244	n/d	n/d	n/d	n/d	n/d	n/d
	Lead	ug/g	22	0	1	1	7.3	10	13	6.0545	3.6694	0.78232	4.4383	2.5369	16.3	19.7	36.7	412.4	35	91.3
	Manganese	ug/g	22	0	22	22.55	195	388.5	1270	237.41	253.54	54.056	159.75	2.6446	n/d	n/d	n/d	n/d	n/d	n/d
	Molybdenum	ug/g	22	2	<0.1	0.1	0.65	11.95	13	<2.4455	4.1007	0.87428	<0.83873	4.1956	23	245	13.8	1,239	n/d	n/d
	Nickel	ug/g	22	3	<0.1	<0.1	5.6	11.895	12	<5.1	3.6738	0.78327	<2.7847	4.651	21	326	23.4	484	n/d	n/d
	Selenium	ug/g	22	7	<0.1	<0.1	0.8	1.49	1.6	<0.73182	0.49989	0.10658	<0.4781	3.0508	3.6	30	1.9	16.1	n/d	n/d
	Silver	ug/g	22	11	<0.1	<0.1	<0.1	0.68	2	<0.25455	0.41142	0.087714	<0.16407	2.1254	n/d	n/d	n/d	n/d	n/d	n/d
	Strontium	ug/g	22	0	16	17	26.5	39.75	42	26.545	7.076	1.5086	25.66	1.3072	n/d	n/d	n/d	n/d	n/d	n/d
	Thallium	ug/g	22	22	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0	0	<0.2	1	n/d	n/d	n/d	n/d	n/d	n/d

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
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Radionuclides	Tin	ug/g	22	7	<0.1	<0.1	0.2	0.4	0.4	<0.19091	0.10193	0.021731	<0.16863	1.6518	n/d	n/d	n/d	n/d	n/d	n/d
	Titanium	ug/g	22	0	31	31.25	200	446.5	480	205.36	139.5	29.741	147.31	2.5607	n/d	n/d	n/d	n/d	n/d	n/d
	Uranium	ug/g	22	0	0.2	0.2	0.7	1.395	1.5	0.67727	0.38537	0.08216	0.56276	1.9464	97	2,296	104.4	5,874	n/d	n/d
	Vanadium	ug/g	22	0	1.2	1.3	18	26.75	30	14.223	9.3994	2.004	8.7761	3.4375	35.1	31.8	35.2	160	n/d	n/d
	Zinc	ug/g	22	5	<0.5	<0.5	24	43.3	62	<19.85	16.079	3.4281	<8.2122	6.2729	n/d	n/d	n/d	n/d	123	315
	Lead-210	Bq/g	22	7	<0.04	<0.04	0.415	0.725	0.75	<0.35273	0.24914	0.053116	<0.21687	3.3521	n/d	n/d	0.9	20.8	n/d	n/d
	Polonium-210	Bq/g	22	1	<0.01	0.02	0.41	0.678	0.76	<0.35136	0.25533	0.054436	<0.17468	4.8038	n/d	n/d	0.8	12.1	n/d	n/d
	Radium-226	Bq/g	22	6	<0.01	<0.01	0.03	0.0495	0.05	<0.025909	0.012968	0.0027649	<0.0225	1.7702	n/d	n/d	0.6	14.4	n/d	n/d
	Thorium-228	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-230	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	0.03	<0.020455	0.002132	0.00045455	<0.020372	1.0903	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-232	Bq/g	22	22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.

2. The reporting locations are: "LA-1-1", "LA-1-2", "LA-1-3", "LA-5-1", "LA-5-2", "LA-5-3", "LA-5-4", "LA-5-5", "LA-6-1", "LA-6-2", "LA-6-3", "LA-6-4", "LA-6-5", "LAB-1-1", "LAB-1-2", "LAB-1-3", "LAB-2-1", "LAB-2-2", "LAB-2-3", "LAB-2-CORE".

**0.7**

indicates exceedance of CCME ISQG

## Attachment: IR-131

Number	IR-131
Dept.	CNSC
Project effects link	Migratory birds, Wildlife and Wildlife Habitat
Reference to EIS, appendices, or supporting documentation	Section 9, Terrestrial Environment
Context and Rationale	<p>Context and Rationale: As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</p> <p>As per the CNSC's Generic Guidelines for the Preparation of an EIS pursuant to the Canadian Environmental Assessment Act, 2012: "The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan".</p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>
Information Requirement	Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.

### Response:

A new appendix to the final EIS (Appendix 9-D Species At Risk) is included below.





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## **Appendix 9-D Wildlife Species At Risk**

**New Appendix to final EIS, Section 9**

**Version 1**

**July 2023**

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## Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	<i>Species at Risk Act</i>
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component



# 1 Introduction

## 1.1 Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 1.2 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 1.1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

**Table 1.1 Wildlife Species at Risk Listed by Environment and Climate Change Canada**

Common Name	Scientific Name	Discussed in the draft EIS
<b>Nine-spotted lady beetle</b>	<i>Coccinella ovemnotata</i>	No
<b>Transverse lady beetle</b>	<i>Coccinella transversoguttata</i>	No
<b>Yellow-banded bumble bee</b>	<i>Bombus terricola</i>	No
<b>Northern leopard frog</b>	<i>Lithobates pipiens</i>	No
<b>Little brown myotis</b>	<i>Myotis lucifugus</i>	No
<b>Northern myotis</b>	<i>Myotis septentrionalis</i>	No
Wolverine	<i>Gulo gulo</i>	Yes
Woodland caribou	<i>Rangifer tarandus caribou</i>	Yes
<b>Bank Swallow</b>	<i>Riparia riparia</i>	No
<b>Barn Swallow</b>	<i>Hirundo rustica</i>	No
Common Nighthawk	<i>Chordeiles minor</i>	Yes
<b>Horned Grebe</b>	<i>Podiceps auritus</i>	No
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes
Rusty Blackbird	<i>Euphagus carolinus</i>	Yes



Common Name	Scientific Name	Discussed in the draft EIS
Short-eared Owl	<i>Asio flammeus</i>	Yes
Yellow Rail	<i>Coturnicops noveboracensis</i>	Yes

Of the 16 species listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

## 1.2 Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 1.2 and Table 1.3, which formed the basis for the subsequent VC-specific assessment.

**Table 1.2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project**

Valued Component	Rationale
<b>Biophysical Environment</b>	
<b><i>Terrestrial Environment</i></b>	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., <i>Species at Risk Act</i> [SARA; Government of Canada 2022], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], <i>The Wildlife Act, 1998</i> [Government of Saskatchewan 2020]).
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], <i>Migratory Birds Convention Act 1994</i> [Government of Canada 2017], <i>Saskatchewan Activity Restriction Guidelines for</i>

Valued Component	Rationale
	<i>Sensitive Species</i> [Government of Saskatchewan 2017], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).

**Table 1.3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project**

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities. The number of Yellow Rail mortalities directly or indirectly attributable to the Project.

The five bird species identified in Table 1.3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

## 2 Supplemental Information

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As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 2.1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

**Table 2.1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement**

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Arthropods</b>						
Nine-spotted lady beetle	<i>Coccinella novemnotata</i>	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.1 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	<i>Coccinella transversoguttata</i>	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.2 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	<i>Bombus terricola</i>	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 2.1.3 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
<b>Amphibians</b>						
Northern leopard frog	<i>Lithobates pipiens</i>	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom; (2) breeding and larval waterbodies with	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow marshes, moist upland meadows where grass height is less than 1 m. See Section 2.2.1 for further details.	observations to date. Amphibian nocturnal call and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs ( <i>Pseudacris maculata</i> ) were detected (Appendix 9-C).	
<b>Bats</b>						
Little brown myotis	<i>Myotis lucifugus</i>	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.1 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	<i>Myotis septentrionalis</i>	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.2 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA (Appendix 9-C).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.



Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Terrestrial Wildlife Species</b>						
Wolverine	<i>Gulo gulo</i>	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	<i>Rangifer tarandus caribou</i>	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
<b>Avian Species</b>						
Bank Swallow	<i>Riparia riparia</i>	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of open habitats. See Section 2.4.1 for further details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Barn Swallow	<i>Hirundo rustica</i>	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of	Documented during the breeding bird surveys as part of the baseline field	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 2.4.2 for further details.	program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	<i>Chordeiles minor</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	<i>Podiceps auritus</i>	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 2.4.3 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5)..
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Rusty Blackbird	<i>Euphagus carolinus</i>	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	<i>Asio flammeus</i>	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	<i>Coturnicops noveboracensis</i>	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

- 1 Schedule 1 under the *Species at Risk Act*.
- 2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

## 2.1 Arthropods

### 2.1.1 Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

### 2.1.2 Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



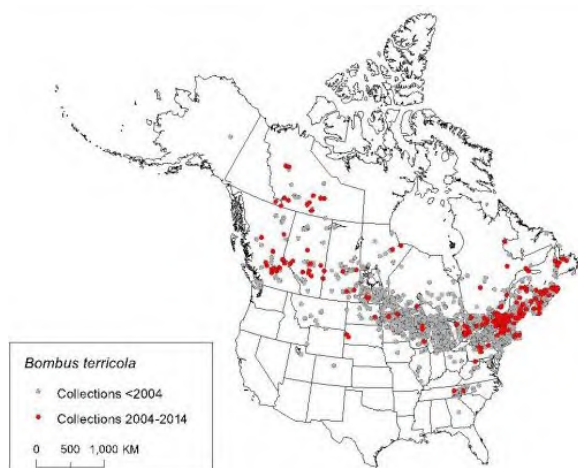
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section 2.1.1.

### 2.1.3 Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015). After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure)

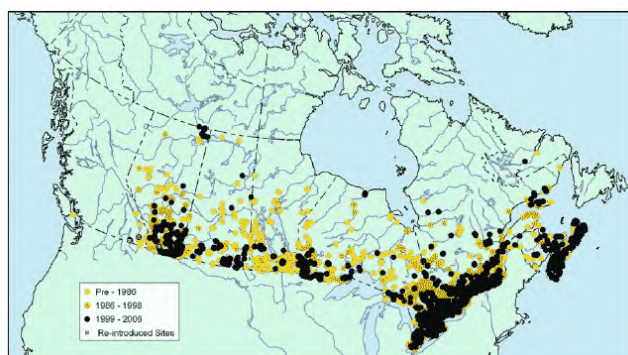
(Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015). The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

## 2.2 Amphibians

### 2.2.1 Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three distinct habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a,



NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

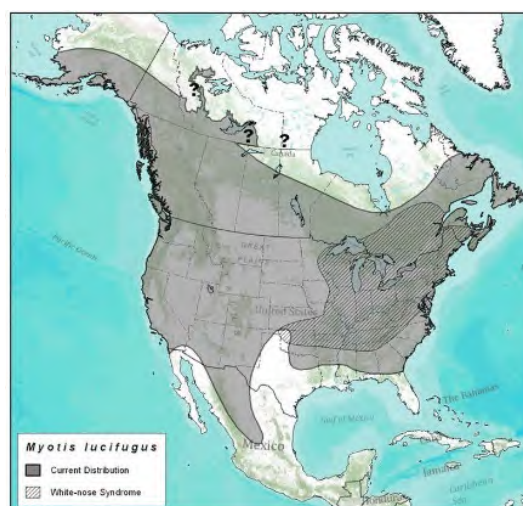
## 2.3 Bats

### 2.3.1 Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).



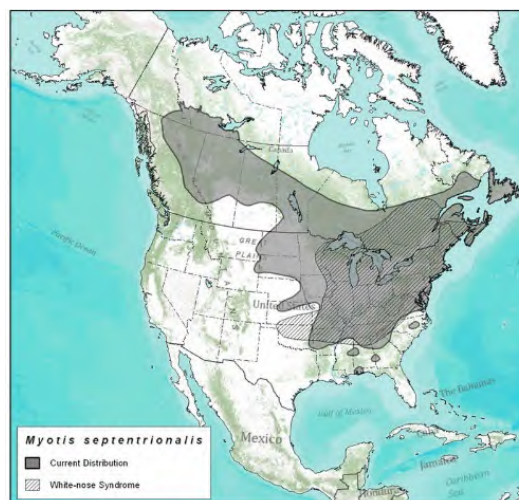
Source: COSEWIC (2013a).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease the causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

### 2.3.2 Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).



Source: COSEWIC (2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has

been identified as the main threat for northern myotis populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a)

## 2.4 Avian Species

### 2.4.1 Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making



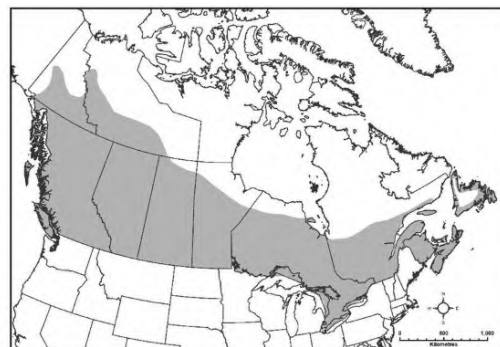
Source: COSEWIC (2013b).

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

## 2.4.2 Barn Swallow

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).

Historically, suitable nesting sites were likely provided by caves, cliff faces, rock ledges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).



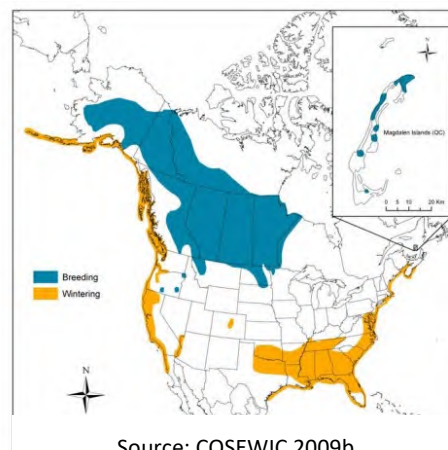
Source: COSEWIC (2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021).

## 2.4.3 Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation,



Source: COSEWIC 2009b



anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

### 3 Mitigation Measures

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The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

#### 3.1 Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;



- controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.
- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
  - The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
  - Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
  - Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
  - A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
  - Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
  - Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
  - Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
  - The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.
  - All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

## 3.2 General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**.

### 3.2.1 Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.

### 3.2.2 Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- **Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.**

### 3.2.3 Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

### 3.2.4 Wildlife Deterrence and Prevention of Wildlife Entrapment

- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**
- **Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.**
- **Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).**
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- **Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.**

- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

### 3.2.5 Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- **Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.**
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

### 3.2.6 Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- **Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.**
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interact.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.

- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

### 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**. These will be added to the final EIS.

#### 3.3.1 Arthropod Species

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.

- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species.**

### 3.3.2 Amphibian Species

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).**
- **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.**
- **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.**

### 3.3.3 Bat Species

- Vegetation clearing activities will occur outside of roosting periods, when practical.
- **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**
- **In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.**



- **Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.**

### 3.3.4 Avian Species

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.
- **In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.**
- **Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).**
- **Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.**
- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**

## 4 Residual and Cumulative Effects Summary

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The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 4.1. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 4.2.

**Table 4.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk**

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
<b>Terrestrial Environment</b>	Nine-spotted lady beetle Transverse lady beetle Yellow-banded bumble bee	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>Waste management (composting, domestic and industrial landfill operation, recycling).</li> <li>Water management (including treatment).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on these species, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the arthropod SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to groundwater and/or surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			

<sup>1</sup> Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>• Site water management, treatment, and release</li><li>• Process water treatment and release.</li><li>• Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Reclamation of disturbed areas.</li></ul>	Decommissioning	<div>roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</div> <div>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</div>		
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>• Development of access roads and air strip.</li><li>• Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>• <b>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on arthropod species.</b></li></ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the arthropod SAR to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>• Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Reclamation of disturbed areas.</li></ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials</li> </ul>	Operation	<ul style="list-style-type: none"> <li>• <b>Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>Reclamation of disturbed areas).</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li>• <b>Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li>• <b>Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.</b></li> </ul>		



Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<ul style="list-style-type: none"> <li>Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.</li> </ul>		
Terrestrial Environment	Little brown myotis Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>Vegetation clearing activities will occur outside of roosting periods, when practical.</b></li> <li><b>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).</b></li> <li><b>In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat</b></li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bat species within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> </ul>	Construction		Change in mortality: predicted to be low	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		attributable to the Project.	<ul style="list-style-type: none"> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>		<p><b>exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.</b></p>	magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of the bat species to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation	<ul style="list-style-type: none"> <li><b>Locations of these site-specific habitat features used by bats will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li><b>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</b></li> </ul>		
<b>Terrestrial Environment</b>	Bank Swallow Barn Swallow Common Nighthawk Horned Grebe Olive-sided Flycatcher Rusty Blackbird	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to</li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the avian SAR within the Terrestrial RSA to the

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
	Short-eared Owl Yellow Rail		<ul style="list-style-type: none"> <li>Air transportation for workers.</li> </ul>		<p>August 31; however, the dates differ for certain species.</p> <ul style="list-style-type: none"> <li><b>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.</b></li> <li><b>Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance</b></li> </ul>		point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the avian SAR to the point where they are not sustainable or available to
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"> <li>Air transportation for workers.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<p>and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</p> <ul style="list-style-type: none"> <li>Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li> <li>Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been previously described in Section 3.2.4 of the EIS.</li> <li>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible</li> </ul>		contribute to ecological functions.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<div>barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces</div> <ul style="list-style-type: none"><li>Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.</li></ul>		

**Table 4.2**      **Summary of Significance of the Cumulative Effects on Wildlife Species At Risk**

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	<ul style="list-style-type: none"> <li>Nine-spotted lady beetle</li> <li>Transverse lady beetle</li> <li>Yellow-banded bumble bee</li> <li>Northern leopard frog</li> <li>Little brown myotis</li> <li>Northern myotis</li> <li>Bank Swallow</li> <li>Barn Swallow</li> </ul>	Alteration and/or loss of habitat.	<b>Not significant:</b> The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
		<ul style="list-style-type: none"> <li>Common Nighthawk</li> <li>Horned Grebe</li> <li>Olive-sided Flycatcher</li> <li>Rusty Blackbird</li> <li>Short-eared Owl</li> <li>Yellow Rail</li> </ul>	Change in mortality.	<b>Not significant:</b> The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.



## 5 References

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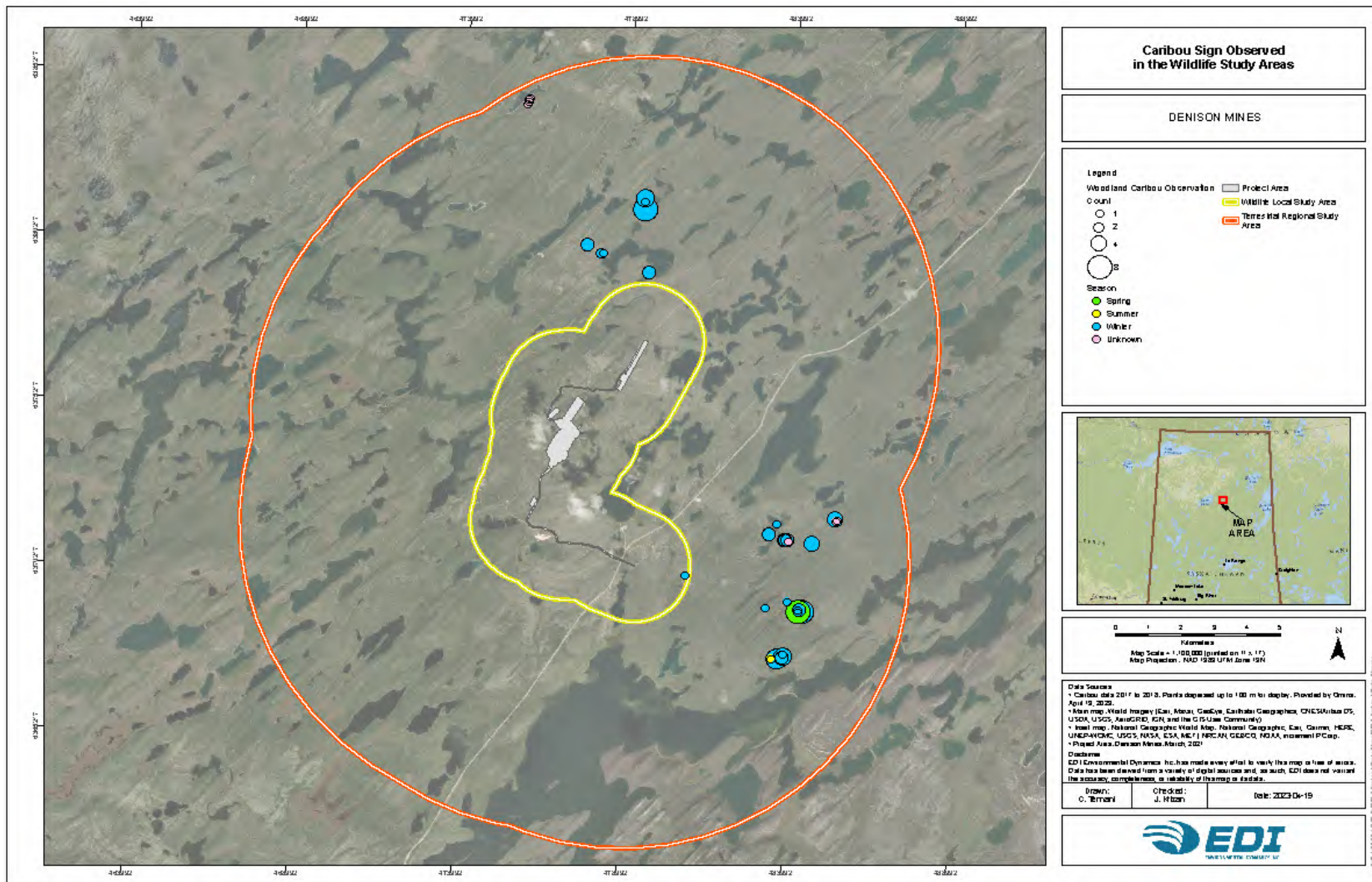
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## Attachment: IR-143

Number	IR-143
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Baseline Studies
Context and Rationale	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>
Information Requirement	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"> <li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li> <li>• Description of seasonal use of the LSA, RSA and caribou range.</li> <li>• Description of Project areas used by caribou.</li> <li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li> </ul> <p>Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).</p> <p>See also related: IR-152.</p>

Supporting figure to the response provided in table: revised Figure 9.3-8



Attachment IR-143 Figure 9.3-8 Caribou Sign Observations in the Wildlife Study Areas (updated)

## Attachment: IR-145

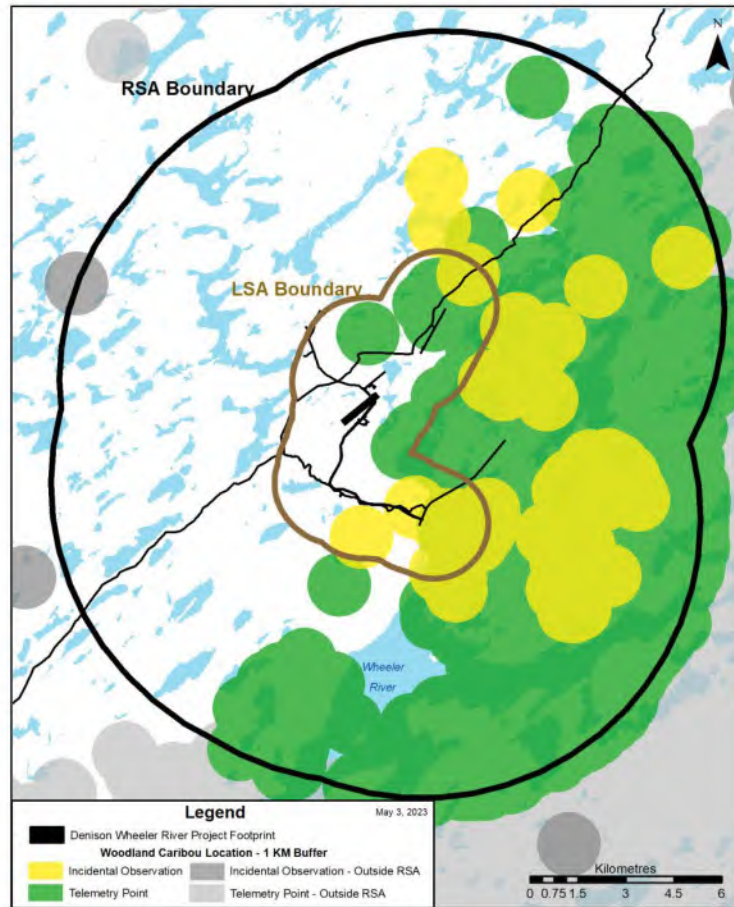
Number	IR-145
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Woodland Caribou
Context and Rationale	<p>Context and Rationale: The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).</p> <p>The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.</p> <p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>

Information Requirement	<p>1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada:</p> <ul style="list-style-type: none"><li>• information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>• a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,</li><li>• mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul> <p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p>
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Supporting figure to the response provided in table:



Denison-Wheeler Study Area - Woodland Caribou Location Data



RSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.

## Attachment: IR-149

Number	IR-149
Dept.	ECCC CNSC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures
Context and Rationale	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>
Information Requirement	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical</p>

	<p>habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"> <li>1. <b>AVOID:</b> Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li> <li>2. <b>MINIMIZE:</b> Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li> <li>3. <b>RESTORE ON-SITE:</b> describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li> <li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li> <li>5. <b>OFFSET:</b> Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</li> <li>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</li> </ol> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>
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**Response:**

Conceptual Caribou Mitigation Plan is included below.





 Denison Mines

*Powering*  
**PEOPLE, PARTNERSHIPS  
AND PASSION**

# Denison Mines Corp.

## Conceptual Caribou Mitigation Plan

**Version 1**

**June 2023**

### Revision History

Version	Date	Description of Revision
1	June 30, 2023	Conceptual plan to support provincial and federal review of the draft environmental impact statement

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## Acronyms and Abbreviations

Term	Definition
Anthropogenic	Caused or produced by humans
BSCs	biological soil crusts
Boreal Caribou	The boreal ecotype of woodland caribou occurs within the boreal forest of Canada. These non-migratory caribou form small aggregations throughout the year and disperse for solitary calving.
Committee on the Status of Endangered Wildlife in Canada (COSEWIC)	A committee made up of experts from academic, government and non-government organizations that assess the conservation status of wildlife species that may be at risk of extinction in Canada.
Critical Habitat	The habitat that is necessary for the survival of a listed wildlife species and is identified as the species critical habitat in the recovery strategy or action plans for the species.
DERT Project	Developing Eco-Restoration Together Project
Disturbed habitat (per ECCC 2020)	Habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer).
ECCC	Environment and Climate Change Canada
EA	environmental assessment
EIS	environmental impact statement
EMS	environmental management system
ENV	Saskatchewan Ministry of Environment
ha	hectare
Local Populations (ECCC 2020)	Group of boreal caribou occupying a defined area distinguished spatially from areas occupied by other groups of boreal caribou. Local population dynamics are driven primarily by local factors affecting birth and death rates, rather than immigration or emigration among groups. In this recovery strategy, “local population” refers to a group of boreal caribou occupying any of the three types of boreal caribou ranges (i.e., conservation unit, improved conservation unit, local population unit).

Plan	Conceptual Caribou Mitigation Plan
Project	Wheeler River Project
Range (per ECCC 2020)	<p>The geographic area occupied by a group of individuals that are subject to similar factors affecting their demography and used to satisfy their life history processes (e.g., calving, rutting, wintering) over a defined time frame.</p> <p>Environment and Climate Change Canada (2011) identified three types of boreal caribou ranges categorized based on the degree of certainty in the delineated range boundaries (i.e., conservation unit, improved conservation unit, local population unit).</p>
Recovery strategy	A planning document that identifies what needs to be done to stop or reverse the decline of a species.
SARA	Species at Risk Act
Self-sustaining local population (ECCC 2020)	A local population of boreal caribou that on average demonstrates stable or positive population growth over the short-term ( $\leq 20$ years) and is large enough to withstand stochastic events and persist over the long-term ( $\geq 50$ years), without the need for ongoing active management intervention.
Threatened species	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Undisturbed habitat (per ECCC 2020)	Habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.

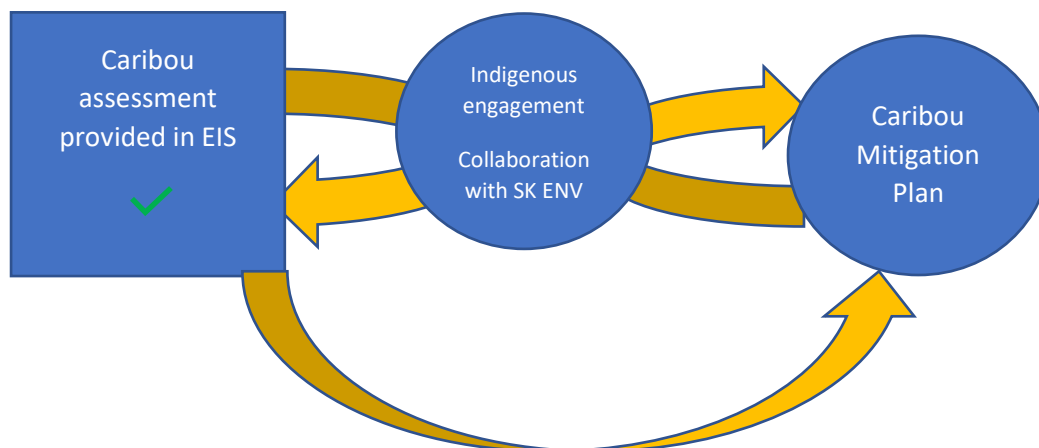
# 1 Introduction

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The Wheeler River Project (the Project) environmental impact statement (EIS) evaluates and assesses potential Project-related effects on the Boreal population of woodland caribou (*Rangifer tarandus caribou*; referred to herein as caribou or boreal caribou) following standard environmental assessment (EA) methodology. The assessment of potential effects considered both direct (i.e., habitat loss) and indirect effects (i.e., habitat alteration) on caribou and their habitat, while assuming that caribou were present year-round and during all of their life stages (i.e., calving, rearing, mating, over wintering). In this way, the EIS took a precautionary or conservative approach to understanding/addressing the likely residual effects (i.e., effects remaining after mitigation measures were considered) of the Project on caribou and their habitat and is using this approach as a planning tool to inform/support future Project-related regulatory approvals processes and follow-up monitoring. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.

This Conceptual Caribou Mitigation Plan (the Plan), developed proactively by Denison, has a different objective than the EIS. The Plan builds on the assessment of potential Project effects and commitments to mitigate such effects made in the EIS and is expected to be advanced with ongoing consultation with the Saskatchewan Ministry of Environment (ENV), as ENV finalize the caribou range plan for SK1. The EIS is a conservative planning tool, whereas the Plan is a practical, living document designed to define management works associated with caribou. The Plan is not a requirement for EA determination but is provided as a guidance document to help Denison proactively describe and inform the development and implementation of appropriate mitigation measures related to caribou and their habitat.

The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit, and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and regulators (e.g., ENV). As noted above, the boreal caribou range plan for SK-1 is under development and it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan is in part due to the absence of range plan priorities and reflects Denison's commitment to continue to work with the province to meet the management objectives and management strategies for the SK1 range.



## 2 Guidance and Regulatory Framework

A brief review highlighting federal and provincial considerations of boreal caribou is provided below for reference.

### 2.1 Federal

Boreal caribou have been designated as *threatened* under the federal *Species at Risk Act* (SARA). Environment and Climate Change Canada (ECCC) released amended recovery strategy for woodland caribou in 2020 (ECCC 2020). A recovery strategy is a planning document that identifies what should be done to stop or reverse the decline of a species.

The Project is located in the Boreal Shield West ecoregion of the Boreal Shield ecozone. The Boreal Shield West ecoregion stretches from Alberta to Ontario (Figure 2-1).

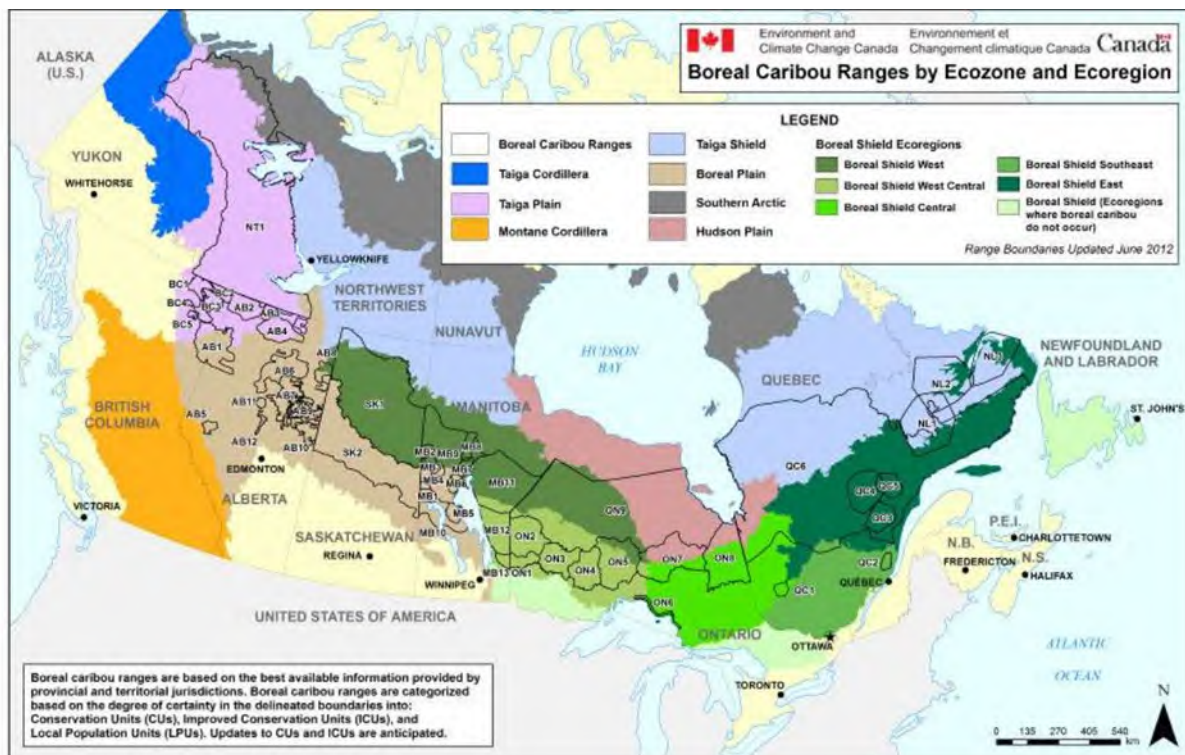


Figure 2-1: Boreal Caribou Distribution Across Ecozones and Ecoregions in Canada (source: ECCC 2020)

The SK1 range comprises more than 18,000,000 hectares (ha) and is characterized by high fire disturbance and low anthropogenic disturbance (ECCC 2020). The likelihood of caribou self-sustainability in the boreal shield range in SK1 is “likely” (ECCC 2020). For SK1, the amended recovery strategy (ECCC 2020) identifies 40% undisturbed habitat in the range as the disturbance management threshold, which provides a measurable probability (71%) for the local population to be self-sustaining. This threshold is considered a minimum threshold because at 40% undisturbed habitat there remains a risk (29%) that the SK1 local population cannot be self-sustaining. Disturbed habitat (ECCC 2020) is habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the

anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Undisturbed habitat (ECCC 2020) is habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.

Studies (e.g., McLoughlin et al. 2019) indicate that the SK1 local caribou population is likely self-sustaining at current levels of disturbance (60% total disturbance), with a 71% probability of persistence. Environment and Climate Change Canada's analyses also indicate that the SK1 local population is sensitive to small increases anthropogenic disturbance and sensitive to small decreases in adult survival. For these reasons, a higher probability of persistence was selected for critical habitat identification in SK1 (71%) than was selected for the other 50 ranges across Canada (60%) (ECCC 2019).

The precise location of the 40% undisturbed habitat within the range is expected to vary over time. The habitat within the SK1 range should exist in an appropriate spatial configuration such that boreal caribou can move throughout the range and access required habitat when needed. The key to this habitat delineation is achieving and maintaining an overall, ongoing range condition that allows for the dynamic habitat supply system, containing the biophysical attributes upon which caribou depend, to remain sustainable. It is this dynamic habitat supply system within the SK1 range that is the habitat condition considered to be necessary for the caribou.

## **2.2 Provincial**

The responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels.

The Saskatchewan Conservation Data Centre (SK-CDC) is responsible for evaluating and assigning a conservation rank to each taxon, resident or transient, found in the province. Woodland caribou's subnational or S-rank conservation rank is S3. This ranking indicates that, provincially, the species is vulnerable/rare to uncommon which is associated with a moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors. Currently, the caribou population in SK-1 is stable (ENV 2023) and the range plan is under development. Engagement is a key component of the range plan process and will be completed with representatives from First Nation, Métis, industry, non-governmental organizations, and communities.

The provincial goal is to sustain and enhance woodland caribou populations, and maintain the ecosystems they require, throughout their current range (ENV 2013). Through the woodland caribou range assessment and range planning program, the province is:

- Gaining a better understanding of woodland caribou ecology;
- Working toward meeting objectives identified in provincial and federal strategies; and
- Improving how the province manages the species and related habitat.

The province's woodland caribou range assessment and range planning program incorporates two key components:



- Woodland caribou range assessment, which enhances the understanding of woodland caribou populations and their interactions with the environment; and
- Woodland caribou range planning, which provides a framework, strategies and objectives that allow for better decisions involving habitat management and self-sustaining caribou populations.

Although the management objectives and management strategies for caribou in SK1 are not yet defined, Denison is committed to working with ENV as the range plan is developed. The Plan will be updated as the Project advances so that it aligns with the conservation objectives as determined by the province as the primary steward of caribou in the province.

## 3 SK 1 Caribou Population – Background Information

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Background information concerning the condition of the SK 1 caribou population is provided below.

### 3.1 Population Trends

The SK1 Boreal Shield management unit contains high-quality conifer-dominated caribou habitat with greater than 40-year-old stands of jack pine and black spruce forests suitable for lichen colonization, black spruce swamps, and open muskegs supporting relatively high densities of caribou, at 36.9 caribou/1,000 km<sup>2</sup> or approximately 4,000 caribou across the SK1 Boreal Shield Woodland Caribou Management Unit (McLoughlin et al. 2019).

Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens. If the quantity of available lichen forage is low, caribou can exist without relying entirely on lichens (McLoughlin et al. 2019). Due to their physiology, lichens are resilient to periods of drought and cold temperatures, but because of their slow growth rate, exhibit a slow recovery time after depletion and fire events. In the SK1 range, McLoughlin et al. (2019) found that stand types with the highest potential for adequate lichen biomass for caribou are jack pine and poorly drained black spruce sites.

McLoughlin et al. (2019) observed that, from 2014 to 2018, the caribou population exhibited a high average adult female survival rate and moderate recruitment (0.192 calves per cow in March), ranging from a low of 0.134 calves/cow in March 2016 to 0.244 calves/cow in March 2018. These demographic parameters led the authors to assess the SK1 Boreal Shield caribou population as being stable at the time of their study (McLoughlin et al. 2019).

While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).

Neufeld et al. (2021) summarized results from aerial surveys over a period of eight years in an 87,193 km<sup>2</sup> study area in the Athabasca Plain and Churchill River Upland ecoregions in the north, that are inclusive of the Terrestrial RSAs that were used in the EIS. During 11 of 16 aerial caribou surveys conducted between 2008 and 2015, woodland caribou were detected in the surveyed areas. The average density of the 16 surveys was estimated at 36.9 caribou/1,000 km<sup>2</sup> (95% CI = 26.7 to 47.2 caribou/1,000 km<sup>2</sup>). Across the Neufeld et al. (2021) study area and all years, estimated caribou densities were higher in comparison to averages reported for most other boreal woodland caribou ranges in Canada (i.e., caribou density reported in other areas ranged 4.3 to 18.7/1,000 km<sup>2</sup>) indicating that caribou can tolerate natural disturbance. One exception to the relatively high caribou densities in northern Saskatchewan was noted: the 2,285 km aerial the Millennium Project in March 2014, 10 km west of the Terrestrial RSA, resulted in lower woodland caribou densities at 5 caribou/1,000 km<sup>2</sup> (Neufeld et al. 2021).

Eight of the sixteen caribou surveys reported the ratios of male to female and calf to female in their results with the average male:female ratio calculated at 0.571 (95% CI = 0.444 to 0.699) and calf:female at 0.195 (0.158 to 0.232). Again, the 2014 Millennium survey reported a different male:female ratio, outside the reported range (1.6), concurring with the reported low caribou densities.

## 3.2 Predation

In addition to relatively low predator densities in their study area, McLoughlin et al. (2019) found some spatial separation between caribou and wolves. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>) (McLoughlin et al. 2019).

McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season and only 1 of 94 collared caribou was harvested by a hunter during the four years of the study.

While predation is believed to be a key limiting factor for woodland caribou (Bergerud 1974; Stuart-Smith et al. 1997, DeMars et al. 2011 from ECCC 2020), Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat- or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.

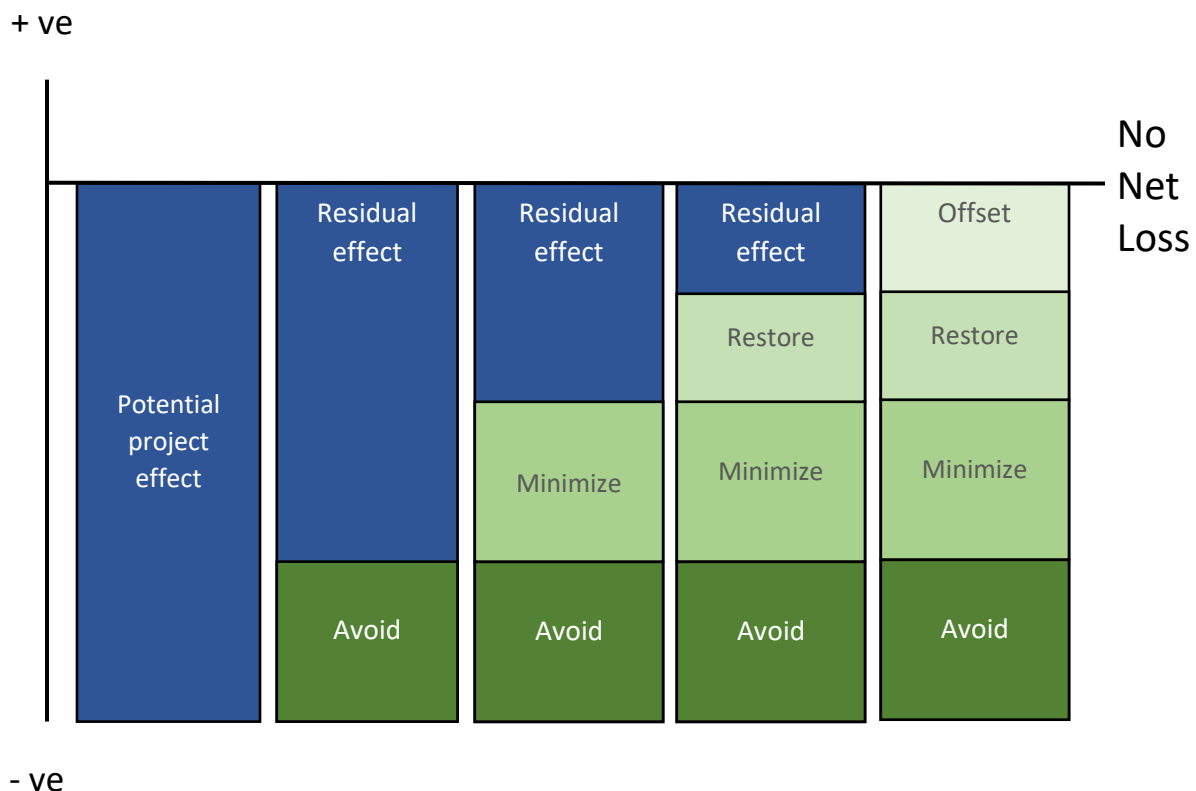
## 3.3 Harvest

Indigenous peoples in Saskatchewan have an inherent right to harvest woodland caribou for subsistence purposes (ENV 2013). No other harvest of woodland caribou is currently permitted. Under provincial and federal recovery planning and effective species management, self-sustaining caribou populations will support long-term subsistence use of the species and protect treaty rights. Subsistence harvest levels are assumed to be low but actual numbers are not available because most communities or Indigenous groups are not collecting and/or publishing this information.

## 4 No Net Loss and Mitigation Hierarchy

A generic biodiversity mitigation hierarchy (OECD 2016) to achieve no net loss is provided in Figure 4-1. As shown in the hierarchy, an offset can be used to achieve no net loss if residual effects remain following efforts to avoid, minimize, and restore potential project effects. This generic hierarchy is generally consistent with the approach of ENV to manage effects on caribou and their habitat.

The balance of Section 4 of this Plan outlines Denison's approach to avoid, minimize, and restore caribou habitat per commitments made in the draft EIS associated with the Wheeler River Project.



**Figure 4-1: Generic No Net Loss and Mitigation Hierarchy (modified from OECD 2016)**

### 4.1 Avoid

Potential adverse effects on the caribou have been avoided to the extent possible through Project design, including:

- Selection of in-situ recovery (ISR) mining avoids some direct and indirect effects compared to conventional underground or open-pit mining methods. ISR mining avoids the need for spatially expansive infrastructure such as waste rock piles and tailings management facilities reducing the Project footprint (i.e., avoids direct effects on caribou and their habitat). ISR mining also reduces the potential for interactions between caribou and Project components / activities as it concerns sensory disturbance as it is inherently a less intensive form of mining with reduced noise/light/vibration generation (i.e., avoids indirect effects on caribou and their habitat).

- Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for caribou (for example, outside of wintering/calving period from April 1-July 31, per ENV 2013), where practical, to avoid disturbance during sensitive time periods.
- Pre-disturbance wildlife surveys will be completed to identify caribou presence and work will be postponed if caribou are present.

## 4.2 Minimize

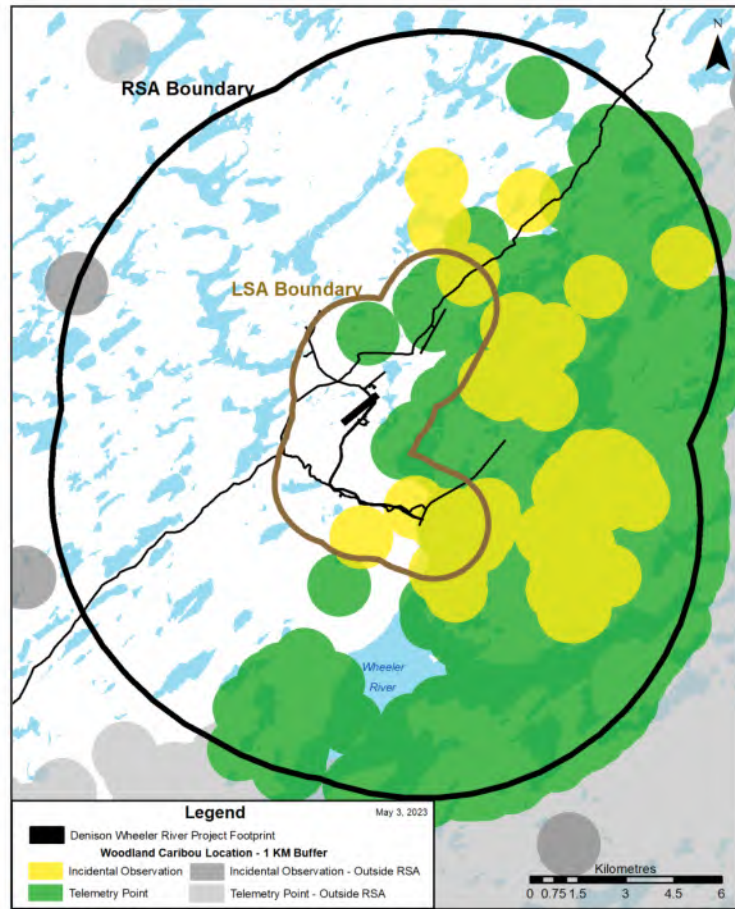
Additional mitigation measures to minimize effects on caribou and their habitat and tailored to Project features have been incorporated into the various Project management and monitoring plans within the Environmental Management System (EMS) including but limited to erosion and sediment controls, soil and vegetation monitoring, Decommissioning Plan, air quality monitoring, fuel spill control and response, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.

The Project's EMS plans provide direction on monitoring and adaptive management so that issues are identified and mitigation measures are developed and implemented in a timely and effective manner. Mitigation measures specific to caribou are applicable during all Project phases, within all seasons and expected to be effective following appropriate implementation. Examples of the measures to minimize Project effects on wildlife in general, and caribou in particular, are highlighted below.

### 4.2.1 Disturbance Footprint

- Siting Project components in close proximity to the ISR mining area minimizes indirect effects on caribou and their habitat. The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area. . Appropriate siting is anticipated to minimize the potential for interactions with woodland caribou and Project activities.
- The Project footprint (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable, resulting in limited/minimal habitat loss/disturbance and noise propagation.
- Portions of the proposed Project footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.

# Denison-Wheeler Study Area - Woodland Caribou Location Data



RSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.

**Figure 4-2 Saskatchewan Ministry of Environment Woodland Caribou Location Data Provided to Denison**



#### **4.2.2 Wildlife and Habitat Protection**

- Project activities have been assessed for their potential to disturb or remove wildlife and/or wildlife habitat (e.g., site clearing, soil disturbance) to determine potential effects on wildlife and wildlife habitat and the assessment, including proposed mitigation measures, for the Project will guide Project activities.
- Pre-disturbance wildlife clearance surveys will be conducted within the Project Area; results of the clearance surveys will inform the development and implementation of appropriate mitigation (e.g., delay of work) to address the identified issue (e.g., presence of caribou).
- Personal firearms for employees and contractors will be prohibited within the Project Area to prevent hunting activities.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing wildlife species within the Project Area.
- To support wildlife habitat regeneration, progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Decommissioning Plan.

#### **4.2.3 Wildlife Deterrence and Prevention of Wildlife Entrapment**

- In addition to installing secure fencing around all contaminated areas to prevent accidental contaminant exposure, buildings and other Project components will be designed and maintained to exclude wildlife from using buildings for refuge or shelter, and to deter wildlife from potentially becoming entrapped.

#### **4.2.4 Sensory Disturbance**

- Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife, especially during sensitive time periods, such as calving. This would include:
  - locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;
  - directing the generator discharge openings away from sensitive locations; and
  - making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings).
- The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. Low sound emission equipment and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities. There will be regular maintenance of equipment to ensure it is in proper working order and not emitting noise unduly.

- Lighting will be focused on work sites and not surrounding areas, to minimize light trespass and other light-related pollution sources.
- Facilities will be illuminated only to meet standards set for the protection of workers to avoid over-illumination.
- Battery-powered, light vehicles and mobile equipment, and an AC powered dual rotary drill will be used for ISR wellfield development instead of a traditional diesel-powered unit, where practical, to reduce air emissions and noise levels and improve energy efficiency.
- Fugitive dust sources that could lead to deposition of dust on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - dust suppression techniques on site roadways, such as road watering and traffic management;
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;
  - making a wash bay available to clean items, equipment, and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge; and,
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area.

#### **4.2.5 Road and Traffic Management**

- Traffic and access control measures will be implemented, including managing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic) to the Project site and roads with both north and south security access gates. It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it was safe to do so given Project activities in the area.
- Appropriate road signage will be installed (e.g., speed limits, identification of wildlife crossings and areas of high activity) along Project roads to minimize the risk of wildlife-vehicle collisions.
- Speed limits will be implemented to reduce the risk of wildlife-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage caribou to move off Project roads and processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow caribou to move away or off the road before resuming normal road speeds for the area.

- Road watering and regular road maintenance to limit dust dispersion.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be promptly reported to ENV and disposed of as directed to prevent scavenging.
- Vegetation along Project roads will be managed to reduce attractiveness to wildlife (e.g., forage plants) and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable, to limit the use of specialty chemicals and potential exposure of wildlife including caribou to them.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate caribou crossing and escape and, with that, reducing their risk of vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water as roadside pools may attract caribou.

#### **4.2.6 Water Management, Waste Management, Emissions, and Hazardous Materials Management**

- Education on and enforcement of proper water, waste, emissions and hazardous materials management practices will be provided to employees and contractors.
- A freeze wall will be established around the uranium deposit to reduce potential for groundwater disturbance or contamination mitigating the likelihood of exposure of caribou to contaminants in local areas of groundwater discharge to surface.
- The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit, reducing water use requirements to the extent feasible. Make-up water will be preferentially sourced from site runoff (instead of freshwater) where possible.
- Contaminated wastes (e.g., mineralized drill cuttings, process precipitates) will be temporarily stored on double lined pads with leak detection capabilities and an associated monitoring program until final disposal at an approved facility. An adjacent pond will be used to collect contact water from these pads.
- All contact water will be routed to the Industrial Wastewater Treatment Plant for treatment and eventual release to the environment. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits. This will mitigate exposure of caribou to Project-related contaminants released to the environment.

- Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations to mitigate the likelihood of the release of such chemicals to the environment that could result in exposure of caribou to the chemicals.
- Double-walled high-density polyethylene (HDPE) or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement to mitigate the likelihood of the piping failure and the associated release of wellfield chemicals to the environment that could result in exposure of caribou to the chemicals.
- Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the domestic landfill generating odours and thereby minimizing wildlife attractants.
- Domestic waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting wildlife and reduce the risk for human-wildlife interactions. The wildlife-proof containers will be inspected regularly for evidence of wildlife presence or access to waste disposal facilities. If evidence of wildlife presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal/incineration frequencies will be increased.
- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- Air emissions will be reduced to the extent practical through implementation of the development of air emissions management and monitoring plans within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited to reduce emissions.
- The use of hazardous materials will be limited as much as possible.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines to minimize the risk of accidental spills or leakage. This will mitigate the likelihood of release to the environment that could result in exposure of caribou to the hazardous materials.
- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance to avoid attracting wildlife (e.g., wildlife-proof containers, exclusion fencing) to mitigate the likelihood of exposure of caribou to hazardous materials.
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use / interaction. The deterrents will be monitored and maintained .
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan to mitigate the likelihood of

the release of hazardous material to the environment that could result in exposure of caribou to the material.

- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan. This will mitigate the likelihood of a fuel spill to water that could result in exposure of caribou to fuel.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials and mitigate the likelihood of exposure of caribou to such chemicals.
- All vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.

#### **4.2.7 Wildlife Education**

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential caribou issues on site and training on the mitigation measures summarized with the EMS and specifically in this Plan to avoid or minimize potential Project effects on caribou and caribou habitat.
- Employees and contractors will be educated on waste and hazardous waste management practices / policies that limit human-wildlife interactions and the potential exposure of wildlife to those wastes.
- Designated employees will be trained in appropriate wildlife deterrent techniques to minimize wildlife interactions with the Project.
- Employees and contractors will be requested to report wildlife observations, including prompt reporting of caribou observations and immediate communication to on-site staff. Wildlife encounters and outcomes will be monitored, and logbooks will be used to record wildlife observations. Logbooks and reports will be available to employees. Incidental observations recorded by staff will be entered into Species Detection Loadforms and submitted to the Saskatchewan Conservation Data Centre annually.

### **4.3 Restore**

The temporal bounds for the Project as stated in the EIS are years 1 to 3 for construction, years 3 to 18 for operation, years 18 to 23 for decommissioning, and fifteen years of post-decommissioning monitoring and inspections from years 23 to 38. Importantly, during physical decommissioning the majority of Project components are scheduled to be removed from site which is expected to facilitate restoration activities. Also, because of the selected ISR mining method, there are no large, permanent Project components, such as waste rock piles or tailings management facilities, for which large scale and potentially complex restoration strategies are needed.

Denison's decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure. The Project's Conceptual Decommissioning Plan (CDP) is included in the draft EIS. The details of decommissioning and restoration will be refined over time as the Project proceeds. A Preliminary Decommissioning Plan (PDP) will be developed by Denison to support licensing and permitting applications. Prior to executing decommissioning activities, Denison will prepare and submit a Detailed Decommissioning Plan (DDP) to regulators for their review and acceptance, which builds on the PDP.

The CDP outlines plans for physical decommissioning (mining area remediation; asset removal; and decontamination, demolition, and disposal), followed by restoration. A summary of the CDP is provided here.

- Ongoing decommissioning of Project components will be completed when possible.
- Denison has committed to progressively restore areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Restoration of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed regularly at a schedule commensurate with the expectations of the activities per the decommissioning plan. Progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native species and in accordance with the decommissioning plan.
- Once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled, restoration activities, including planting, will take place. Currently this would largely be with jack pine seedlings, but the mix of plants will depend on location and available species. Restoration activities monitored until it is deemed self-sustaining and viable wildlife habitat.
- Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on results of these discussions, transportation corridors including roads or trails associated with the Project site that are no longer needed will be graded, scarified, and vegetated with native, self-sustaining species as required. Access to facilitate safe post-closure monitoring or requested by appropriate Interested Parties (e.g., to facilitate land use) may be left in place. Access to the site may be restricted by gates and/or berms.
- Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during restoration.
- Lessons learned from progressive decommissioning and any site-specific restoration studies will be incorporated into the DDP. Additionally, information from other northern Saskatchewan mine



sites will be examined to help Denison select the restoration tools, including revegetation options, that will contribute towards decommissioning success.

Closure of the entire Project will be completed in accordance with provincial and federal regulations and guidance documents with the fundamental considerations being to confirm physical and chemical stability of the site to protect human health and the environment.

Progressive decommissioning and restoration will be completed throughout the life of the Project, whenever feasible, and reported to the regulatory agencies as part of the annual reporting requirements throughout Operation. Associated activities will focus on the decontamination, demolition, and disposal of unused buildings and infrastructure, as well as the removal of unused equipment and machinery. Progressive decommissioning and restoration are expected to continue and result in positive effects as revegetation is continued and regeneration occurs. Following decommissioning and restoration, wildlife habitat is expected to recover to baseline conditions.

## 5 Habitat Loss Calculation

### 5.1 Habitat Loss in Context of the Disturbance Management Threshold for SK1

To support the Plan with respect to the calculation of habitat loss, a mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020).

#### 5.1.1 Approach

First the Project infrastructure footprint area was delineated and estimated to be 80 ha. Next, a 500 m buffer was applied to the Project footprint, resulting in a total potential disturbance area of 1,350 ha. This is consistent with the approach for determining direct and indirect effects, as outlined in ECCC (2020).

Finally, an analysis was undertaken to quantify the amount of caribou habitat that is currently disturbed within the Project footprint + 500 m buffer. According to ECCC (2020), there are two contributors to disturbed habitat in SK1: 1. anthropogenic disturbance + 500 m buffer and 2. fire disturbance in the last 40 years, without a buffer. The two factors for disturbed habitat were considered as follows:

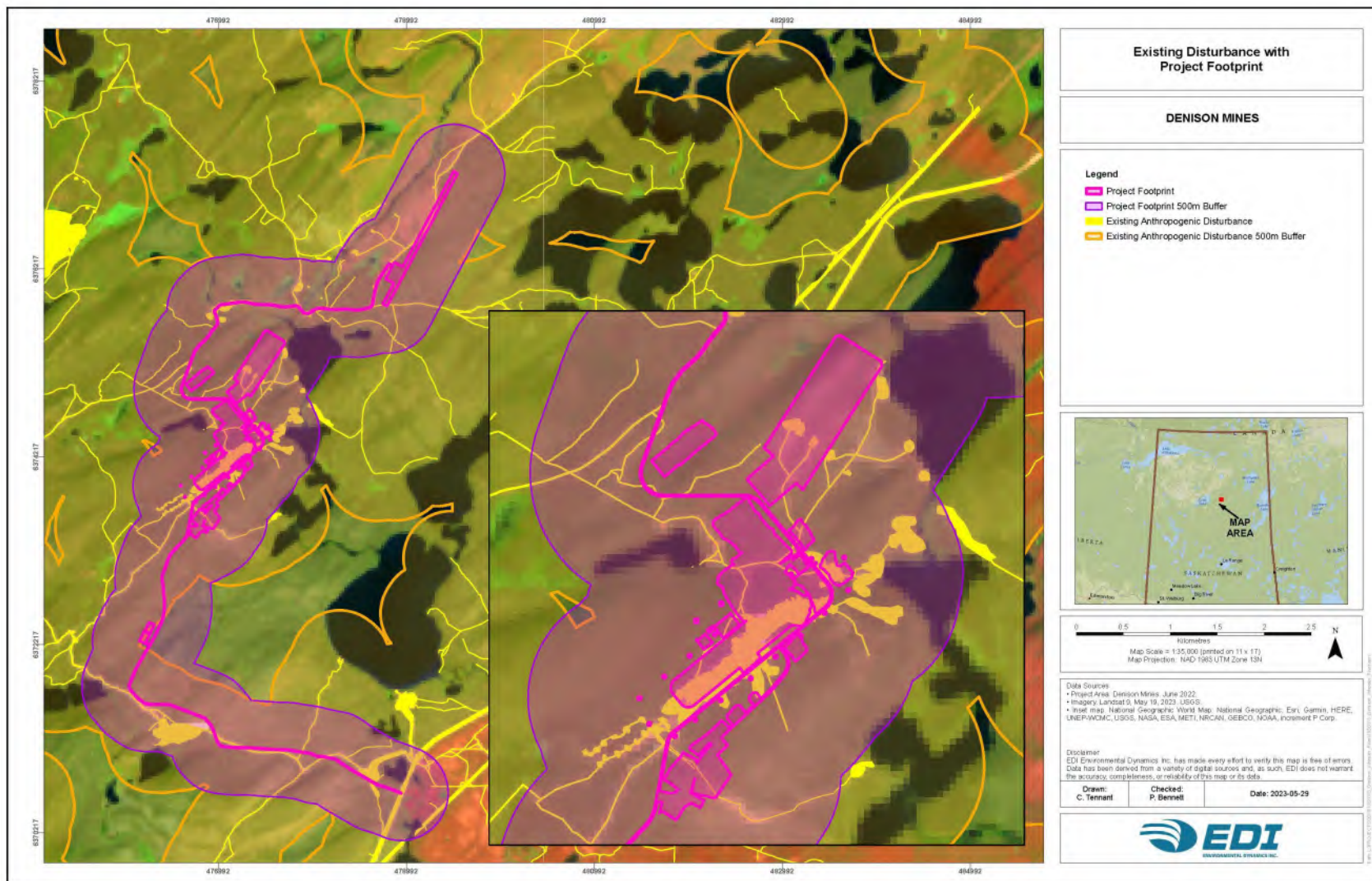
1. Existing anthropogenic disturbance + 500 m: For anthropogenic disturbance calculations to inform the Plan, mapping was completed and evaluated to determine the existing anthropogenic disturbance. Although the EIS considered anthropogenic disturbances on IKONOS imagery at the 1:5,000 scale, the mapping exercise to support habitat loss calculations in the Plan used anthropogenic disturbances visible on Landsat at the 1:50,000 scale, to be consistent with the definitions of disturbed habitat from the amended recovery strategy (ECCC 2020).
2. Fire disturbance in the last 40 years, without buffer: To determine ecosites that were in a regenerating phase or having experienced fire disturbance in the last 40 years, the ecosites BS3/BS7-Jack pine-blueberry/Black spruce-blueberry/lichen were used, based on previous ecosite classification work completed to support the EIS.

#### 5.1.2 Results

As shown in Table 5-1 and Figure 5-1, the proposed Project footprint + 500 m buffer is almost entirely located within existing, buffered anthropogenic disturbance. This means the Project footprint + 500 m buffer is located within already disturbed habitat, according to ECCC (2020). Additionally, the mapping exercise shows that approximately half of the Project footprint + 500 m buffer is located within regenerating forest, i.e., forest burned less than 40 years ago (Figure 5-2).

**Table 5-1: Existing Disturbed Habitat within Buffered Project Footprint**

	Area within Project Footprint + 500 m buffer (1,350 ha)
Existing anthropogenic disturbance (+ 500 m buffer)	1,298 ha
Regenerating forest (fire disturbance in the last 40 years; no buffer)	730 ha



**Figure 5-1: Proposed Project Footprint (+ 500 m buffer) with Existing Anthropogenic Disturbance (+ 500 m buffer) Visible on Landsat at 1:50,000**



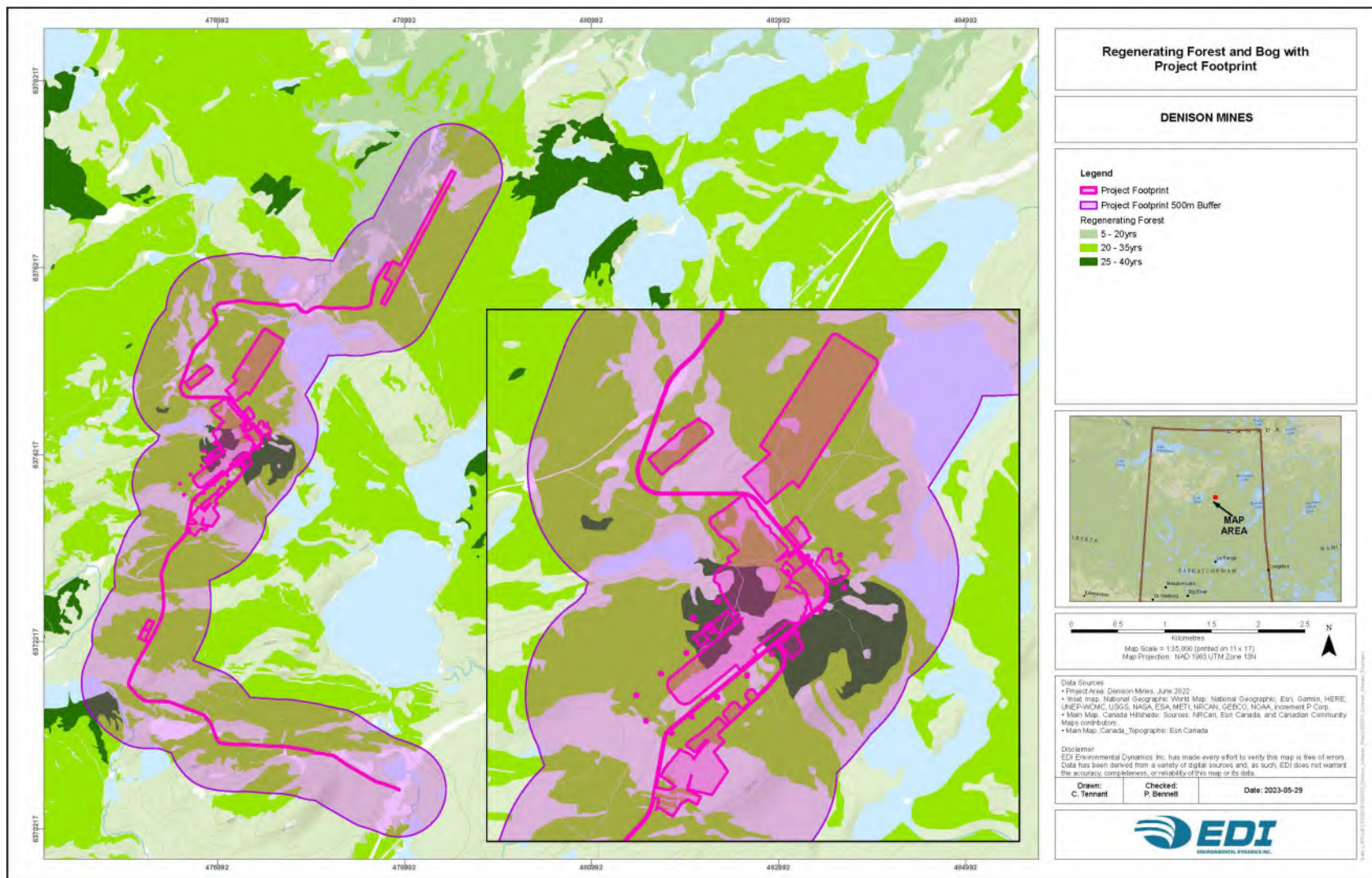


Figure 5-2: Proposed Project Footprint (+ 500 m buffer) with Regenerating Forest

Based on the above analysis using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.

Additionally, ECCC (2020) identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in the SK1 Boreal Shield range should not exceed 5% with the remainder (i.e., 55%) being attributed to natural disturbance (while maintaining a minimum of 40% undisturbed habitat in the range). ECCC (2020) calculated that approximately 58% of the SK1 Boreal Shield range is currently affected by past forest fires and 3% of the range is affected by anthropogenic disturbances. For additional context, the size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020). The Project footprint + 500 m buffer (1,350 ha) would represent an estimated Project-related disturbance of 0.007% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit.

## 5.2 Direct Loss Calculation

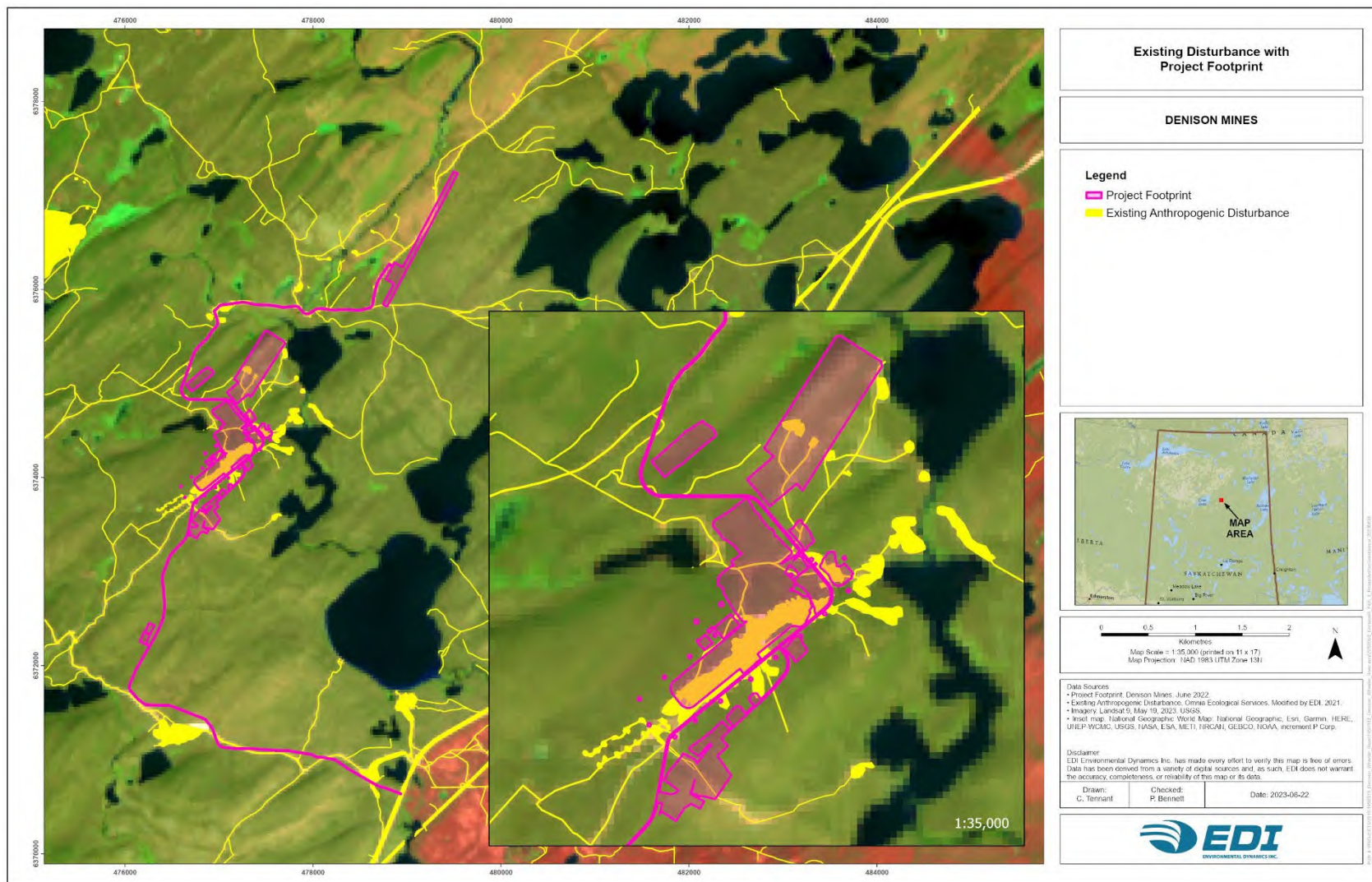
The Project infrastructure footprint has been delineated and the area was determined to be 80 ha. Of this area, 12 ha are comprised of previously disturbed land resulting from past activities (e.g., access, exploration camp and laydown areas). The remainder of the Project footprint is comprised of regenerating forest (forest less than 40 years old) habitat which is typically considered to be low quality habitat for caribou (Figure 5.3).

**Table 5-2: Land Cover Types within the Project Footprint**

Total Area	
Project footprint	80 ha
Existing anthropogenic disturbance	12 ha
Regenerating forest habitat (i.e., low quality caribou habitat)	68 ha

Denison understands that the Project will likely result in a limited residual effect on caribou and their habitat within the RSA; however, these effects are considered to be small in a relative sense when considered in the context of the SK1 range, as described in Section 5.1.





**Figure 5-3: Proposed Project Footprint with Existing Anthropogenic Disturbance Visible on Landsat at 1:50,000**



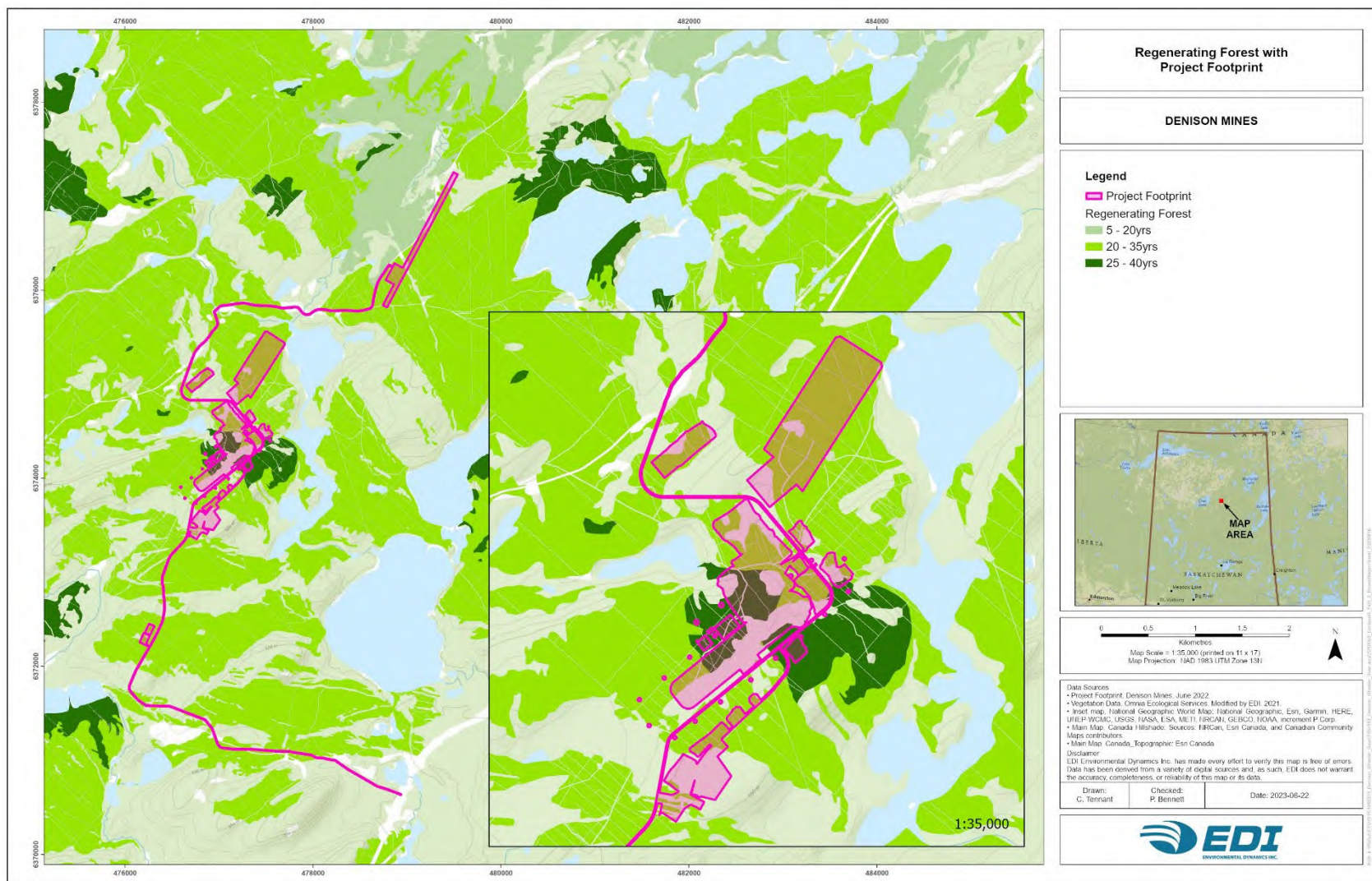
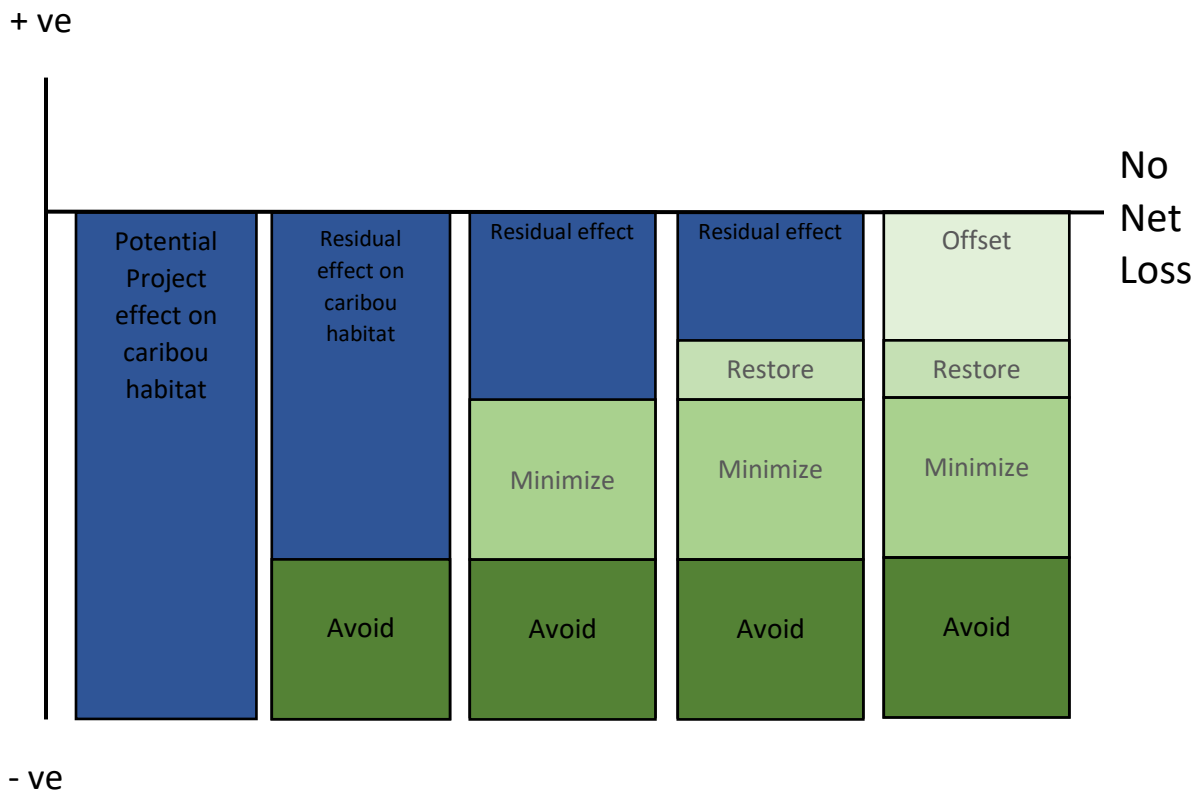


Figure 5-4: Proposed Project Footprint with Regenerating Forest

It is Denison's understanding that currently there are no provisions/requirements for caribou habitat offset by the ENV for projects within the SK1 range. Denison recognizes the importance of woodland caribou to Indigenous groups, the general public, other Interested Parties in Saskatchewan, and Canada. As such, as part of this Plan, Denison is proposing to continue to work with ENV to determine an appropriate offset based on the habitat loss as a result of the Project. Denison expects that the proposed offset calculations would likely include aspects of additionality, temporal considerations, spatial considerations, and other aspects, depending on the expectations/requirements of the caribou habitat offset process that the ENV is currently refining/finalizing. The proposed offset calculations are expected to be refined through ongoing communications with ENV to appropriately address issues at the provincial level related to caribou and habitat.

Future versions of the Plan will include detailed options to develop and advance restoration work and initiatives to provide responsible, proactive environmental stewardship. These offsets (Figure 5-5) are expected to be further refined/defined through Plan updates as the Project proceeds and consultations with ENV advance. Some initial options are presented at a conceptual level in Section 6.



**Figure 5-5: Wheeler River Project Conceptual Caribou Mitigation Plan to Achieve No Net Loss**

## 6 Offset Framework

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This section provides a discussion on offset options will become more defined as the Plan advances, in consultation with ENV. This is expected to offset residual effects over the life-of-the-Project and enhance the restoration activities occurring within the Project footprint to result in no net loss of habitat within the RSA as a result of the Project.

### 6.1 Conceptual Offset Opportunities

An opportunity that Denison has proactively identified is a combined linear feature mitigation and restoration option. Denison has implemented a practical and experimental pilot study to investigate the design, implementation, testing, and monitoring of several functional and structural habitat mitigation options. This opportunity involves two components: 1) applying treatments to address (i.e., reduce) lines-of-sight and discourage linear feature use by both caribou and their predators, and 2) restoration focused on re-establishing terrestrial lichen communities co-established with a biological soil crust (BSC) component.

Importantly, to complete this pilot program, Denison has partnered with the University of Saskatchewan and Northwest Communities Environmental Services (an Indigenous-owned environmental company) under the Developing Eco-Restoration Together (DERT) program. This unique project aims to co-create ecological restoration practices that centre Indigenous peoples, worldviews, and values while also braiding knowledge from the land, Indigenous knowledge, and western science. The project is supported by the three partners but is ultimately guided by the Indigenous Project Advisory Board, and the Community Liaison/Education Coordinator. Through restoration trials, community engagement, and various planting techniques, Denison, with their partners are seeking to return ecosystem functions in areas where they have been previously disturbed (e.g., exploration cutlines). Through collaboration with community members, University of Saskatchewan, industry partners, two graduate students, and local youth, this project is expected to ultimately inform the creation of a framework for effective restoration practices in northern Saskatchewan that centre on caribou and Indigenous communities.

#### 6.1.1 Caribou Trail Study

Wildlife, particularly bears, wolves, and woodland caribou, are using anthropogenic linear features to move throughout their habitat with greater ease. This can result in increased chance encounters between predators and prey and could contribute to the reduction in woodland caribou populations (Omnia 2022). Denison is conducting research on the use of linear features predators and prey in the Athabasca Basin to collect relevant data to inform an effective plan designed to disrupt the current risk related to predator/prey movements/interactions.

Currently, ENV has no guidelines or protocols for assessing the status of disturbance features or for evaluating the need for linear feature mitigation. Denison proactively initiated research to collect field-based findings on the effectiveness of linear disruption features on predator/prey movements in the vicinity of the Project. This field program was designed and implemented to deploy and monitor the effectiveness of five linear feature treatments across nine locations. Treatment types include, seeding and/or planting of jack pine, spreading coarse woody debris, tree tipping, constructing biodegradable fencing, and earth/debris mounding. Methods vary by location but have a common goal: to discourage prolonged disturbance and encourage new growth in areas of disturbance (Omnia 2022). Each

treatment area is monitored by game cameras year-round to determine how wildlife interact with the created physical and visual barriers. All treatments are temporary and biodegradable with the purpose of reducing trail use in the near-term so that the forest can regenerate naturally.

Preliminary results are encouraging and indicate that bear use of treated lines was reduced by 43% compared to untreated lines, caribou use was reduced by 95%, and wolf and moose use was reduced by approximately 94%. Overall, use of treated lines by species of interest was reduced by approximately 83% when compared to baseline monitoring rates. These successful preliminary results will guide future work to define potential offset options associated with linear feature mitigation and restoration.

### **6.1.2 Biological Soil Crust Research**

To support restoration planning, additional research will be designed to investigate BSCs and conducted by a soil science graduate student at the University of Saskatchewan. This research is expected to contribute to the goals of the Developing Eco-Restoration Together Project. BSCs are communities of lichen, bryophytes, cyanobacteria, and microorganisms found in the top layer of the soil (Heindel et al. 2019). These surface soil mats are rich in diversity, and play an important role in the broader ecosystem, especially in locations with extreme climate, little moisture, and nutrient-poor soil (Cowden et al., 2022). Research on BSCs has been focused on desert regions, and this research provides insight to BSC's role in boreal ecosystems, specifically in northern Saskatchewan. By gaining a better understanding of how to support BSC establishment and growth, it is expected that the findings can inform restoration activities that would ultimately benefit caribou.

Sampling of BSCs within the region will be based on a fire chronosequence. This is expected to provide a foundation to better understand the functions and species present in BSCs, and how they develop post-disturbance (Coxson and Marsh 2001). Understanding how these communities develop and interact is important, especially considering the gap in knowledge on soil microbial communities, non-vascular species, and their role in restoration techniques.

A critical element in supporting caribou populations is the consideration of caribou forage lichens. Due to the slow-growing nature of lichens, it can be difficult to include them in restoration activities (McMullin and Rapai 2020). Denison is planning to focus on caribou forage, primarily through transplanting and propagation of the appropriate lichen species. Natural regrowth of lichen communities after fires takes place in a complex setting, where BSCs and bryophyte communities stabilize soil surfaces, providing habitats where lichen propagules can establish and grow (Coxson and Marsh 2001). Denison hypothesizes that reestablishment of terrestrial lichen communities will have a better chance of success where these supporting BSC components can be co-established at the same time. The findings from the BSC research within post-fire environments is expected to support lichen communities, restoration activities for the DERT project, and ultimately caribou and caribou habitat within the Wheeler River Project area.



## 7 Monitoring and Adaptive Management Framework

An adaptive management framework will be developed to support the implementation of this Plan (Figure 7-1). In this context the adaptive management framework provides the means for the integration of Plan scope, management, and monitoring to systematically evaluate assumptions to adapt and learn. In practical terms the framework will consider the outcomes of actions taken/implemented, whether they have been successful and, if not, how can such actions be adapted to increase the likelihood of success. Outcomes of the Plan would be measured by establishing performance indicators as the way to define and measure progress toward achieving the objectives.

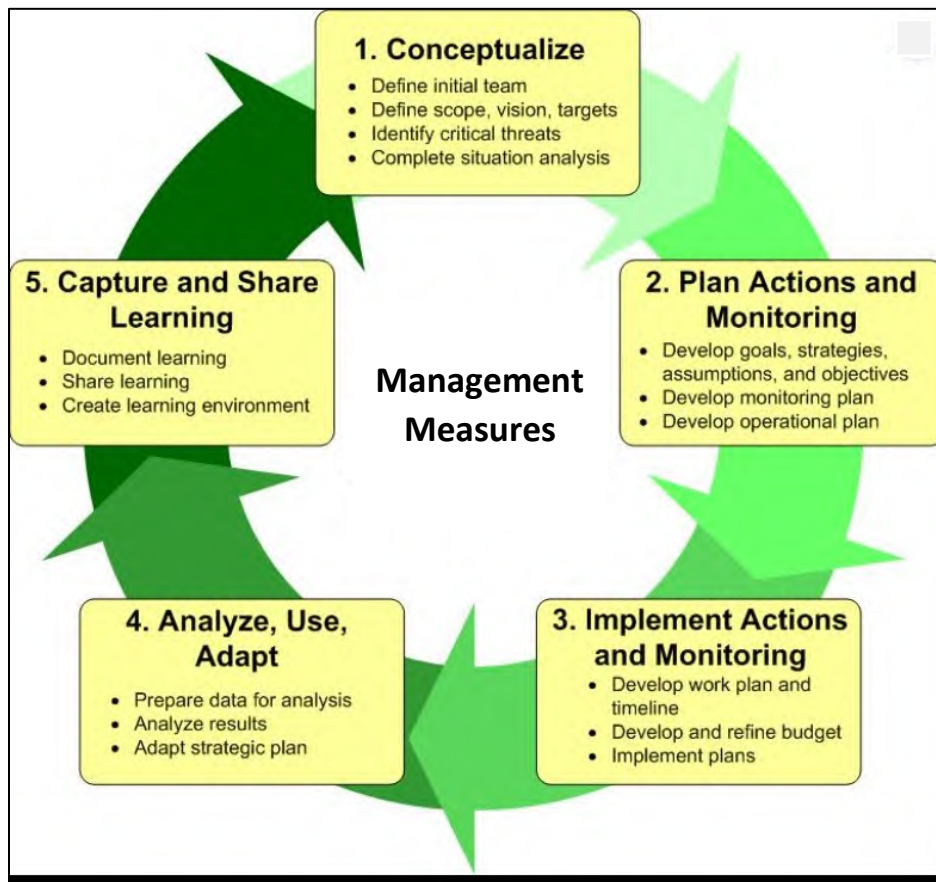


Figure 7-1: Adaptive Management Cycle

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## Attachment: IR-150

Number	IR-150
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan
Context and Rationale	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>
Information Requirement	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.

### Response:

The requested report titled *Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results* is included below.

**Denison Mines Corporation  
Wheeler River Project**

**Pilot Program: Linear Feature Mitigation  
Interim Report- Status Update and Preliminary Results**

*Prepared for:*

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November 2022  
Omnia Project ID: 2103-01

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Denison Wheeler River Project.

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## 1 INTRODUCTION

Federal and provincial planning documents and woodland caribou (*Rangifer tarandus caribou*) population assessments have indicated that much of the Saskatchewan woodland caribou population is at risk from landscape-level disturbance. There exist no guidelines for evaluating reclamation requirements or outlining what the criteria for reclamation are. Omnia Ecological Services (Omnia) has been engaged by Denison Mines Corporation (Denison) to continue to support the project application (e.g., assessment of impacts and regional mapping/inventory) with respect to reclamation/offset planning to assist with developing potential woodland habitat reclamation selection and criteria protocol through the use of cost effective and practical functional habitat restoration/mitigation options. If successful, these mitigation techniques could be deployed at a larger scale within the SK Boreal Shield and may assist government in developing mitigation/reclamation criteria.

A pilot project of potential mitigation options to disrupt predator-prey movement patterns on linear features by creating a physical, visual, and/or line-of sight barriers has been deployed at 12 sites within the Wheeler River study area ([Figure 1](#)). Detailed background information and full details of site-specific treatments, including preliminary planning and consultation, can be accessed in Omnia (2022). Also included in that report are preliminary findings from the first five months of monitoring.

The objectives of this interim report are to outline preliminary results gathered from monitoring data thus far (year 1) and outline program follow-up requirements and recommendations for future consideration.

## 2 MONITORING

A site visit was completed in May 2022 as part of the planned bi-annual inspection/data collection with the following objectives:

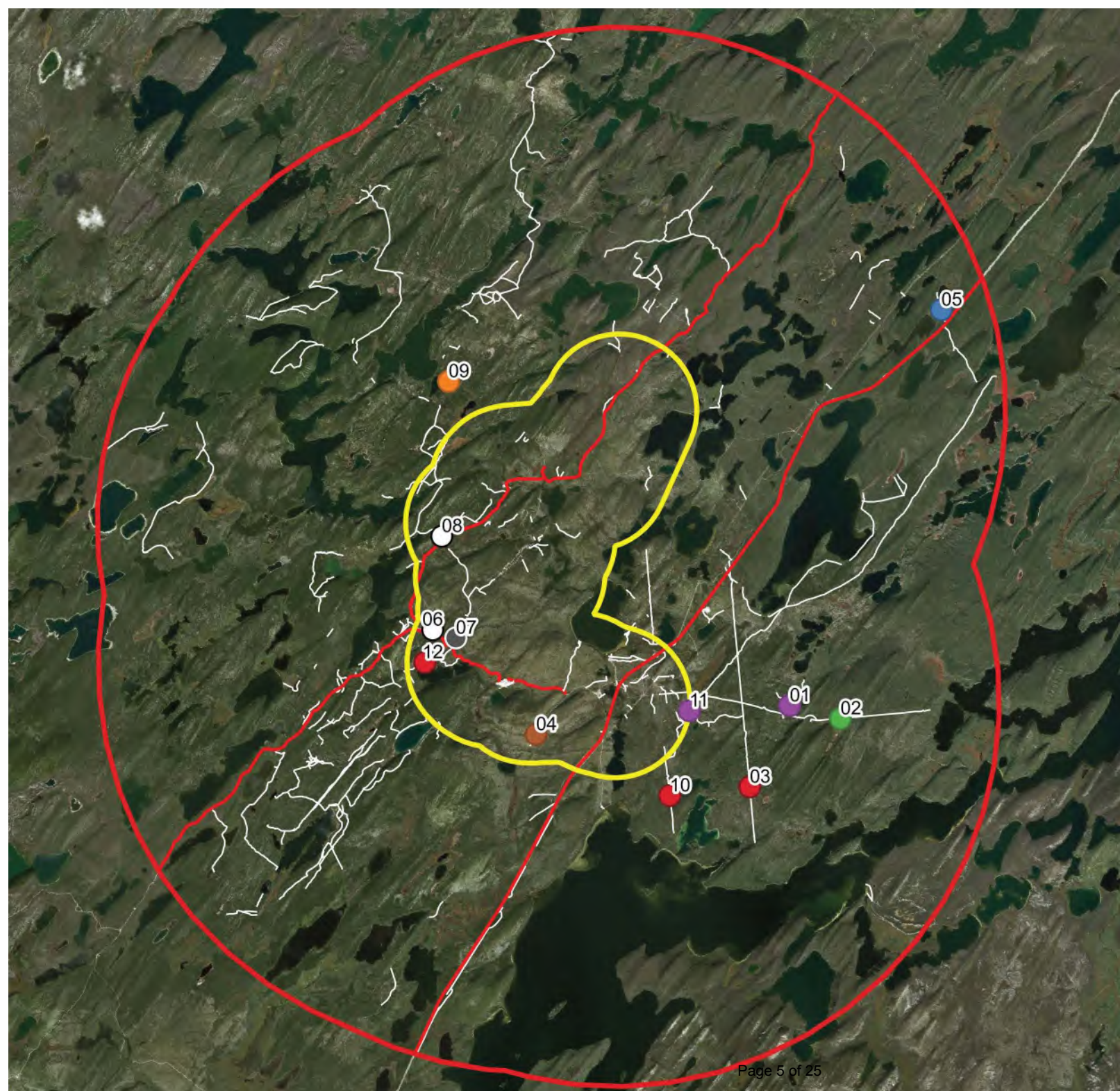
- Revisit and check the status of all 12 treatment sites.
- Make any repairs or modifications as required.
- Remove and replace covert camera memory cards to collect wildlife use data collected since deployment.
- Replace covert camera batteries to support ongoing monitoring.
- Measure height and assess health status of planted Jack pine seedlings.

### 2.1 Methods

The linear feature mitigation sites were visited from May 24-25, 2022. Photographs were taken at each site and notes were taken on overall conditions of the installation, durability, effect of snow cover/melt, issues encountered, and modifications or repairs conducted. Any signs of wildlife use in the area were also noted (i.e., tracks, pellets). Covert camera cards were replaced and camera setups were adjusted where required to prevent unnecessary false trigger events (such as from burlap flapping in the wind). All camera batteries were replaced. Camera photographs were retrieved and analyzed for wildlife use along the 12 treated linear features (LFs) and six reference/untreated parallel linear features.

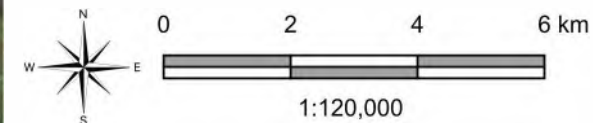


Figure 1. Installed mitigation features for the linear feature reclamation and mitigation trial.  
- Denison Wheeler River Project



### Legend

- |   |   |
|---|---|
| <span style="border: 2px solid yellow; padding: 2px;"> </span> Local Study Area (LSA) | Disturbance Type                                |
| <span style="border: 2px solid red; padding: 2px;"> </span> Regional Study Area (RSA) | <span style="color: red;">—</span> Road         |
| Treatment Type  | <span style="color: green;">—</span> Rough Road |
|   | <span style="color: gray;">—</span> Trail       |
- 
- Burlap fence
  - Coarse Woody Debris + Planting
  - Coarse Woody Debris + Planting + Burlap Fence
  - Tree Tip / Wood Structure
  - Tree Tip / Wood Structure + Planting
  - Tree Tip / Wood Structure + Planting + Burlap Fence
  - Trench Pile + Planting
  - Trench Pile + Planting + Burlap Fence





For treated and untreated LFs, each wildlife trigger event was characterized as a “use” event if the animal appeared to be travelling on the line and/or displaying non-avoidance behavior, such as approaching/interacting with the burlap or other treatment features. Behavior such as crossing the LF, traveling in the adjacent forest, or paralleling the LF was characterized as “non-use” of the LF. Cameras were programmed to take five photographs per trigger event, often allowing for movement trajectory to be determined. However, if field of view was limited, body language and movement cues of the animals were used to best determine appropriate categorization, such as angle of head/body, no assumption of sharp turns, etc. Photograph analysis findings were compared to results gathered from multi-year baseline linear feature camera monitoring across the project area, and between treated and reference sites. Effects of treatments on wildlife use of LFs was then analyzed across all species of interest and between individual species types.

Each seedling that was planted when treatments were installed in July 2021 was measured for height, and a relative health score was assigned to each seedling: 1=healthy, 2=average, 3=poor 4=dead/missing. Evidence of browsing events by wildlife were also recorded.

## 2.2 Results

### 2.2.1 Treatment Visits

[Table 1](#) summarizes the overall status of the treatment types, wildlife sign observations and modifications completed. Coarse woody debris (CWD) treatments maintained reasonable coverage and withstood snow pack/snowmelt ([Photograph 1](#)). Tree hinging/structures treatments were holding up very well and only a few structures/tree hinges had fallen over and needed reinforcing ([Photograph 2](#)). Needles on the trees that were hinged were yellowing but remained intact ([Photograph 3](#)). Trench and pile treatments were holding up very well and didn't appear compressed following the winter snow ([Photographs 4](#)). Burlap installations, both on their own and when combined with other treatment types, required minimal repairs ([Photograph 5](#)).

Repairs consisted of:

- Replacement of ripped/ deteriorating burlap panels
- Replacing wooden lath ripped off by a bear (Site 10, [Photograph 6](#))
- Adding screws and staples to reinforce, where required

### 2.2.2 Wildlife Photograph Analysis

#### *Overall*

Photographs were analyzed from 18 different cameras totaling 4,861 camera days. One hundred-ninety-four (194) detections were recorded of 13 different species, averaging four detections per 100 cameras nights. The most commonly detected species from all cameras, treatment and reference, was snowshoe hare with 56 detections, followed by woodland caribou with 44 detections, and black bear with 25 detections ([Table 2](#)). [Table 2](#) summarizes the detections rates of species of interest (caribou, moose, black bear, wolf) by treatment type / reference linear feature. Detection rates of species of interest and human (ATV) use were compared with baseline covert camera results from multi-year linear feature monitoring conducted in the Denison Wheeler

River study area ([Table 2a](#)). Results were separated into desired non-use and use of linear feature type (treated versus untreated monitoring/reference trails). The results for trails (approximately 5m wide) were included for direct comparison and data from hand-cut lines and roads were excluded. A similar comparison was completed for treatments where no burlap was present, either on its own or in combination with other blocking techniques ([Table 2b](#)). This was to assess for trends without the potential wildlife attractant effects of the burlap. When treatments including burlap were included in the analysis, detection rates of all species of interest on treated lines are less than those of multi-year linear feature monitoring in the area. Bear use of treated lines was reduced with 61% compared with untreated lines, moose use was reduced with a 92%, and caribou use was reduced with 94% ([Table 2a](#)). No wolves were detected using treated lines. Overall use of treated lines by species of interest was reduced by approximately 85% when compared to monitoring rates. When installations including burlap are excluded from analysis, the reduction in detection rates along the treated sites are even more pronounced. No bears or wolves were observed using treated lines, while only a single caribou and moose were detected using treated lines.

#### *Treatment Sites*

[Figures 2 and 3](#) highlight the relative effectiveness of the individual treatment types on wildlife species of interest detections and their use of the treated linear features. Non-use of the treated line by wildlife via travel in the adjacent forest, crossing, or paralleling the line was the desired effect and was therefore rated as positive. Use of a treated LF via traveling down the line/interacting with the treatment features was an undesired effect and was therefore rated as negative.

[Figure 2](#) shows the results of the treatments for all species of interest combined. CWD treatment sites had the most wildlife detections (20) of three species, (bear, caribou and moose) and all interactions were positive (non-use of the line). Tree hinging/structures had ten detections of bear and caribou, 92% of these interactions were rated as positive. Trench and pile treatments had three moose detections; two thirds positive. Trench and pile + burlap had a split response between bears (all use) and moose (all non-use). CWD + burlap and burlap only had all negative interactions.

[Figure 3](#) shows the results of the treatments for each species of interest. Caribou showed positive interactions (avoidance) with CWD and tree hinging/structures (100% and 83% of detections, respectively) and a negative interaction with burlap (100% of detections). Moose response to CWD and trench and pile + burlap was 100% positive, and was two-thirds positively associated with trench and pile. Black bears responded positively to CWD and tree hinging/structures, and negatively to CWD + burlap, trench and pile + burlap, and burlap only. Wolf responded negatively to burlap.

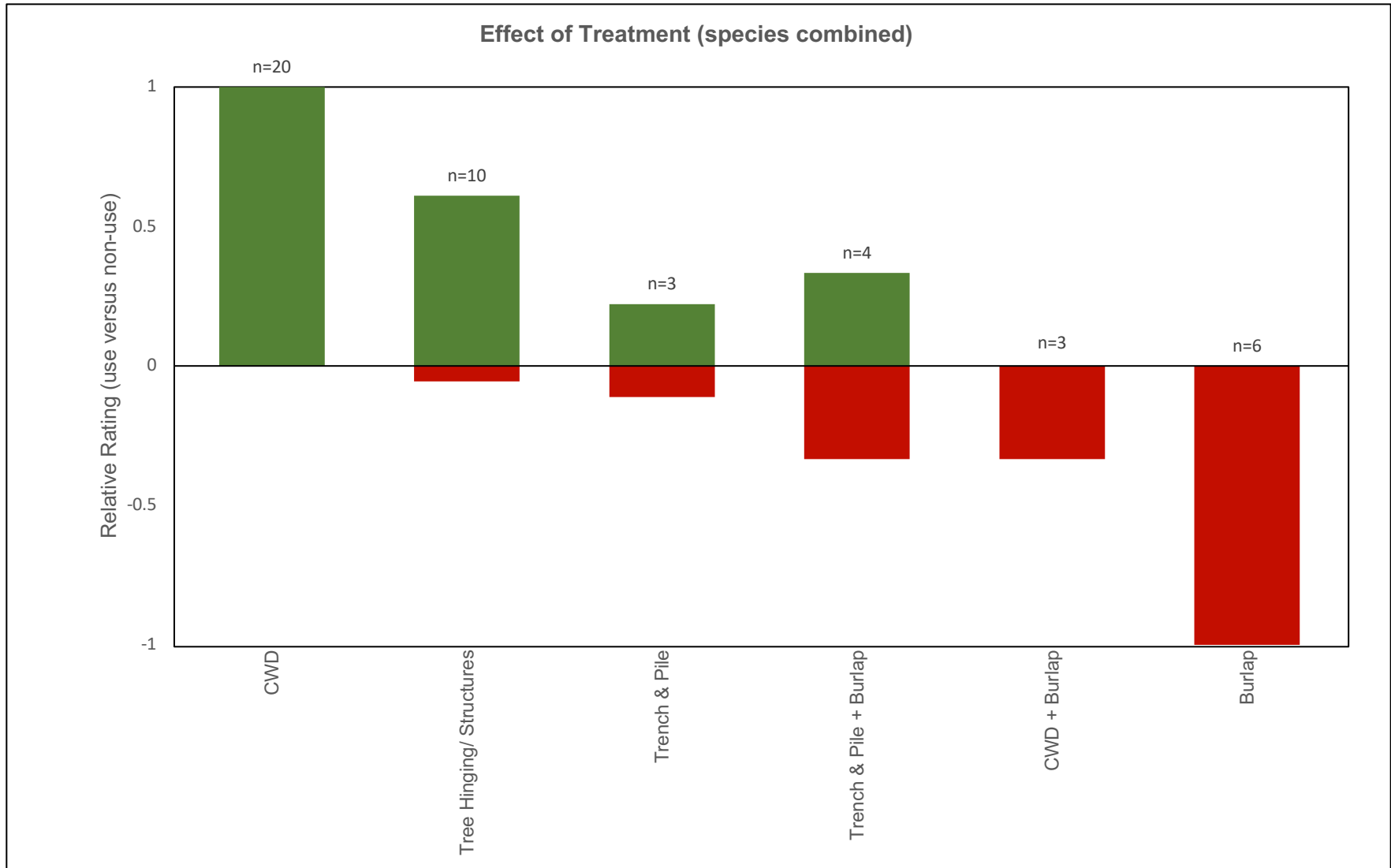


Figure 2. Wildlife detections by treatment type, all species combined (caribou, moose, black bear and wolf). Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

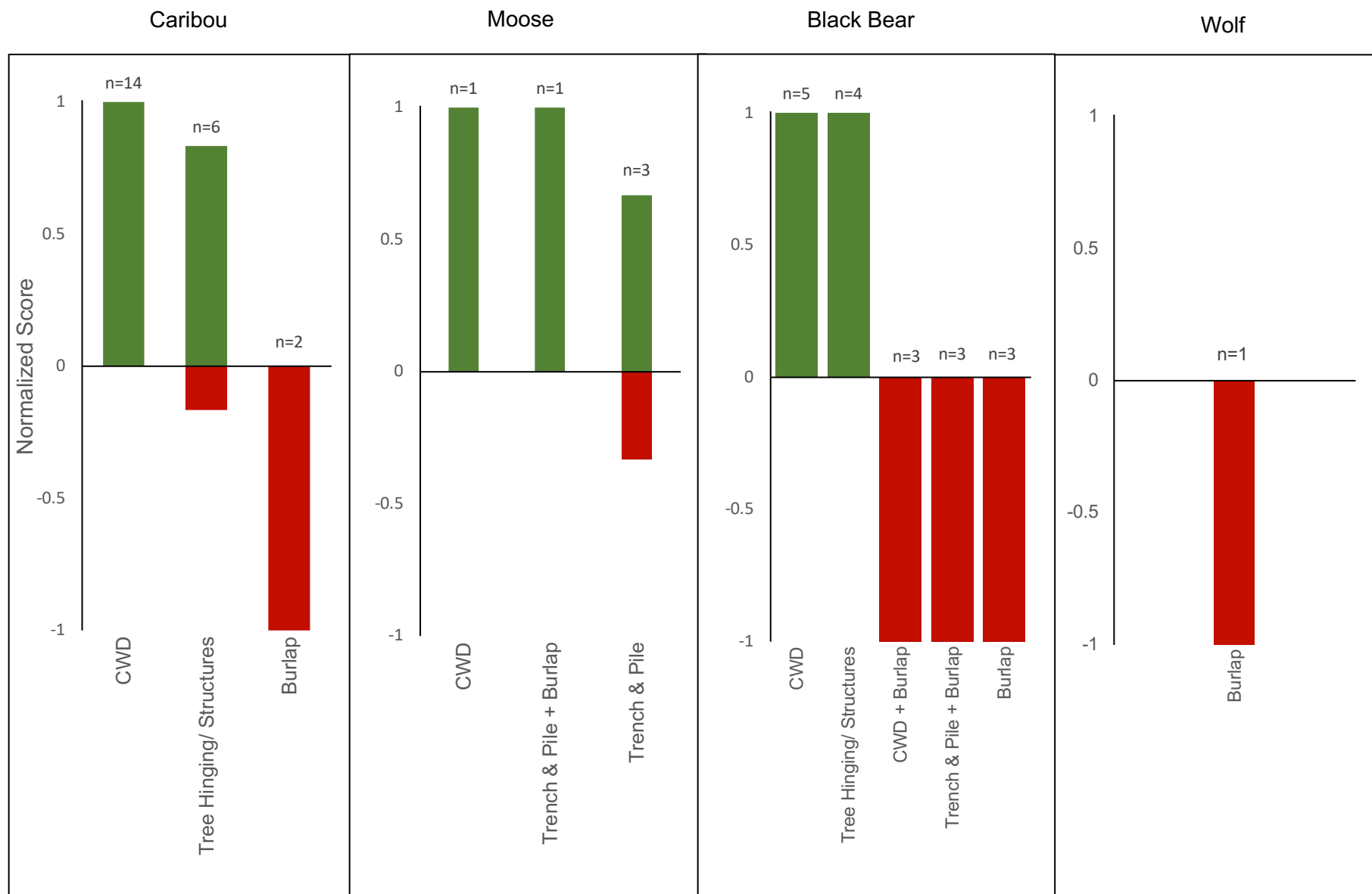


Figure 3. Caribou, moose, black bear and wolf detections by treatment type. Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

### 2.2.3 Seedling Health Assessment

A total of 476 seedlings were counted and measured, out of the initial 500 planted. Seedling height averaged 15cm (range 12-18cm) when planted and average height when measured in May 2022 was 18.8 cm ([Table 4.](#)). Average health status was 1.8. [Photograph 7](#) illustrates representative examples of each health status, ranging from 1-4, healthy, average, poor, and dead, respectively. Mortality/loss averaged 4.8%.

## 3 SUMMARY PRELIMINARY CONCLUSIONS – Year 1

- Detection rates of all species of interest on treated lines (including burlap) are less than those of multi-year linear feature monitoring in the area (bears 61% reduction, moose 92% reduction and caribou 94% reduction; no wolves). When burlap is removed from analysis, the frequency of detection on treated lines is further reduced (no bears or wolves; only 1 caribou and 1 moose)
- CWD, tree hinging/structures, and trench & pile treatments elicited all/mostly positive avoidance responses from species of interest.
- Burlap, when used alone or in combination with other treatments, elicited the most negative responses from species of interest. Although preliminary, early results indicate that burlap may act as an unwanted attractant for curious wildlife or is not perceived as a barrier to species movement ([Photograph 8](#)).
- Burlap remains the most labor-intensive treatment in terms of maintenance and repairs required.
- Overall planted seedling health was strong and growth progression is promising.

## 4 NEXT STEPS

- Continuation of multi-annual site visits to monitor the status of treatment types, make repairs or adjustments as necessary.
- Continuation of multi-annual inspection/service and data collection of covert cameras and analysis of covert camera photographs.
- Assess potential impacts of a 2022 forest fire on several treatment locations/cameras and determine suitability for continued monitoring and/or redeployment.
- Analysis of potential snow depth/weather effects on wildlife activity over time are anticipated as more winter data is collected.
- Evaluate seedling status once again in 2023 to ensure status.
- Verify tree-hinge/structure counts to ensure replicability at other sites.
- Quantify coarse woody debris (CWD) stem counts and volume estimates to ensure replicability at other sites.
- Monitoring is ongoing and an increased monitoring period, and associated sample size, will facilitate further analysis, including potential use of statistics.



## TABLES

**Table 1. Summary of treatment status, observations, and modifications.**

<b>Treatment</b>	<b># Linear Features</b>	<b>Overall</b>	<b>Wildlife Sign</b>	<b>Modifications</b>
CWD	2	Holding up well after snow melt, minor compression	Faint caribou tracks at start of treatment, appear to deflect away from treatment; other caribou tracks on edge	none
CWD + Burlap	1	CWD holding up well, burlap corners lifted	none	reinforced burlap
Tree Hinging/ Structures	3	In great shape; needles on tree hinges yellowing but intact	none	Lifted/ reinforced a few structures/hinges that had fallen
Trench & Pile	2	Holding up very well, no compression	moose tracks avoid treatment and stay on parallel trail	none
Trench & Pile + Burlap	1	Trenches in good shape, burlap had a few holes	none	replaced 2 burlap panels
Burlap	3	Repairs made in December 2021 held up well, minor repairs needed	none	reinforced stakes pulled off by a bear, added more screws/ fixed burlap holes where needed

**Table 2. Wildlife detection results by treatment type/ reference.**

Treatment	# Linear Features	Camera Days	Detections/ 100 Camera Nights												ATV	Comments
			Bear			Caribou			Wolf			Moose				
			Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total		
CWD	2	613	0.82	0	0.82	2.28	0	2.28	0	0	0	0.16	0	0.16	0	-
CWD + Burlap	1	306	0	0.98	2.27	0	0	0	0	0	0	0	0	0	0	-
Tree Hinging/ Structures	3	745	0.54	0	0.54	0.67	0.13	0.81	0	0	0	0	0	0	0	-
Trench & Pile	2	610	0	0	0	0	0	0	0	0	0	0.33	0.16	0.49	0	-
Trench & Pile + Burlap	1	305	0	0.98	0.98	0	0	0	0	0	0	0.33	0	0.33	0	-
Burlap	3	622	0	0.48	0.48	0	0.32	0.32	0	0.16	0.16	0	0	0	0	-
TOTAL Treatments	12	3201	0.28	0.28	0.56	0.59	0.09	0.69	0	0.03	0.03	0.12	0.03	0.16	0	-
TOTAL Reference	6	1660	0.24	0.18	0.42	0.60	0.72	1.33	0	0.18	0.18	0	0.12	0.12	1.02	removed site 6 reference camera Dec2021

**Table 3a. Comparison of caribou mitigation trial covert camera wildlife detections with baseline linear feature wildlife use inventory results.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	3201	9	0.28	19	0.59	1	0.03	4	0.12	33	1.03	89	2.78	0	0.00
	Treatment- Use		9	0.28	3	0.09	0	0.00	1	0.03	13	0.41	39	1.22	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc

**Table 3b. Comparison of caribou mitigation trial covert camera wildlife detections with linear feature monitoring results, all burlap installations excluded.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	1837	9	0.49	19	1.03	1	0.05	3	0.22	32	1.74	83	4.52	0	0.00
	Treatment- Use		0	0.00	1	0.05	0	0.00	1	0.05	2	0.11	19	1.03	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc.

**Table 4. Seedling health assessment results.**

Plot ID	Treatment	# Planted July 2021	# Seedlings May 2022	Average Height (cm)	Average Status <sup>a</sup>	% browsed	% Missing / Dead	Comments
1	CWD	65	61	19.9	1.5	36.1	6.2	
2	Tree Hinging/Structures	70	67	12.3	2.4	97.0	4.3	
4	CWD + Burlap	65	62	17.9	1.9	14.5	4.6	
6	Trench & Pile	60	57	22.2	1.54	33.3	5.0	
7	Trench & Pile + Burlap	60	60	21	1.2	1.7	0.0	
8	Trench & Pile	60	59	22.3	1.3	32.2	1.7	
9	Tree Hinging/Structures	60	53	12.7	2.2	88.7	11.7	lost ~5 due to burlap log being cut down and landing on seedlings
11	CWD	60	57	21.8	2	75.4	5.0	
<b>Total / Average</b>		<b>500</b>	<b>476</b>	<b>18.8</b>	<b>1.8</b>	<b>47.4</b>	<b>4.8</b>	

a: 1= healthy, 2=average, 3=poor, 4=dead

## REFERENCES

Omnia Ecological Services. 2022. Linear Feature Mitigation Trial. Project Update Report. Prepared for Denison Mines Corporation. 58pp.



## FIELD PROGRAM PHOTOGRAPHS



Photograph 1. Status of CWD treatment May 2022.





Photograph 2. Status of tree hinge/structures treatment May 2022.





Photograph 3. May 2022 status of needles on tree that was hinged.





Photograph 4. Status of trench & pile treatment May 2022.





Photograph 5. Burlap repairs May 2022, before and after.





Photograph 6. Wooden lath removed by bear.





Photograph 7. Seedling health assessment examples 1-4, left to right, respectively.





Photograph 8. Burlap challenges with wildlife.

## Attachment: IR-165

Number	IR-165
Dept.	CNSC ECCC
Project effects link	Birds (all species)
Reference to EIS, appendices, or supporting documentation	<p>Section 9.4.4.2.2</p> <p>Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment</p> <p>Appendix 10-A (ERA)</p>
Context and Rationale	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p> <p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>
Information Requirement	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:

	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p>Suggestions for mitigation and follow-up measures: CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>
--	--

Response:

**Water Management Context and Risk of Exposure**

Details on water management and treatment facilities are provided in Section 2 Project Description, Section 2.2.3 Water Management. Importantly, the Project does not include a tailings management facility because of the nature of the proposed mining and processing methods. A summary of water management plans is provided herein; please refer to the marked-up Figure 2.2-15 below.

Clean, non-contact runoff will be diverted around Project components where possible. Contact water will be collected in various ponds and routed to the process water pond (shown in yellow in figure below). These contact water management ponds have been designed to manage event driven runoff and are not intended to be “wet” ponds. That is, the contact water ponds are not designed to hold standing water for long periods of time; rather, they would contain / manage runoff volumes up to the design event and subsequently be pumped down to ensure ongoing management capacity. As a result, the quality of water in these ponds is expected to be relatively good as it would largely comprise precipitation and runoff from natural surfaces.

Additionally, given the design basis of the contact water management ponds (i.e., they are not wet ponds that are meant to hold water at all times), birds and wildlife are not likely to interact with them in a material fashion from a contaminant exposure perspective.

Considering the Project design, the ponds with potential to contain water for any period of time in consideration of potential temporary use by avian species are:

- the process water pond, and the
- effluent monitoring and release ponds.

Process water pond

The process water pond can hold up to 30,000 m<sup>3</sup> of water. It will be a central pond collecting water from a variety of areas, including:

- water from the wash bay (shown in green in figure below),

- water from the domestic wastewater treatment plant,
- water from the dewatering of IWWTP precipitates (non-radioactive, gypsum type material), and
- precipitation-related contact water (shown in yellow in figure below; includes water from the wellfield runoff pond, clean waste rock pond, process precipitate pond, and landfill leachate collection [which is expected to be primarily surface contact water during the Operation phase]).

Water in the process water pond can be used directly in the processing plant or be directed to the industrial wastewater treatment plant (IWWTP) for treatment prior to release to Whitefish Lake. The majority of the flows into the process water pond during Operation (approximately 61% or 10.7 m<sup>3</sup>/hour out of total 17.5 m<sup>3</sup>/hour) are contact waters. As noted above, the quality of the contact water is expected to be relatively good given its sources. As such, a screening was conducted to evaluate the main non-contact water input to the pond, namely the water from the IWWTP precipitate pond. This input represents about 20% of the expected inflow to the process water pond and using this as an estimate for quality of the entire pond is considered conservative.

#### Effluent monitoring and release ponds

The effluent monitoring and release ponds will receive treated water from the IWWTP. Each of the three ponds will have capacity for 3,300 m<sup>3</sup> of water and a composite liner system. The ponds have been designed to hold effluent for a period of 80 hours for testing before discharge to the environment. Having three ponds allows for increased operational flexibility, as one pond can be undergoing maintenance when required. A minimum of two ponds are required to be operational at all times to make sure all effluent released to surface water meets federal and provincial discharge limits. Each pond will be operated with the following stages: 1) filling, 2) holding while awaiting quality confirmation; and 3) releasing to Whitefish Lake once water quality is confirmed to meet discharge limits. There is potential for wildlife to be in contact for short periods of time with the ponds during the holding stage. Table 2.2-1 outlines the upper bound effluent quality proposed for the Project.

In addition to the above that considers where exposure to water management facilities could reasonably occur on the Project site, the following is also relevant as it concerns the likelihood that such exposure would occur. During construction and operations, bird and other wildlife species are expected to avoid the Project Area and Local Study Area (LSA) because of sensory disturbance from project activities that generate noise, artificial light, vibration, dust, etc. and the presence of workers (Adams et al. 2019, Habib et al., 2007; Narins, 1990). While some habituation to sensory disturbance is anticipated that could result in individuals of some species returning to the LSA, generally it is expected that many individuals will be displaced into available habitat elsewhere outside the LSA in the Regional Study Area (RSA). The LSA is not within a major flyway and the LSA currently provides limited waterfowl habitat relative to the neighbouring parts of the RSA. Overall, based on these considerations we characterize the likelihood of bird and other wildlife species exposures to water management facilities on the site as low.

#### **Potential Toxicity to Aquatic Migratory Birds and Species at Risk (SAR)**

A comparison of the expected water quality from the IWWTP precipitate pond, a conservative representation of the process water pond, to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines (WQG) for the protection of livestock and considered protective of



animals potentially exposed to contaminated waste ponds on the Project site was completed. This comparison shows that the expected IWWTP precipitate pond water quality was below the CCME WQG for the protection of livestock for most constituents except selenium (**Table IR 165-1**), and as such, risks to birds, species at risk and other wildlife that may contact or ingest this water are not expected for those constituents below the CCME WQG protective of livestock.

Oviparous birds and fish are the most sensitive to selenium in aquatic environments with toxicity to birds and fish being associated with organic selenium primarily in the diets and tissues of exposed biota.<sup>3</sup> Selenium toxicity to these organisms is manifested through the maternal transfer of selenium which may cause embryotoxicity and teratogenicity<sup>4</sup>. Considering the mitigation measures described below to deter avian use of the ponds, including vegetation management such as managing areas around the waste ponds being free of vegetation to limit the attraction of waterfowl and other wildlife to these areas for foraging and/or breeding, potential risks to avian birds exposed to selenium at this pond would be low.

A CCME WQG protective of livestock was not available for antimony, barium, iron, manganese, silver, strontium, tin and titanium. Potential risks to avian species are unlikely for silver and titanium as these parameters were not detected in the IWWTP precipitate pond. Avian species and wildlife are not expected to be at increased risk for antimony, barium, iron, manganese, strontium and tin because the IWWTP precipitate pond water concentrations for these parameters represents about 20% of the expected inflow to the process, and the mitigation measures, discussed below, to deter avian species and wildlife from these ponds, will reduce the receptor's exposure to these constituents.

**Table IR165-1: Comparison of Expected IWWTP precipitate pond Water Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Aluminum, dissolved	mg/L	0.018	5
Antimony, dissolved	mg/L	0.0007	NV
Arsenic, dissolved	ug/L	0.4	25
Barium, dissolved	mg/L	0.097	NV
Beryllium, dissolved	mg/L	<0.0001	0.1
Boron, dissolved	mg/L	0.36	5
Cadmium, dissolved	mg/L	0.00045	0.08
Chromium, dissolved	mg/L	0.0064	0.05
Cobalt, dissolved	mg/L	0.0002	1
Copper, dissolved	mg/L	0.0021	0.5 <sup>a</sup>
Iron, dissolved	mg/L	0.001	NV
Lead, dissolved	mg/L	<0.0001	0.1
Manganese, dissolved	mg/L	0.0012	NV

<sup>3</sup> Young, T.F., Finley, K., Adams, W., Besser, J., Hopkins, W.A., Jolley, D., McNaughton, E., Presser, T.S., Shaw, D.P., & Unrine J.(2010). What You Need to Know about Selenium. In: P.M. Chapman, W.J. Adams, M.L. Brooks, C.G. Delos, S.N. Luoma, W.A. Maher, H.M. Ohlendorf, T.S. Presser & D.P. Shaw (Eds.), Ecological Assessment of Selenium in the Aquatic Environment. Boca Raton (FL): CRC. p 7–45.

<sup>4</sup> Ibid

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Molybdenum, dissolved	mg/L	0.018	0.5
Nickel, dissolved	mg/L	0.0004	1
Selenium, dissolved	mg/L	0.19	<b>0.05</b>
Silver, dissolved	mg/L	<0.00005	NV
Strontium, dissolved	mg/L	4.1	NV
Thallium, dissolved	mg/L	0.0007	1
Tin, dissolved	mg/L	0.0044	NV
Titanium, dissolved	mg/L	<0.0002	NV
Uranium, dissolved	ug/L	25	200
Vanadium, dissolved	mg/L	0.0064	0.1
Zinc, dissolved	mg/L	0.0027	50

Notes:

NV – no CCME WQG

a- lowest value between the sheep, cattle, swine and poultry value

**Bold indicates that the predicted water quality exceeds the CCME WQG for protection of livestock.**

A comparison of the proposed effluent quality in Table 2.2-1 of the EIS to the CCME WQG for the protection of livestock was also completed. This comparison shows that the proposed effluent quality was below the CCME WQG protective of livestock for most constituents except molybdenum and sulphate (**Table IR 165-2**). As such, birds, species at risk and other wildlife that may contact or ingest the proposed effluent quality are not expected to be at increased risk for those constituents below the CCME WQG protective of livestock.

**Table IR165-2: Comparison of Proposed Effluent Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
<b>General Chemistry</b>			
Chloride	mg/L	600	NV
Sulphate	mg/L	3915	<b>1000</b>
Total Dissolved Solids	mg/L	6420	NA
<b>Metals and Metalloids (Dissolved)</b>			
Arsenic	mg/L	0.006	0.025
Cadmium	mg/L	0.0018	0.08
Chromium	mg/L	0.025	0.05
Cobalt	mg/L	0.003	1
Copper	mg/L	0.022	0.5 <sup>a</sup>
Molybdenum	mg/L	2.5	<b>0.5</b>
Selenium	mg/L	0.042	0.05
Uranium	mg/L	0.057	0.2
Zinc	mg/L	0.042	50
<b>Radionuclides</b>			

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
Uranium-238	Bq/L	0.7	0.2 <sup>b</sup>
Uranium-234	Bq/L	0.7	95 <sup>b</sup>
Thorium-230	Bq/L	0.9	22 <sup>b</sup>
Radium-226	Bq/L	0.15	13.5 <sup>b</sup>
Lead-210	Bq/L	0.419	8 <sup>b</sup>
Polonium-210	Bq/L	0.15	7 <sup>b</sup>

Notes:

NV – no CCME WQG

NA- not applicable.

a - lowest value between the sheep, cattle, swine and poultry value

b - US DOE Standard (2019) for aquatic biota, including riparian animals

**Bold indicates that the proposed effluent quality exceeds the CCME WQG for protection of livestock.**

For molybdenum and sulphate increased risks to avian species and wildlife exposed to effluent in the ponds are not expected as the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the potential receptor's exposure to these constituents.

A CCME WQG protective of livestock was not available for chloride and for the radionuclides. Avian species and wildlife are not expected to be at increased risk to those constituents without a CCME WQG protection of livestock because the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the receptor's exposure to these constituents.

A comparison of the proposed effluent quality for radionuclides to the US Department of Energy (DOE) Standard<sup>5</sup> for *a graded approach for evaluating radiation doses to aquatic and terrestrial biota* (Table IR165-2), that is protective of wildlife exposed to radionuclides, suggests that wildlife are not expected to be at increased risks to these radionuclides, as the proposed effluent quality for these radionuclides were below the US DOE Standard. As such, increased risk are not expected to avian species, species at risk and other wildlife exposed to constituents in contaminated waste ponds on the Project site.

## Mitigation Measures

Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.

<sup>5</sup> US Department of Energy. 2019. DOE Standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. U.S. Department of Energy, Washington, DC. DOE-STD-1153-2019.

- Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.
- Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.
- Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.

Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:

- Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020<sup>6</sup>) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.
- Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012<sup>7</sup>). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006<sup>8</sup>), as birds can habituate to a timely, consistent firing/noise event.

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<sup>6</sup> Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.

<sup>7</sup> Ezeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.

<sup>8</sup> Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119

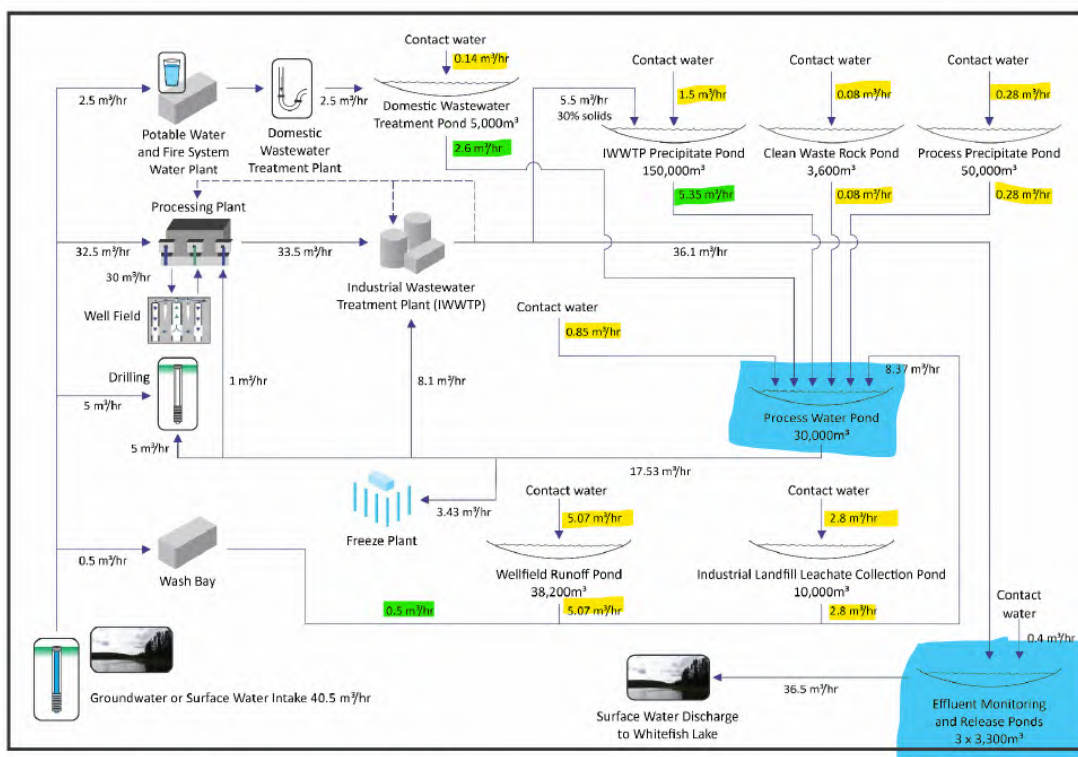


Figure 2.2-15: Operation Water Balance for the Project

## References

- Adams, C. A., A. Blumenthal, E. Fernández-Juricic, E. Bayne, and C. C. St. Clair. 2019. Effect of anthropogenic light on bird movement, habitat selection, and distribution: a systematic map protocol. *Environmental Evidence* 8(S1): 1–16.
- Habib, L., E.M. Bayne and S. Boutin. Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology*, 44: 176–184.
- Narins, P.M. 1990. Seismic communication in anuran amphibians. *Bioscience* 40 (4):268-274

## Attachment: IR-183 to 187

Number	IR-183
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C
Context and Rationale	<p>Context: Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p>Rationale: The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>
Information Requirement	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

Number	IR-184
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C, 2.0
Context and Rationale	<p>Context: It is stated in Appendix 10-C, section 2.0 that: “In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p>



	Rationale: The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.
Information Requirement	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

Number	IR-185
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2 Appendix 10-C Table 3.10-3.12
Context and Rationale	Context: The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.  Rationale: The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.
Information Requirement	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

Number	IR-186
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2.4, Section 10.2.3.2.6, Section 10.2.4 Appendix 10-C, Section 3.2
Context and Rationale	Context: In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.

	<p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: “For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA.”</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>

Number	IR-187
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	<p>Section 10.2.3.2.4, Section 10.2.3.2.6</p> <p>Appendix 10-C, Section 3.3, 6.0</p>

Context and Rationale	<p>Context: The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, Radiation Protection.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>

### **Summary of IRs 183 to 187 and Responses:**

**IR-183 (CNSC):** Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

**Response:** *Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the EIS. As noted in response to IRs 185, 186, and 187, some revisions to Appendix A are detailed in an attached memo.*

**IR-184 (CNSC).** As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period. The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

**Response:** *The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation.*

**IR-185 (CNSC).** The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

**Response:** *The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the EIS.*

*The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3, and have changed inputs for drying and packaging in response to IR-186, a revised table is provided (see Table A.3 below).*

**IR-186 (CNSC).** Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant. Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant. Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.

**Response:** *We had used a very conservative dust level in drying and packaging areas (representing equipment sources of dust to the exhaust system). While the hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below).*

**IR-187 (CNSC).** Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility. Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle. Identify mitigation measures as per the hierarchy of control for radiological protection.

**Response:** *As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.*

#### **Changes to the Worker Dose Calculations and Report:**

The Worker Dose Assessment (Appendix 10-C of the EIS) will be revised to reflect the information provided in Responses to IRs above. References to routine use of PAPR as an exposure control will be deleted. The primary engineering controls on dust exposure in the drying and packaging areas will be explained. Section 6.0 (Radiation Protection Strategies) will be updated to reflect the hierarchy of controls – elimination > substitution > engineering > administrative > PPE. Neither elimination nor substitution of the hazard are feasible controls for the Project, given its purpose to produce uranium

concentrate, and given the radioactive nature of uranium. Elimination of an exposure pathway would typically involve engineering controls. Engineering controls will be utilized as a first line of defense.

As noted in the responses, a design estimate has been obtained for dust levels in the main room for the drying area and the packaging/loading area. This value of 0.5 mg/m<sup>3</sup> is a conservative representation of potential dust levels for workers under normal operations. It translates to a respirable dust value of 0.4 mg/m<sup>3</sup> and a U-238 activity of 3.9 Bq/m<sup>3</sup>. This value has been used in revised calculations of the dust inhalation dose (presented herein). In addition, time spent in the room has been reduced from 8 to 4 hours per day. The revised dose calculations show that the CNSC regulatory dose limits can be met without use of PAPR.

Because the dust sources (dryer and calciner in the drying area; drum loader in the packaging area) will be fully enclosed under negative pressure, workers will not be in the enclosure, and time spent at 1 m from source will be zero. The time at distance allocation has been revised to:

0 h/d at 1 m, 3 h/d at 5 m, and 1 h/d at 10 m

This time at distance allocation is relevant to the external dose, which is a minor dose component for the drying and packaging/loading areas.

To accommodate these new assumptions, the worker dose calculations have been revised. In addition, several typos in the tables of the June 2022 Worker Dose Assessment have been corrected. For completeness, all the tables from the report that have any changes are provided below, including the example calculations from Appendix A of the Worker Dose Assessment. Any word or numeric value that has changed is shown in red font.

The revised effective dose from dust inhalation, in both drying and packaging areas, without use of PAPR, is calculated to be 11.7 mSv/a (Table 5.1 and Table A.1) well below the 5-year average effective dose limit of 20 mSv/a. Actual dust levels will be confirmed during the commissioning phase, using both area monitoring and sampling pumps worn by workers, and the control system will be optimized to ensure that doses are ALARA. Monitoring will continue through the operations phase, in accordance with the Radiation Protection Program.

**Section 2.0 of the Worker Dose Assessment** (on Regulatory Context) will be updated to align with the Radiation Protection Regulations, by deleting the following text:

~~“In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”~~

**Section 6.0 of the Worker Dose Assessment** (on Radiation Protection Strategies) will be updated to describe the planned mitigations, consistent with the hierarchy of controls. Text in this section relevant to dust exposure will be revised as follows:

“Doses to workers at the Wheeler River Project are expected to be maintained below the average annual dose limit of 20 mSv/a for NEWs. Several mitigations have been assumed and will be important

in keeping doses ALARA. For the drying and packaging/loading areas of the ISR Plant, ~~the engineering controls will include negative pressure enclosures around source equipment and exhaust, as well as ventilation controls in the main rooms (beyond enclosures). Administrative controls will include area and individual monitoring and time-exposure management. Actual dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. Use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce dose from inhalation of uranium dust. Dust levels in these areas should be monitored and kept as low as reasonably achievable.”~~

~~“Powered Air Purifying Respirators (PAPR) should be available in these areas in case of need for any non-routine work that may involve high dust exposures. However, PAPR is a control of last resort. Under the Radiation Protection Program, a radiation work permit process will be in place for any non-routine work that may involve unusually high exposures, ensuring that risks are assessed and exposure controls are optimized in accordance with the ALARA principle. protection factor of 1000 is provided by several types of respirators such as Powered Air Purifying Respirators (PAPR) with a full facepiece or hood, and Supplied-Air Respirators (SAR) in positive-pressure mode or continuous flow mode. Alternatively, a Self-Contained Breathing Apparatus will provide protection factors over 10,000 if used in positive-pressure mode. It should be noted that Air Purifying Respirators will not offer protection against radioactive gases such as radon.”~~

~~“Dust inhalation is also a potentially significant component of dose at the core shack. At this location, PAPR will not be required; however, dust levels should be monitored here too. An administrative level of respirable dust equal to ¼ of the ACGIH TLV of 0.27 mg/m<sup>3</sup> has been assumed. Again, dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. It may be possible to increase air exchange in the core shack, above the planned 6 exchanges per hour, should this be necessary. This would help also with radon exposure in the core shack.”~~

Radiation Protection Program documents, now in preparation, to be completed during licensing, will provide more detail regarding radiation protection processes and procedures.

**Tables of the Worker Dose Assessment** (in Section 3, Section 5, and Appendix A) will be revised as discussed above. The revised tables are shown below.



**Table 3.1: Exposure Locations and Sources**

Location	Work Area	Source	Worker Function
Wellfield	Wellfield drilling	Cuttings in drum	Driller 1
	Pump houses	UBS in pump house piping	Wellfield Operator 1
	UBS Pond	UBS in storage pond	Wellfield Operator 1
	Wellfield piping	UBS in piping	Wellfield Operator 2 <sup>a</sup>
ISR Plant	Process Precipitate Removal Area	UBS feed tank	Plant Operator 1 <sup>a</sup>
		Totes of filter cake	
		Precipitate thickener	
	Yellowcake Precipitation Area	Yellowcake precipitation tank	Plant Operator 2 <sup>a</sup>
		Yellowcake conveyor	
		Yellowcake thickener	
	Water Treatment Area	WTP clarifier	Plant Operator 3 <sup>a</sup>
	Drying Area	Yellowcake	Plant Operator 4 <sup>a</sup>
	Packaging Loading Area	Yellowcake	Plant Operator 5 <sup>a</sup>
Site Ponds Pads	Special Waste Pad	Drill cuttings	Equipment Operator 1
	Contaminated Landfill	none	Equipment Operator 1
	Process Precipitate Pond	Process precipitate	Equipment Operator 1
Site infrastructure	Core Shack	3 cores	Geologist/Geotech Loggers

(a) Operator and Maintenance worker have the same exposure characteristics

**Table 3.2: Concentrations in Dust and Occupancy in Work Area for the Indoor and Outdoor Dust Inhalation Scenarios**

Work Area	Worker	Respirable Dust in Air (kg/m <sup>3</sup> )	U-238 in Dust (Bq/kg)	Ra-226 in Dust (Bq/kg)	U-238 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>d</sup>
Wellfield	Driller 1	-	-		9.49E-04 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	-	-		9.49E-04 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	-	-		3.41E-03 <sup>a</sup>	8	12
Yellowcake Precip Area	Plant Operator 2	-	-		3.41E-03 <sup>a</sup>	8	12
Water Treatment Area	Plant Operator 3	-	-		3.41E-03 <sup>a</sup>	8	12
Drying Area	Plant Operator 4	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Packaging Loading Area	Plant Operator 5	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Special Waste Pad	Equipment Operator 1	-	-		6.83E-03 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	-	-		9.95E-04 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	-	-		4.25E-04 <sup>a</sup>	3	12
Core Shack	Geologist/	6.75E-08	2.99E+06	2.06E+06	2.02E-01 <sup>c</sup>	11	6
	Geotech Logger						

(a) U-238 (Bq/m<sup>3</sup>) in air calculated from IEC (2022) µg/m<sup>3</sup> in outdoor air at each location, operations phase, with calciner

(b) U-238 in air shown for drying and packaging areas is an ambient concentration, based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

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- (c) U-238 in air for core shack based on an administrative level for respirable dust equal to ¼ of the ACGIH Threshold Limit Value (TLV); U-238 concentration in dust from ore assays by R and D Enterprises (2018)
- (d) Workers are assumed to work 20 days per month

**Table 3.3: Concentrations of Radon and Occupancy in Work Area for the Indoor and Outdoor Radon Inhalation Scenarios**

Work Area	Worker	Source	Rn-222 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>b</sup>
Wellfield	Driller 1	Outdoor	6.75E+01 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Cake	2.72E+01		
		Thickener	7.35E+02		
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Thickener	4.96E+02		
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Clarifier	1.28E+02		
Drying Area	Plant Operator 4	Outdoor	1.17E+02 <sup>a</sup>	4	12
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02 <sup>a</sup>	4	12
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01 <sup>a</sup>	3	12
Core Shack	Geologist/Geotech Logger	Outdoor	6.75E+01 <sup>a</sup>	11	6
		Cores	1.18E+03		

(a) Rn-222 (Bq/m<sup>3</sup>) in air taken from IEC (2022) value in outdoor air at each location, operations phase, with calciner

(b) Workers are assumed to work 20 days per month

**Table 3.9: Exposure Factors for External Exposures.**

Location	Source <sup>a</sup>	Worker Function	h/d in area	h/d at 1 m	h/d at 5 m	h/d at 10 m	active months per year
Wellfield	Cuttings in Drum	Driller 1	11	2	4	5	8
	UBS Solution in pump house piping	Wellfield Operator 1	4	2	1	1	12
	UBS solution in storage pond	Wellfield Operator 1	4	2	1	1	12
	UBS Solution in piping	Wellfield Operator 2	8	4	2	2	12
ISR Plant	UBS feed tank	Plant Operator 1	8	6	1	1	12
	Totes of filter cake						
	Precipitate Thickener						
	Yellowcake precipitation tank	Plant Operator 2	8	6	1	1	12
	Yellowcake conveyor						
	Yellowcake Thickener						
	WTP Clarifier	Plant Operator 3	8	6	1	1	12
	Drying Area, Dryer	Plant Operator 4	4	0	3	1	12
	Drying Area, Calciner						
	Packaging/Loading Area	Plant Operator 5	4	0	3	1	12
Site Ponds Pads	Special Waste Pad	Equipment Operator 1	2	0	2	0	12
	none	Equipment Operator 1	3	0	2	1	12
	Process Precipitate Pond	Equipment Operator 1	4	0	3	1	12

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Core Shack	3 cores	Geologist/Geotech Loggers	11	2	8	1	6
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(a) When there are several sources in one work area, the worker is assumed to divide his time roughly equally among those sources (see Appendix Table A.3).



Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant



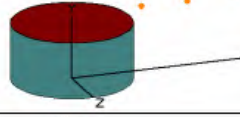

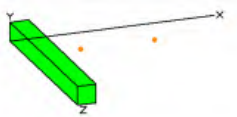
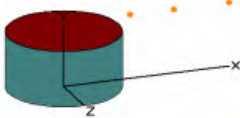
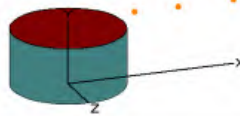
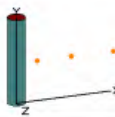

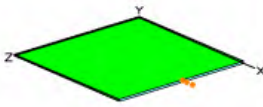
Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
UBS Feed Tank	Height: 5.2m, diameter: 3.3m	UBS Feed		4.45E+01	6.35	Steel	Liquid	1.00E+03
Totes of Filter Cake	3 totes of filter cake, each 1m height, 1m diameter	Process Precipitates		3.00E+00	6.35	PET	Cake	1.88E+03
Precipitate Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	Process Precipitates		3.93E+02	6.35	Steel	Slurry	1.30E+03
Precipitation Tank	Height: 5.2m, Diameter: 3.3m	Yellowcake Precipitation Solution		4.45E+01	6.35	Steel	Liquid	1.00E+03
Yellowcake in Screw conveyor	Height: 1m, Length: 10m, Width: 1m	UO <sub>4</sub>		1.00E+01	6.35	Steel	Cake	2.40E+03

Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant (continued)

Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
Yellowcake Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	UO <sub>4</sub>		3.93E+02	6.35	Steel	Slurry	1.30E+03
WTP Clarifier	Height: 5m, Diameter: 10m, drum 1.7m above the floor	NA		3.93E+02	6.35	Steel	Slurry	1.00E+03
Dryer	Horizontal cylinder, Length: 10m, Diameter: 2m	UO <sub>4</sub>		3.14E+01	6.35	Steel	powder	2.03E+03
Calciner	Horizontal cylinder, Length: 20m, Diameter: 2m	UO <sub>4</sub>		6.28E+01	6.35	Steel	powder	2.03E+03
Drum Storage	350 barrels on a pad, each height: 0.89m, diameter: 0.58m	UO <sub>4</sub>		1.08E+02	1.20	Steel	powder	1.71E+03

**Table 5.1: Internal Annual Dose from Dust Inhalation**

Work Area	Worker	Effective Dose from Inhalation U-238 <sup>+</sup> (mSv/a)	Effective Dose from Inhalation Ra-226 <sup>+</sup> (mSv/a)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	5.21E-03	-	5.21E-03 <sup>a</sup>
Wellfield	Wellfield Operator 1, 2	5.68E-03	-	5.68E-03 <sup>a</sup>
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	-	2.04E-02 <sup>a</sup>
Yellowcake Precip Area	Plant Operator 2	2.04E-02	-	2.04E-02 <sup>a</sup>
Water Treatment Area	Plant Operator 3	2.04E-02	-	2.04E-02 <sup>a</sup>
Drying Area	Plant Operator 4	1.17E+01	-	1.17E+01 <sup>b</sup>
Packaging Loading Area	Plant Operator 5	1.17E+01	-	1.17E+01 <sup>b</sup>
Special Waste Pad	Equipment Operator 1	1.02E-02	-	1.02E-02 <sup>ac</sup>
Process Precipitate Pond	Equipment Operator 1	2.98E-03	-	2.98E-03 <sup>ac</sup>
Contaminated Landfill	Equipment Operator 1	9.54E-04	-	9.54E-04 <sup>ac</sup>
Core Shack	Geologist/	5.63E+00	1.02E+00	6.65E-00 <sup>d</sup>
	Geotech Logger			

(a) Based on outdoor concentration of U dust from IEC (2022); U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(b) Based on indoor concentration of U dust, which dominates; U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(c) Equipment Operator 1 frequents 3 locations; the 3 doses must be added for this worker

(d) Based on indoor concentration of ore dust, which dominates; U-238<sup>+</sup> DCF 2.08E-05 Sv/Bq from ICRP 137 includes the entire U-238 series; doses shown for U-238<sup>+</sup> and Ra-226<sup>+</sup> reflect the portions from U-238 to Th-230, and from Ra-226 to Po-210, respectively.

Table 5.2: Internal Annual Dose from Radon Inhalation

Work Area	Worker	Source	Dose from Radon in Air (mSv/a)	Total Radon Dose for Worker (mSv/a)
Wellfield	Driller 1	Outdoor	9.44E-02 <sup>a</sup>	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	1.03E-01 <sup>a</sup>	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.78E-01 <sup>a</sup>	2.27E+00
		Cake	7.47E-02 <sup>b</sup>	
		Thickener	2.02E+00 <sup>b</sup>	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.78E-01 <sup>a</sup>	1.54E+00
		Thickener	1.36E+00 <sup>b</sup>	
Water Treatment Area	Plant Operator 3	Outdoor	1.78E-01 <sup>a</sup>	5.30E-01
		Clarifier	3.52E-01 <sup>b</sup>	
Drying Area	Plant Operator 4	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	3.37E-01 <sup>a</sup>	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	6.89E-02 <sup>a</sup>	
Contaminated Landfill	Equipment Operator 1	Outdoor	1.70E-02 <sup>a</sup>	
Core Shack	Geologist/	Outdoor	7.08E-02 <sup>a</sup>	2.30E+00
	Geotech Logger	Cores	2.23E+00 <sup>b</sup>	

(a) Based on outdoor concentration of radon from IEC (2022)

(b) Based on an indoor source of radon to indoor air

**Table 5.3: Effective Dose and Equivalent Dose to the Lens of the Eye for Workers from External Exposure**

Work Area	Worker	Source	By Exposure Scenario		By Worker	
			External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)	External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	10.16	16.40	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	0.05	0.07	0.05	0.07
	Wellfield Operator 1	Pump House Piping	0.24	0.34	0.53	0.81
		UBS Pond	0.29	0.47		
Process Precipitate Removal Area	Plant Operator 1	Feed Tank	0.24	0.39	12.59	20.40
		Cake	8.19	13.15		
		Thickener	4.16	6.86		
Yellowcake Precip Area	Plant Operator 2	Precip Tank	0.08	0.13	0.10	0.15
		Cake	0.02	0.02		
		Thickener	0.001	0.001		
Water Treatment Area	Plant Operator 3	Clarifier	1.70	2.61	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0.002	0.002	0.004	0.004
		Calciner	0.002	0.002		
Packaging Loading Area	Plant Operator 5	Drums	0.009	0.009	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	<0.0001 <sup>a</sup>	0.0001 <sup>a</sup>	5.68	9.33
Process Precipitate Pond	Equipment Operator 1	Precip Pond	5.68	9.33		
Contaminated Landfill	Equipment Operator 1	No source	0.000	0.000		

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Core Shack	Geologist/ Geotech Logger	Cores	2.02	3.25	2.02	3.25
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(a) Dose to Equipment Operator 1 at the Special Waste Pad is mitigated by a 2m wide berm, which provides shielding.



**Table 5.4: Total Dose from Internal and External Pathways for Workers**

Work Area	Worker	Internal Dose (mSv/a)		External Dose (mSv/a)	Total Effective Dose (mSv/a)
		Dust	Radon		
Wellfield	Driller 1	5.21E-03	9.44E-02	10.16	10.26
Wellfield	Wellfield Operator 2	5.68E-03	1.03E-01	0.05	0.16
	Wellfield Operator 1	5.68E-03	1.03E-01	0.53	0.64
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	2.27E+00	12.59	14.88
Yellowcake Precip Area	Plant Operator 2	2.04E-02	1.54E+00	0.10	1.66
Water Treatment Area	Plant Operator 3	2.04E-02	5.30E-01	1.70	2.25
Drying Area	Plant Operator 4	1.17E+00 <sup>a</sup>	8.92E-02	0.004	11.77
Packaging Loading Area	Plant Operator 5	1.17E+00 <sup>a</sup>	8.92E-02	0.009	11.78
Special Waste Pad	Equipment Operator 1	1.02E-02	3.37E-01	- <sup>b</sup>	6.11
Process Precipitate Pond	Equipment Operator 1	2.98E-03	6.89E-02	5.68	
Contaminated Landfill	Equipment Operator 1	9.54E-04	1.70E-02	-	
Core Shack	Geologist/	6.65E+00 <sup>a</sup>	2.30E+00	2.02	10.97
	Geotech Logger				

(a) Dust exposures in work area to be monitored and kept ALARA.

(b) External dose mitigated by a berm around the Special Waste Pad, which provides shielding

## Appendix A Example Calculations

**Table A.1: Dust Inhalation Dose Calculation**

Work Area	Worker	U-238 in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	DCF (Sv/Bq)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	9.49E-04	1760	2.60E-06	5.21E-03
Wellfield	Wellfield Operator 1, 2	9.49E-04	1920	2.60E-06	5.68E-03
Precipitate Removal Area	Plant Operator 1	3.41E-03	1920	2.60E-06	2.04E-02
Yellowcake Precip Area	Plant Operator 2	3.41E-03	1920	2.60E-06	2.04E-02
Water Treatment Area	Plant Operator 3	3.41E-03	1920	2.60E-06	2.04E-02
Drying Area	Plant Operator 4	3.90E+00	960	2.60E-06	1.17E+01
Packaging Loading Area	Plant Operator 5	3.90E+00	960	2.60E-06	1.17E+01
Special Waste Pad	Equipment Operator 1	6.83E-03	480	2.60E-06	1.02E-02
Precipitate Pond	Equipment Operator 1	9.95E-04	960	2.60E-06	2.98E-03
Industrial Landfill	Equipment Operator 1	4.25E-04	720	2.60E-06	9.54E-04
Core Shack	Geologist/	2.02E-01	1320	2.08E-05	6.65E+00
	Geotech Logger				

Total Effective Dose (mSv/a) = C<sub>air</sub> (Bq/m<sup>3</sup>) x I (m<sup>3</sup>/h) x ET (h/a) x DCF (Sv/Bq) x 1000 (mSv/Sv)

### Notes:

Concentrations from indoor sources for Drying/Packaging and Core Shack

Concentrations in Drying and Packaging are respirable activity based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

DCFs (Sv/Bq) from ICRP 137: U238+U234 (2.60E-6); U238 to Po-210 (2.08E-5)

Inhalation Rate (I) from ICRP 119 is 1.2 m<sup>3</sup>/h

**Table A.2: Radon Dose Calculation**

Work Area	Worker	Source	Radon in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	Equilibrium Factor F	Radon Dose (mSv/a)	Total (mSv/a)
Wellfield	Driller 1	Outdoor	6.75E+01	1760	0.10	9.44E-02	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01	1920	0.10	1.03E-01	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02	1920	0.10	1.78E-01	2.27E+00
		Cake	2.72E+01	1920	0.18	7.47E-02	
		Thickener	7.35E+02	1920	0.18	2.02E+00	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02	1920	0.10	1.78E-01	1.54E+00
		Thickener	4.96E+02	1920	0.18	1.36E+00	
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02	1920	0.10	1.78E-01	5.30E-01
		Clarifier	1.28E+02	1920	0.18	3.52E-01	
Drying Area	Plant Operator 4	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02	480	0.10	3.37E-01	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01	960	0.10	6.89E-02	
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01	720	0.10	1.70E-02	
Core Shack	Geologist/ Geotech Logger	Outdoor	6.75E+01	1320	0.10	7.08E-02	2.30E+00
		Cores	1.18E+03	1320	0.18	2.23E+00	

Radon Dose (mSv/a) = (C<sub>air</sub> (Bq/m<sup>3</sup>)/3700 Bq/m<sup>3</sup> per WL) x F x (ET (h/a)/170 h per WL) \* 5 (mSv/a per WL)

**Table A.3: External Dose Calculation**

Work Area	Worker	Source	Exposure Time (h/d) at:			Max Effective Dose (mSv/h)			Max Lens Dose (mSv/h)			Exp Days (d/a)	By Exposure Scenario	
			1m	5m	10m	1m	5m	10m	1m	5m	10m		External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	2	4	5	2.68E-02	1.86E-03	4.84E-04	4.33E-02	3.01E-03	7.82E-04	160	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	4	2	2	4.91E-05	9.10E-06	3.40E-06	6.85E-05	1.26E-05	4.68E-06	240	0.05	0.07
	Wellfield Operator 1	Pump House Piping	2	1	1	4.74E-04	4.13E-05	1.08E-05	6.74E-04	5.81E-05	1.52E-05	240	0.24	0.34
		UBS Pond	2	1	1	4.63E-04	1.80E-04	8.75E-05	7.59E-04	2.94E-04	1.43E-04	240	0.29	0.47
Precipitate Removal Area	Plant Operator 1	Feed Tank	2.2	0.33	0.33	4.35E-04	8.51E-05	2.82E-05	7.13E-04	1.39E-04	4.60E-05	240	0.24	0.39
		Cake	1.6	0.33	0.33	2.08E-02	1.92E-03	5.06E-04	3.34E-02	3.09E-03	8.14E-04	240	8.19	13.15
		Thickener	2.2	0.33	0.33	7.17E-03	3.26E-03	1.43E-03	1.18E-02	5.34E-03	2.34E-03	240	4.16	6.86
Yellowcake Precip Area	Plant Operator 2	Precip Tank	2	0.33	0.33	1.63E-04	3.18E-05	1.05E-05	2.65E-04	5.17E-05	1.71E-05	240	0.08	0.13
		Cake	2	0.33	0.33	3.69E-05	7.89E-06	2.50E-06	3.69E-05	7.89E-06	2.50E-06	240	0.02	0.02
		Thickener	2	0.33	0.33	2.33E-06	1.87E-06	8.74E-07	2.33E-06	1.87E-06	8.74E-07	240	0.001	0.001
Water Treatment Area	Plant Operator 3	Clarifier	6	1	1	1.06E-03	5.03E-04	2.22E-04	1.63E-03	7.51E-04	3.30E-04	240	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0	1.5	0.5	9.12E-06	4.37E-06	1.55E-06	1.51E-05	4.37E-06	1.55E-06	240	0.002	0.002
		Calciner	0	1.5	0.5	1.52E-05	5.10E-06	2.30E-06	1.52E-05	5.10E-06	2.30E-06	240	0.002	0.002
Packaging Loading Area	Plant Operator 5	Drums	0	3	1	5.91E-05	1.19E-05	3.79E-06	5.91E-05	1.19E-05	3.79E-06	240	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	0	2	0	1.02E-07	8.54E-08	5.86E-08	1.84E-07	1.55E-07	1.06E-07	240	4.10E-05	0.0001
Precipitate Pond	Equipment Operator 1	Waste Pond	0	3	1	1.49E-02	6.78E-03	3.31E-03	2.45E-02	1.12E-02	5.43E-03	240	5.68	9.33
Industrial Landfill	Equipment Operator 1	No source	0	3	0	-	-	-	-	-	-	240	0	0
Core Shack	Geologist/ Geotech Logger	Cores	2	8	1	6.59E-03	4.39E-04	1.12E-04	1.06E-02	7.09E-04	1.81E-04	120	2.02	3.25

External Dose (mSv/a) = [  $\Sigma$  ET (h/d) x Max Effective Dose (mSv/h) ] x ED (d/a)

Dose to Lens (mSv/a) = [  $\Sigma$  ET (h/d) x Max Lens Dose (mSv/h) ] x ED (d/a)

**Notes:**

Maximum dose rates at distance (mSv/h) are output from Microshield scenarios; highest value considering all possible orientations.

Skin dose was less than or equal to lens dose, depending on the scenario.

## Attachment: IR-195

Number	IR-195
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.1
Context and Rationale	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</li> <li>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</li> <li>3. Update ERA figures and conclusions as needed.</li> </ol>

Figures and tables to support response in IR table:

**Table IR195-1: Modelled Maximum COPC Concentrations in Water by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	3.28E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	3.26E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	2.68E-04	8.40E-04
	Non-radionuclides during Decommissioning Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.14E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	3.87E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.11E+00	1.28E-04	7.30E-04	8.17E-04	2.40E-02	3.85E+01	4.12E-04	5.47E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.28E-05	4.20E+00	1.19E-04	6.54E-04	7.50E-04	1.58E-02	2.60E+01	2.59E-04	3.38E-04	3.28E-04	9.01E-04
Icelander River	1.26E-04	3.26E-05	4.16E+00	1.19E-04	6.52E-04	7.49E-04	1.56E-02	2.57E+01	2.56E-04	3.34E-04	3.26E-04	8.99E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.26E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	1.99E+01	1.95E-04	2.52E-04	2.69E-04	8.40E-04
	Radionuclides during Operations Phase (Bq/L)											
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210	
Kratchkowsky Lake	3.85E-04		3.85E-04		1.01E-02		5.70E-03		6.22E-03		6.33E-03	
Whitefish Lake North	3.77E-04		3.77E-04		1.01E-02		5.63E-03		5.68E-03		5.78E-03	



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Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/L)</b>					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.36E-03	6.71E-03
Whitefish Lake South	6.72E-03	6.72E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.15E-03	4.15E-03	1.57E-02	6.33E-03	6.68E-03	6.23E-03
Icelander River	4.11E-03	4.11E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.09E-03	3.09E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03

**Table IR195-2: Modelled Maximum COPC Concentrations in Sediment by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/kg dw)										
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.07E+01	4.79E-01	-	3.02E-01	7.41E+00	2.28E+00	5.40E+01	4.90E+00	6.39E+00	3.40E+01	1.32E+01
Whitefish Lake South	1.03E+01	4.73E-01	-	3.02E-01	7.35E+00	2.28E+00	5.30E+01	4.70E+00	6.12E+00	3.06E+01	1.31E+01
McGowan Lake	9.33E+00	4.30E-01	-	2.88E-01	6.90E+00	2.16E+00	3.88E+01	3.33E+00	4.26E+00	2.08E+01	1.21E+01
Russell Lake Inlet	8.95E+00	4.06E-01	-	2.80E-01	6.63E+00	2.09E+00	2.95E+01	2.60E+00	3.26E+00	1.73E+01	1.15E+01
Location	Non-radionuclides during Decommissioning Phase (mg/kg dw)										
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.10E+01	4.97E-01	-	3.05E-01	7.59E+00	2.31E+00	5.72E+01	5.48E+00	7.18E+00	3.72E+01	1.36E+01
Whitefish Lake South	1.05E+01	4.90E-01	-	3.04E-01	7.53E+00	2.30E+00	5.62E+01	5.26E+00	6.87E+00	3.33E+01	1.35E+01
McGowan Lake	9.47E+00	4.43E-01	-	2.90E-01	7.03E+00	2.18E+00	4.11E+01	3.71E+00	4.78E+00	2.22E+01	1.24E+01
Russell Lake Inlet	9.04E+00	4.15E-01	-	2.81E-01	6.73E+00	2.10E+00	3.13E+01	2.88E+00	3.64E+00	1.82E+01	1.17E+01
	Radionuclides during Operations Phase (Bq/kg dw)										
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210
Kratchkowsky Lake	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake North	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake Middle	7.85E+01		7.85E+01		3.77E+01		7.46E+01		5.41E+02		5.42E+02
Whitefish Lake South	7.51E+01		7.51E+01		3.75E+01		7.41E+01		5.07E+02		5.09E+02

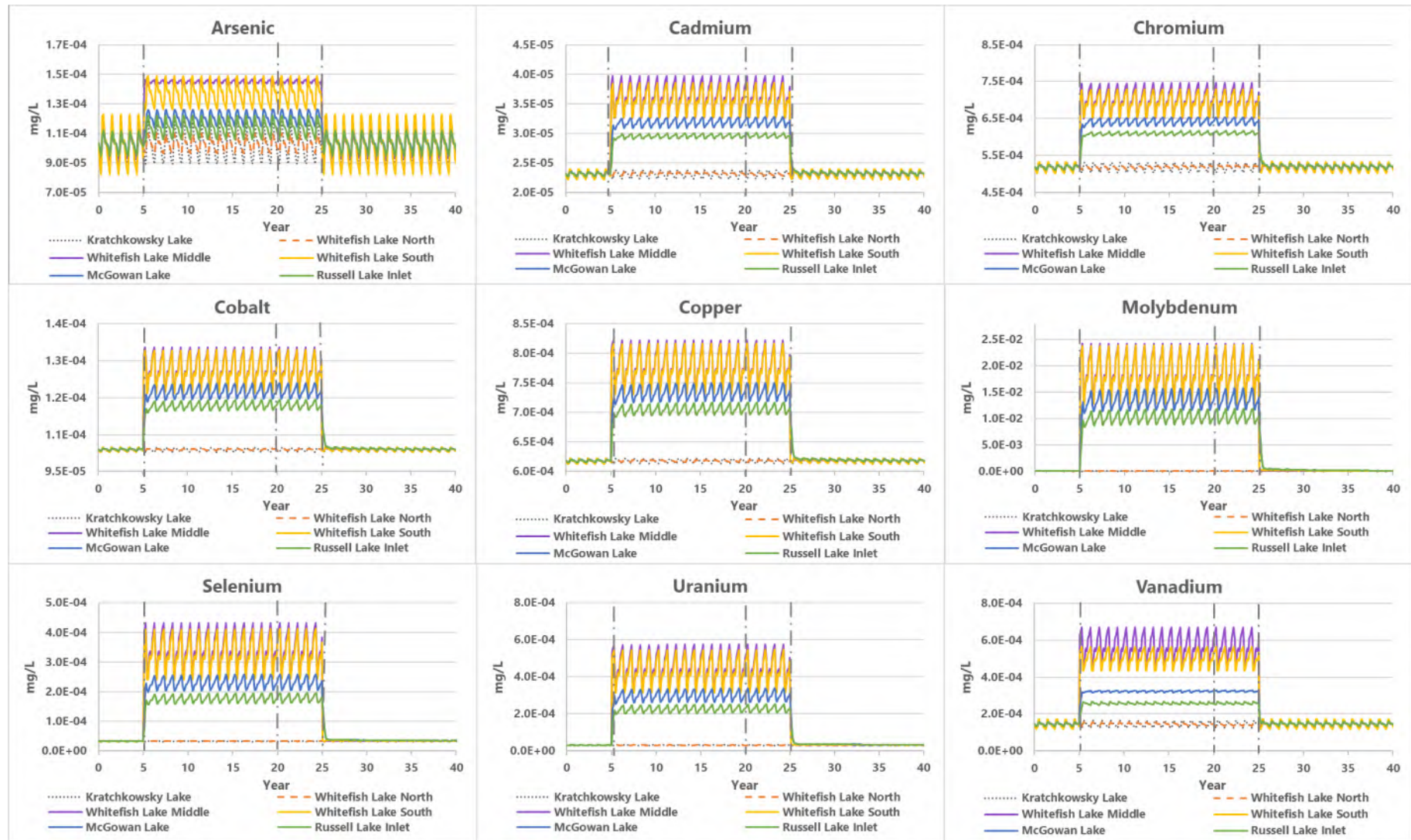
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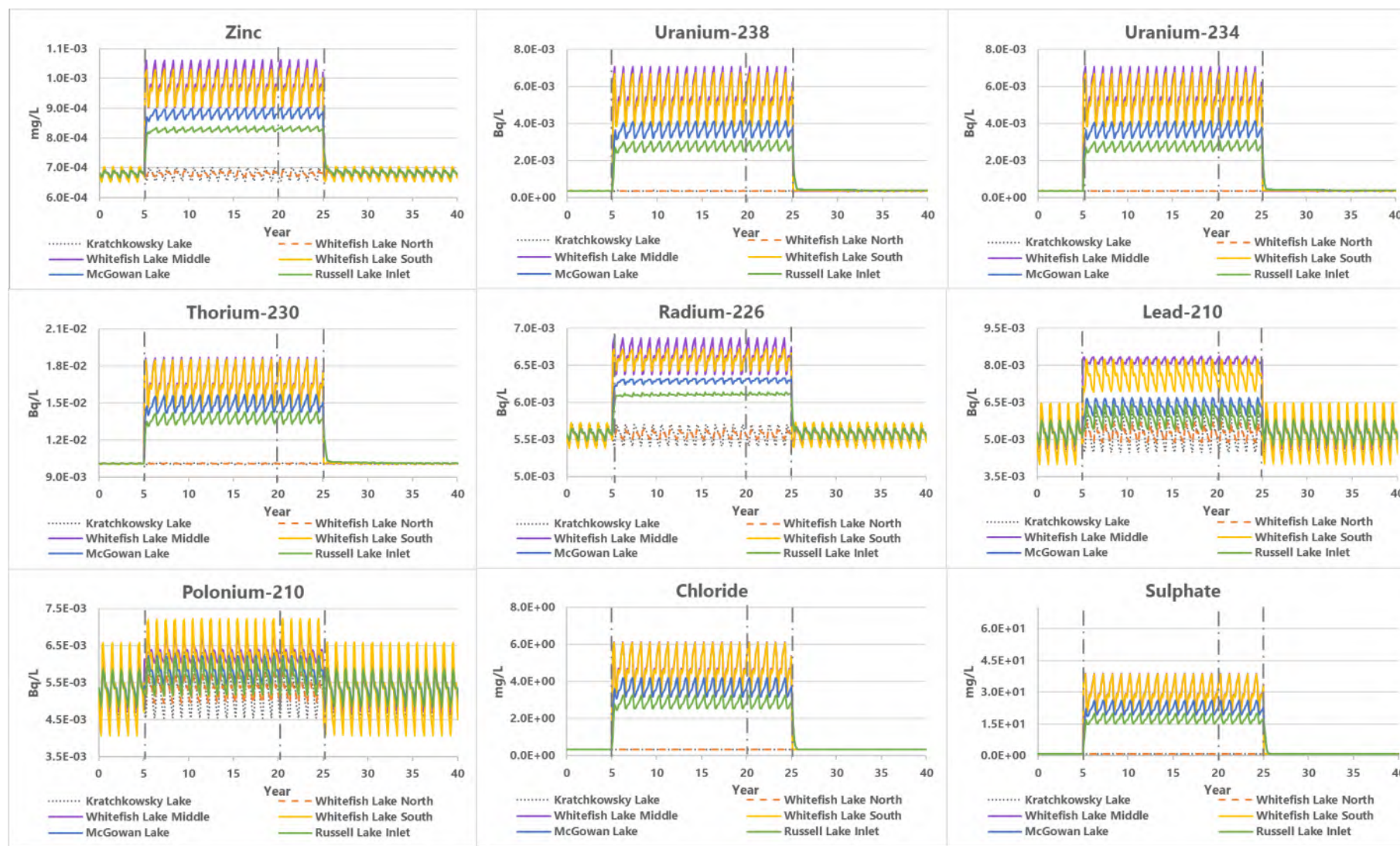
McGowan Lake	5.23E+01	5.23E+01	3.36E+01	7.15E+01	4.36E+02	4.41E+02
Russell Lake Inlet	4.01E+01	4.01E+01	3.11E+01	6.98E+01	4.11E+02	4.16E+02
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/kg dw)</b>					
Kratchkowsky Lake	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake North	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake Middle	8.82E+01	8.82E+01	3.83E+01	7.57E+01	5.57E+02	5.58E+02
Whitefish Lake South	8.44E+01	8.44E+01	3.80E+01	7.52E+01	5.19E+02	5.22E+02
McGowan Lake	5.87E+01	5.87E+01	3.41E+01	7.23E+01	4.42E+02	4.47E+02
Russell Lake Inlet	4.48E+01	4.48E+01	3.15E+01	7.04E+01	4.14E+02	4.20E+02

Table IR195-2: Summary of Effluent Quality for the Wheeler River Project during Operations and Decommissioning Phase

Constituent of Potential Concern (COPC)	Unit	Effluent Quality
<b>General Chemistry</b>		
Chloride	mg/L	600
Sulphate	mg/L	3915
Total Dissolved Solids	mg/L	6420
<b>Metals and Metalloids</b>		
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.003
Copper	mg/L	0.022
Molybdenum	mg/L	2.5
Selenium	mg/L	0.042
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
<b>Radionuclides</b>		
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7
Thorium-230	Bq/L	0.9
Radium-226	Bq/L	0.15
Lead-210	Bq/L	0.419
Polonium-210	Bq/L	0.15

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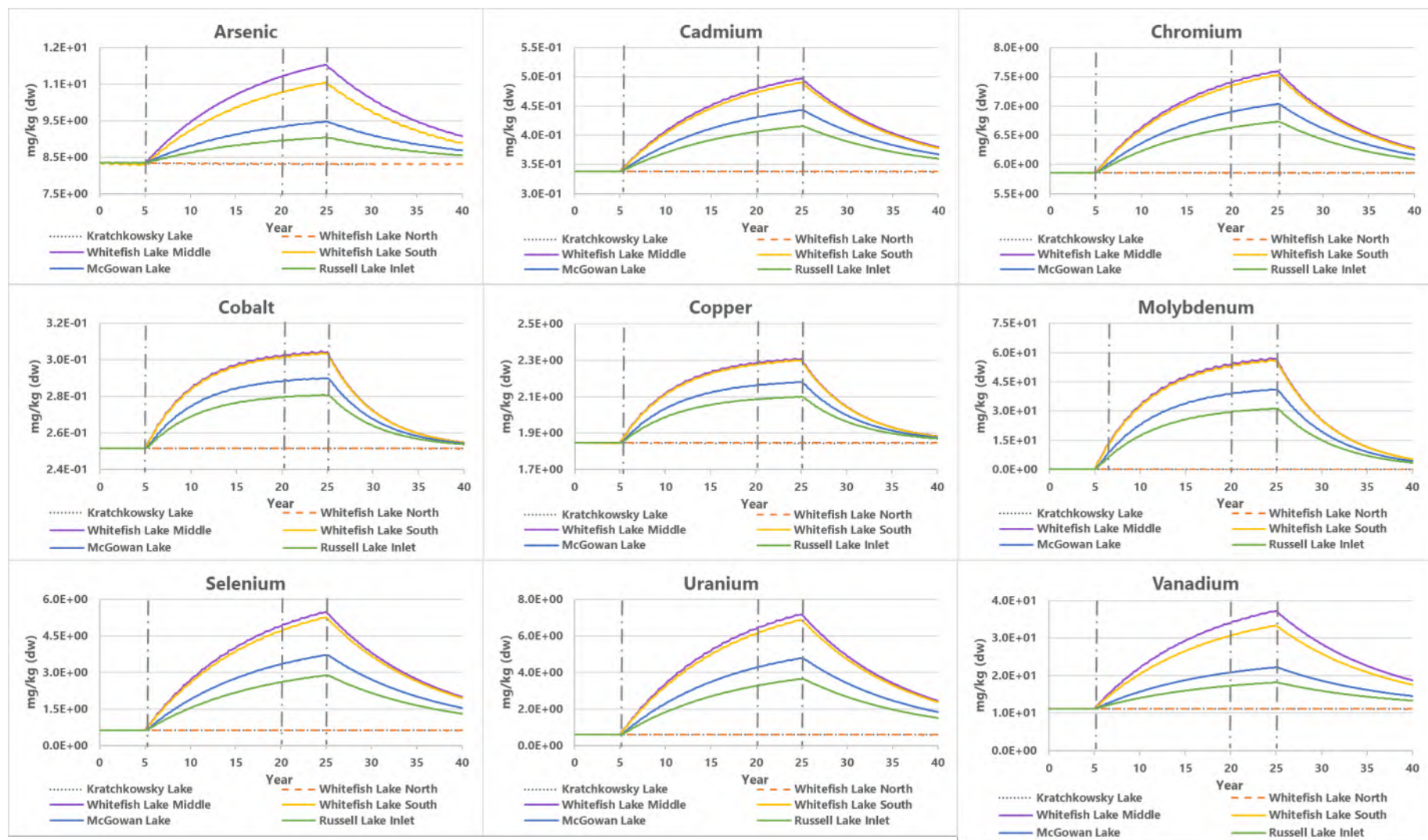


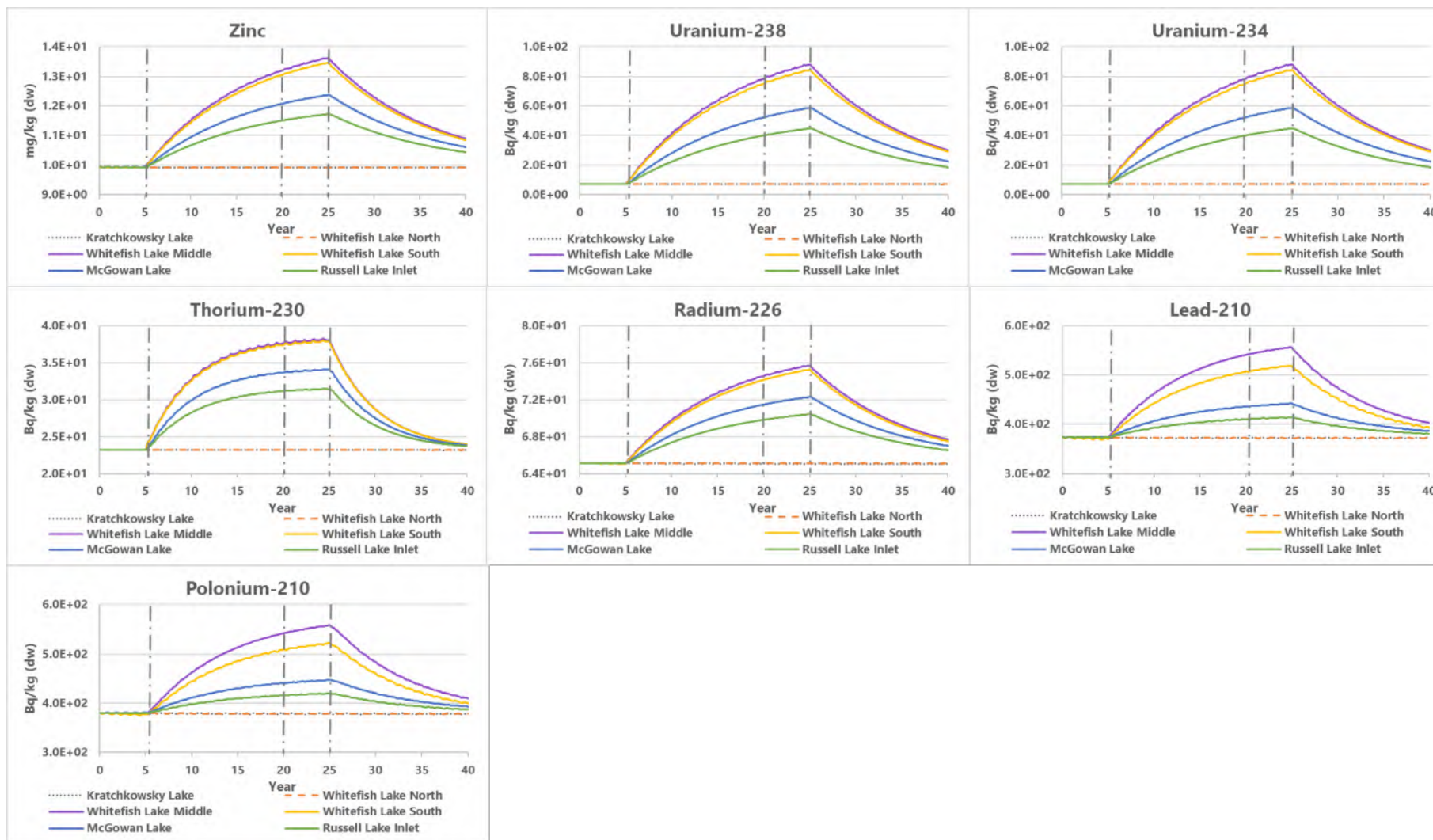
Long dash dot lines separate the time periods of project phases: 3 years baseline; 2 years construction; 15 years operations; 5 years decommissioning; first 15 years post-decommissioning

**Figure IR195-1: Modelled Concentrations of COPCs in Water during Project Phases**



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**Figure IR195-2: Modelled Concentrations of COPCs in Sediment during Project Phases**

## Attachment: IR-196

Number	IR-196
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.3
Context and Rationale	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information and justification for the selection of less stringent thresholds.</li> <li>2. Update the ERA as needed.</li> </ol>

Updated Appendix 10-A Table 3-6 below (red text indicates a change from the existing table in the draft EIS) to support response in IR table:

Table 3-6: Sediment Quality Screening for the Wheeler River Project										
Constituent	Units	Maximum – Whitefish Lake (LA-5)	Sediment Quality Guidelines						Selected Sediment Screening Value	Is Concentration Greater than Selected Screening Value? (Y/N)
			Burnett-Seidel and Liber <sup>(b)</sup>		Thompson et al. <sup>(c)</sup>		CCME <sup>(d)</sup>			
			REF	NE2	LEL	SEL	ISQG	PEL		
Metals and Metalloids										
Arsenic	mg/kg dw	10.7	21	522	9.8	346	5.9	17	21	No
Cadmium	mg/kg dw	0.48	n/d	n/d	n/d	n/d	0.6	3.5	0.6	No
Chromium	mg/kg dw	7.41	31.5	26.2	47.6	115.4	37.3	90	31.5	No
Cobalt	mg/kg dw	0.3	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Copper	mg/kg dw	2.28	9.1	11.3	22	268.8	35.7	197	9.1	No
Lead	mg/kg dw	10.23	16.3	19.7	37	412	35	91.3	16.3	No
Molybdenum	mg/kg dw	53.99	23	245	14	1,239	n/d	n/d	23	Yes
Nickel	mg/kg dw	4	21	326	23	484	n/d	n/d	21	No
Selenium	mg/kg dw	4.9	3.6	30	1.9	16	n/d	n/d	3.6	Yes
Uranium	mg/kg dw	6.39	97	2,296	104	5,874	n/d	n/d	97	No
Vanadium	mg/kg dw	34.03	35.1	31.8	35.2	160	n/d	n/d	35.1	No
Zinc	mg/kg dw	13.2	n/d	n/d	n/d	n/d	123	315	123	No
Radionuclides										
Uranium-234	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Uranium-238	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Thorium-230	Bq/kg dw	37.71	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Radium-226	Bq/kg dw	74.55	n/d	n/d	600	14,400	n/d	n/d	600	No
Lead-210	Bq/kg dw	540.82	n/d	n/d	900	20,800	n/d	n/d	900	No
Polonium-210	Bq/kg dw	541.96	n/d	n/d	800	12,100	n/d	n/d	800	No
Bold and Grey shading indicates sediment concentration exceeds the REF or LEL value.										
a) Sediment concentrations predicted based on release of aqueous source-terms to LA-5 and interaction with sediment. Modelling performed in IMPACT according to the equations outlined in Appendix A.										

## Attachment: IR-198

Number	IR-198
Dept.	HC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)
Context and Rationale	Context: Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals. Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species. Rationale: While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.
Information Requirement	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.

### Response:

#### **1. Mammalian Organ Ingestion Rates**

The derivation of the Traditional Foods diet is explained in detail in Section 4.2.4.2 of Appendix 10-A (ERA), which states: “A dietary study was performed for residents of Patuanak and La Plonge to understand which traditional foods were consumed by each community and the approximate amounts consumed. The results of the survey were summarized in CanNorth (2017) by average daily intake in grams (fresh weight) of country foods by species and season, for Patuanak, La Plonge, and an average. A summary of the ERFN traditional food ingestion rates by food type is shown in Table 4-3 and the proportions of food types are shown in Figure 4-3.”

As shown in Table 4-3 in Appendix 10-A the mammalian organ ingestion rate was 6.2 g/d for La Plonge, and 16.2 g/d for Patuanak, and the average was 12.8 g/d for both areas combined. A more detailed breakdown of organ types is provided in IR-198 Table 1 below which indicates that organs are consumed from moose, woodland caribou, and barren-ground caribou. As shown in IR-198 Table 1 below, the greatest contribution to the total organ ingestion rate is from moose organs. Looking at the total organ ingestion rate, approximately 80% of the contribution is from moose liver, kidney, and other parts (see IR-198 Figure 1 below); therefore, it was decided for the ERA to assign the total organ ingestion rate to moose organs.

## **2. Rationale for Concentrations of Radionuclides in Moose Organs Only**

The reviewer also requested rationale for why concentrations of radionuclides are not provided for organs of animals other than moose. The reviewer acknowledges that they are “not aware of transfer factors to individual organs or to organs that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.” The transfer factor for moose organs was scaled based on the beef organs transfer factor from CSA N288.1-20 (see Table 3-15 in Appendix A to Appendix 10-A). Limited literature data is available for transfer factors for organs. It was decided to represent organs with moose organs based on the results from the ERFN diet explained above.

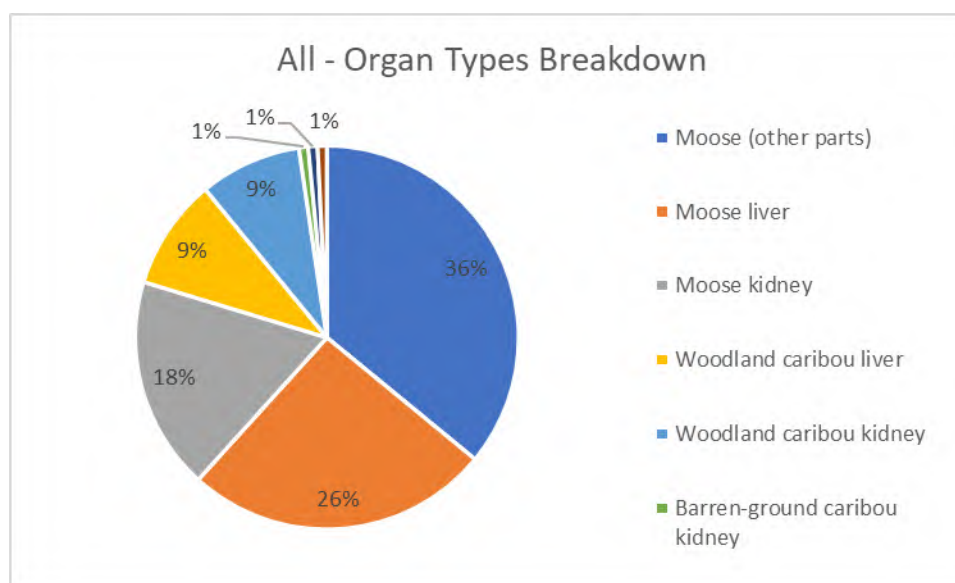
Denison acknowledges that the ingestion transfer factors for woodland caribou organs would be higher than the transfer factors for moose. These ingestion transfer factors are summarized in IR-198 Table 2 below for the relevant radionuclides, and the resulting tissue concentrations based on predicted concentrations at McGowan Lake are summarized in IR-198 Table 3. The predicted tissue concentrations for woodland caribou organs ranges from about 0.6 to 6.9 times higher than the predicted tissue concentrations for moose organs for radionuclides in the U-238 decay chain. However, based on the breakdown of organ ingestion rates shown in IR-198 Table 1 below, the caribou organ intake rate is ¼ of the moose organ intake rate, which roughly offsets the higher concentrations in caribou organs. Therefore, representing the organ intake as 100% moose organs is a reasonable approximation.

No changes to the EIS or ERA (Appendix 10-A) were made based on the response to this IR.



**IR-198 Table 1: Breakdown of Contribution of Organ Types to Total Organ Ingestion Rate**

Organ Types	La Plonge g/d	Patuanak g/d	All g/d	La Plonge % of Organs	Patuanak % of Organs	All % of Organs
Moose (other parts)	2.4	5.7	4.6	39%	35%	36%
Moose liver	1.8	4.1	3.3	29%	25%	26%
Moose kidney	1.8	2.5	2.3	29%	15%	18%
Woodland caribou liver	0.1	1.7	1.2	2%	10%	9%
Woodland caribou kidney	0.05	1.7	1.1	1%	10%	9%
Barren-ground caribou kidney		0.2	0.1	0%	1%	1%
Barren-ground caribou liver		0.2	0.1	0%	1%	1%
Caribou (other parts)	0.02	0.1	0.1	0%	1%	1%
<b>Total Organs</b>	<b>6.2</b>	<b>16.2</b>	<b>12.8</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>



**IR-198 Figure 1: Breakdown of Organ Types for ERFN Traditional Foods Diet**

**IR-198 Table 2: Ingestion Transfer Factors (d/kg fw) for Mammalian Organs**

<b>Radionuclide</b>	<b>Beef Organs</b>	<b>Moose Organs</b>	<b>Woodland Caribou Organs</b>
Body Weight (kg)	600	400	180
Uranium-238	6.90E-04	9.35E-04	1.70E-03
Uranium-234	6.90E-04	9.35E-04	1.70E-03
Thorium-230	6.30E-02	8.54E-02	1.55E-01
Radium-226	9.50E-04	1.29E-03	2.34E-03
Lead-210	2.20E-02	2.98E-02	5.43E-02
Polonium-210	5.00E-05	6.78E-05	1.23E-04

**IR-198 Table 3: Estimated Tissue Concentrations of Moose Organs and Woodland Caribou Organs at McGowan Lake**

<b>Tissue Type</b>	<b>Units</b>	<b>U-238</b>	<b>U-234</b>	<b>Th-230</b>	<b>Ra-226</b>	<b>Pb-210</b>	<b>Po-210</b>
Moose organs	mg/kg fw	7.84E-02	7.84E-02	3.04E+00	8.76E-02	7.15E+00	1.31E-02
Woodland caribou organs	mg/kg fw	3.31E-01	3.31E-01	3.30E+00	5.46E-02	4.94E+01	7.50E-02

## Attachment: IR-213

Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

Table to support response in IR table:

Table 3-2 in Appendix A of Appendix 14-A will be updated in the final EIS to include (new) Scenario 2.4 Well Casing Yield and/or Damage:

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.4	Scenario 2.4 Well Casing Yield and/or Damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Risk level is low, moderate consequence event (assume localized event to ground where clean up is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

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## Attachment: IR-214

Number	IR-214
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Section 14.5.3 Appendix 14-A, section 3.2.3
Context and Rationale	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <ul style="list-style-type: none"> <li>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</li> <li>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</li> <li>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</li> <li>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</li> <li>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</li> <li>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</li> </ul> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>

Information Requirement	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.
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Tables to support response to IR-214:

The updated hazard screening tables on the following pages are provided in support of the response to IR-214.

It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.



Site Works - Summary – Nine potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-1: Hazard Identification Evaluation – Site Works

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
1.1	Fall / slip	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment	5	23	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.2	Fall / slip	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.3	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	4	2	Low	Overall Risk level is low, low-minor consequence event, no further assessment
1.4	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	1	3	Low	Overall Risk level is low, highly unlikely event, no further assessment
1.5	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	2	23	Low	Overall Risk level is low, highly-unlikely event, no further assessment
1.6	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.7	Vehicle and construction equipment accident	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage)	4	2	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.8	Vehicle and construction equipment accident	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.9	Vehicle accident	Co / Op / De	Hazardous materials spill	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage) Spill management and response	4	2	Low	Overall Risk level is low, minor consequence events, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



- EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply

Wellfield - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-2: Hazard Identification Evaluation – Drilling

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.1	Drilling mud spill	Co / Op	Material spill to ground, including contaminated drill muds	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Primary and secondary containment for drilling mud	4	2	Low	Overall risk level is low, <u>low-minor</u> consequence event (assumes containment and clean up), no further assessment
2.2	Piping failure in the well field	Co / Op	Loss of lixiviant, UBS, and/or regents to ground	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to ground where clean up is possible prior to groundwater contamination), no further assessment
2.3	Surface flood	Co / Op	Potential for groundwater contamination	Lined collection points Site grading to collection areas Collection pond sized to accommodate PMP	2	2	Low	Overall risk level is low, <u>low-minor</u> consequence event, no further assessment
2.4	Well casing yield and/or damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to groundwater where cleanup is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking


**EcoMetrix**

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
 Note: Table includes new scenario 2,4 FIRT IR 213.  
 August 16, 2023, 8:23 AM

Access Road / Land Transportation - Summary – Eight potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios carried forward for quantitative assessment.

Table 3-3: Hazard Identification Evaluation – Access Road / Land Transportation (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequences	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
3.1	Vehicle accident including rollover, collision, run off road	Op	Aquatic release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.2	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.3	Vehicle accident including rollover, collision, run off road	Co / Op / De	Aquatic release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.4	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP; Further Assessment Recommended to address interested party concerns (includes consideration of radioactivity)
3.5	Vehicle fire	Co / Op / De	Terrestrial release of hydrocarbons and fuel	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.6	Vehicle fire	Co / Op / De	Release of radioactivity to air	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	<u>Overall moderate (ALARP) low-risk, low-probability</u> highly unlikely event. Reversible and transient effect. No further assessment
3.7	Vehicle fire	Co / Op / De	Atmospheric release of particulate and combustion by-products	Occupational health and safety plan Personnel training and orientation Travel management plan Spill management and emergency response plan Fire safety plan and firefighting systems Ambient air monitoring	1	3	Low	<u>Overall low-low risk, highly unlikely-low-probability</u> event. Reversible and transient effect. No further assessment
3.8	Vehicle – Wildlife collision	Co / Op / De	Wildlife fatality	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan	4	2	Low	<u>Overall low risk</u> . Individual (not population) level <u>minor</u> effect, reversible and nonsignificant effect, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



Airstrip - Summary – Four potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-4: Hazard Identification Evaluation – Airstrip

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
4.1	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	1	3	Low	<del>Overall r</del> Risk level is low, highly unlikely event, no further assessment
4.2	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Secondary containment Spill and emergency response plan	4	2	Low	<del>Overall Risk</del> risk level is low, <del>low-minor</del> consequence event, no further assessment
4.3	Plane de-icing chemical release	Co / Op / De	Terrestrial release of reagent; possible aquatic release of reagent	Personnel training Containment Spill and emergency response plan	3	2	Low	<del>Overall r</del> Risk level is low, <del>low-minor</del> consequence event, no further assessment
4.4	<u>Air plane</u> crash	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-likelihood</del> Highly unlikely event, best practice in air traffic control resulting in ALARP, no further assessment
4.5	Ground vehicle – <u>air plane</u> collision	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Ground traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-Highly unlikely</del> likelihood event, best practice in air / ground traffic control resulting in ALARP, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze plant - Summary – Five potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.

Table 3-5: Hazard Identification Evaluation – Freeze plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
5.1	Ammonia storage and piping failure	Co / Op	Material spill	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	3	2	Low	<del>Overall risk</del> Risk level is low, <del>low</del> <u>minor</u> consequence event, no further assessment
5.2	Loss of freeze capacity	Op	Loss of freeze wall and secondary underground containment	Freeze wall monitoring Monitoring wells outside of the freeze wall – temp, pressure Back up gensets	1	5	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended. Denison does not believe a leak would occur however public perception of a loss of containment is of high concern and should assessed. In practice, the mechanical failure of refrigeration system can be addressed and mitigated well before the thawing of the freeze wall which would take months.
5.3	Cooling line break	Co / Op	Release of brine below ground and potential for groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Spill and emergency response plan	2	4	ALARP, moderate	<del>Low likelihood</del> <u>Unlikely</u> event, best practice resulting in ALARP, no further assessment
5.4	Cooling line break	Co / Op	Release of brine on surface – potential for ground and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Pipes in trenches and secondary containment Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low</del> <u>minor</u> consequence event with appropriate response and mitigation, no further assessment
5.5	Pumps failure	Co / Op	Release of brine on surface - potential for surface and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system No open drain from pumphouse Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low</del> <u>minor</u> consequence event with appropriate response and mitigation, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze wall - Summary – One potential scenario has been identified. Risks have been characterized as high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.								
Table 3-6: Hazard Identification Evaluation – Freeze wall								
ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
6.1	Failure of freeze wall due to seismic event / geotechnical instability	Op	Loss secondary underground containment and groundwater contamination	Freeze wall monitoring Redundancy in design Control of pump and injection wells	2	4	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended

Notes: “Co” is construction  
“Op” is [operations](#)  
“De” is Decommissioning  
“L” is [likelihood](#)  
“S” is [severity](#)  
“RR” is risk [ranking](#)

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No changes needed.

@mention or reply



Production Plant - Summary – Seven potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios are carried forward for quantitative assessment.

Table 3-7: Hazard Identification Evaluation – Production Plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
7.1	Process vessel and piping system failure	Op	Release of sulphuric acid	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.2	Process vessel and piping system failure	Op	Release of hydrogen peroxide and potential for fire	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.3	Process vessel and piping system failure	Op	Release of magnesium hydroxide	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.4	Process vessel and piping system failure, Thickener overflow	Op	Release of aqueous solution	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained Detectable signs of exposure e.g., irritation	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment. ALARP
7.5	Process vessel and piping system failure	Op	Release of acidic fume from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Availability of respirators Emergency response plan will implement medical response to acute exposure to acidic fumes. Ambient monitoring Building ventilation	3	2	Low	Overall low Moderate-risk, low-minor consequence event, no further assessment
7.6	Process vessel and piping system failure	Op	Release of radon from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Emergency response plan Ambient monitoring Building ventilation	3	3	Moderate	Overall moderate risk, moderate consequence event - Further Assessment Recommended
7.7	Facility fire / explosion	Op	Release of radioactivity and yellowcake powder to atmosphere	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan Ambient air monitoring	2	5	High	Further Assessment Recommended. It is also noted that this scenario could be an outcome of many initiating events – the specific details associated with the event will be determined based on the most current inventory of combustible and flammable materials associated with the production plant when the analysis is completed.
7.8	Process containment and gas cleaning and filtration system failure	Op	Release of yellowcake powder to atmosphere	Inspection, testing, and maintenance program Ambient air monitoring	3	4	ALARP, moderate	The consequence is bounded by scenario 7.7.

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply

Clean Waste Rock Pads - Summary – Four potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-8: Hazard Identification Evaluation – Clean Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
8.1	Stockpile slope failure	Co / Op / De	Release of material into surrounding environment	Personnel training and orientation Inspection and maintenance	2	2	Low	Overall low risk, unlikely event due to small extent of stockpiles, no further assessment
8.2	Stockpile erosion	Co / Op / De	Release of materials into the environment	Personnel training and orientation Inspection and maintenance Single-lined pad Inspection and maintenance	2	3	Low	Overall low risk, highly unlikely event, no further assessment
8.3	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of materials into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Ambient monitoring Surface water management Spill management	1	2	Low	Overall low risk, highly unlikely event, no further assessment
8.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of materials into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill response plan	2	3	Low	Overall low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
August 16, 2023, 9:11 AM  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
With Specific reference FIRT IR 214(IV) it is believed that that the revised scoring "unlikely" better reflects the event likelihood. Stockpile erosion may not be uncommon but stockpile erosion that would lead to an environmental release as envisioned by the scenario in consideration of the design basis is deemed unlikely.  
August 16, 2023, 9:12 AM  
@mention or reply

Special / Specialized Waste Containment - Summary – Two potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-9: Hazard Identification Evaluation –Special / Specialized Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
9.1	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Ambient monitoring Surface water management Spill management	1	3	Low	Overall <del>low</del> low risk, <del>highly</del> unlikely event, no further assessment
9.2	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill response plan	1	4	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Gypsum (clean) Precipitates Disposal Area - Summary – Five potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-10: Hazard Identification Evaluation – Gypsum (clean) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
10.1	Precipitates erosion	Co / Op /De	Release of contaminants into surrounding environment	Personnel training and orientation Single-lined pad Inspection and maintenance	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.2	Uncontrolled leachate / seepage release through runoff	Co / Op /De	Release of contaminants into the environment	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.3	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.4	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill management and response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.5	Wind erosion	Co / Op /De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)

EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Iron (contaminated) Precipitates Disposal Area – Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-11: Hazard Identification Evaluation – Iron (contaminated) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
11.1	Precipitates erosion	Co / Op / De	Release of contaminants into surrounding environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment
11.2	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of contaminants into the environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.3	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.5	Wind erosion	Co / Op / De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Wastewater Treatment System - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-12: Hazard Identification Evaluation – Wastewater Treatment System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
12.1	Equipment / piping failure	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Piping design pressure higher than pumps shutoff pressure Inspection and maintenance Process monitoring Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, containment of the piping within the ditches indicates no further assessment
12.2	Effluent clarifier overflow	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Secondary containment Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, no further assessment
12.3	Equipment and control system failure	Op / De	Release of reagents, Environmental contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Recirculation of off-spec water to the process Spill management and response	2	3	Low	Low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix

Changes made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenarios 12.1 and 12.2 were "moderate" but should have been ranked "low" based on L=2 and S=3.  
August 16, 2023, 8:47 AM

@mention or reply



Ponds and Retention Berms - Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-13: Hazard Identification Evaluation – Ponds and Retention Berms

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
13.1	Pond overtopping	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	2	3	Low	Overall low risk, <del>low-probability</del> unlikely event, no further assessment
13.2	Ponds containment or embankment failure	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	5	ALARP, moderate	Best engineering practice in maintenance and inspection of the containment systems and berms. No further assessment
13.3	Ponds lining failure and leakage	Op / De	Contaminant and radioactivity release to groundwater	Personnel training and orientation Inspection and maintenance Groundwater monitoring Response plan	2	3	ALARP, moderate	Overall moderate risk, <del>low-probability</del> likely event with moderate consequence. Overall risk considered ALARP given engineering design and other safeguards. No further assessment recommended.
13.4	Surface flooding	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	3	Low	Overall low risk, <del>low-probability</del> highly unlikely event, no further assessment
13.5	Wildlife entering pond	Op/De	Exposure to contaminants, drowning	Wildlife management plan Inspection Fencing	1	2	Low	Overall low risk, <del>low-probability</del> highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



**EcoMetrix**  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply



**EcoMetrix**  
Per FIRT IR 214 the likelihood score has been revised from L=2 (unlikely) to L=3 (likely) and therefore overall risk has been updated to ALARP, moderate from Low.  
Based on information received from manufactures and the project team's own experience it is thought the L=3 (≤1 occurrence in 10 years and >1 occurrence in 100 years) may better reflect liner performance, assuming the liner is installed based on appropriate design criteria and used as intended.  
August 16, 2023, 10:34 AM  
@mention or reply

Electrical System and Power Plant - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-14: Hazard Identification Evaluation – Electrical System and Power Plant

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
14.1	Substation transformer leak	Co / Op / De	Release of mineral oil and potential for groundwater contamination	Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment	3	2	Low	Overall low risk, low-minor consequence, no further assessment
14.2	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational major injuries	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	2	23	ALARP, moderate/low	Best practice in worker health and safety program resulting in ALARP, no further assessment
14.3	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational fatalities	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

**EcoMetrix** ...  
Per FIRT IR 214, updated severity to 3 (from 2) to reflect occupational injury.  
Also, originally the overall risk ranking was ALARP, moderate - this has been revised to ALARP, low consistent with the hazard analysis risk matrix.  
August 16, 2023, 9:18 AM  
@mention or reply

**EcoMetrix** ...  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix. Also, change made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenario 14.2 was "moderate" but should have been ranked "low" based on L=2 and S=2.  
August 16, 2023, 8:52 AM  
@mention or reply

Fire Protection System - Summary – Two potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-15: Hazard Identification Evaluation – Fire Protection System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
15.1	Failure of fire pump	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Redundancy Fire safety plan and firefighting systems (including and elevated fire water tank, and a gas-powered pump for at a groundwater well) Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment
15.2	Loss or lack of fire water	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix
...

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Hazardous Waste Management System - Summary – One potential scenario has been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-16: Hazard Identification Evaluation – Hazardous Waste Management System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
16.1	Hazardous waste spill	Co / Op / De	Potential for surface water and soil contamination	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Waste management plan Emergency response plan Onsite monitoring	2	2	Low	Overall low risk, low-minor consequence event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

## Attachment: IR-217


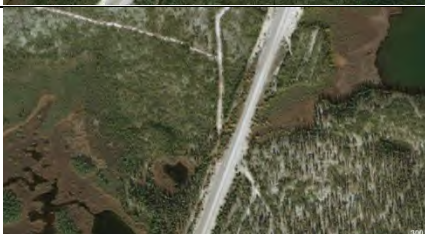


Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

### Response:

As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. A total of 66 water crossings were identified as shown in Table IR-217-1, below. Coordinates (lat., long.; are provided for each of the crossings along with a basic description of each and a corresponding satellite image. For reference, in the table the designation “Highway 165W” means the location of the crossing is on Hwy 165 west of Hwy 914, beginning at the Hwy 165/155 and travelling east and the designation “Highway 165E” means the crossing is east of Hwy 914, travelling east toward Hwy 2. It is noted that most crossings are not identifiable by a specific name and are thus identified as “Unnamed creek”.





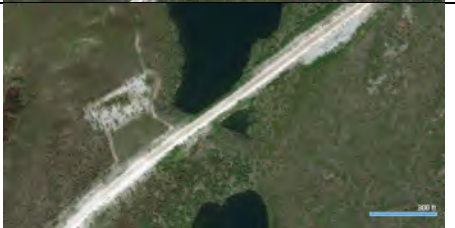

As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.

**Table IR-217-1 – Water Crossings on the Wheeler River Project Transport Route**

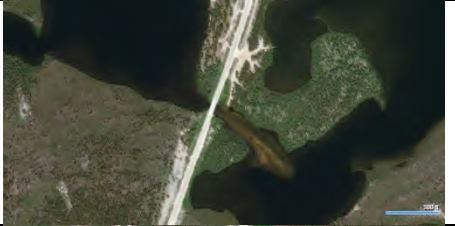





Crossing #	Hwy	Coordinates	Name	Feature	Feature Width (m)	Image
1	914	<a href="#">57.439217, -105.399002</a>	Unnamed creek	Water crossing	10	
2	914	<a href="#">57.378448, -105.464859</a>	Unnamed creek	Water crossing	<2	
3	914	<a href="#">57.354164, -105.485123</a>	Russell Lake	Lake crossing	900	
4	914	<a href="#">57.285332, -105.570038</a>	Unnamed creek	Water crossing	<2	









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5	914	<a href="#">57.273514, -105.591202</a>	Unnamed creek	Wetland complex	100	
6	914	<a href="#">57.220776, -105.685287</a>	Unnamed creek	Water crossing	13	
7	914	<a href="#">57.053490, -105.983330</a>	Unnamed creek	Wetland complex	35	
8	914	<a href="#">56.898136, -106.130302</a>	Unnamed creek	Water crossing	50	
9	914	<a href="#">56.882645, -106.152107</a>	Unnamed creek	Water crossing	60	
10	914	<a href="#">56.850391, -106.159187</a>	Unnamed creek	Water crossing	10	

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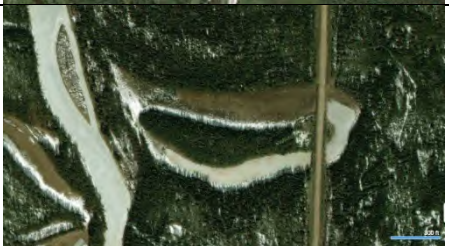
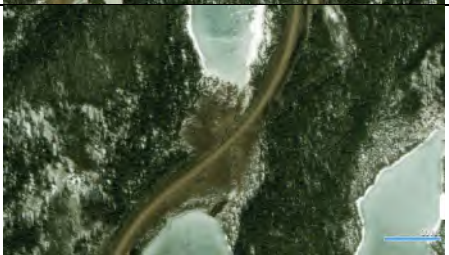
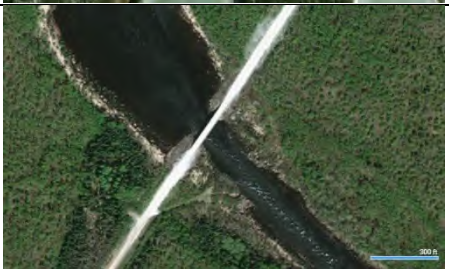
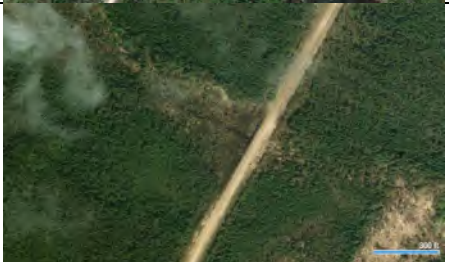
11	914	<a href="#">56.793152, -106.146248</a>	Unnamed creek	Water crossing	15	
12	914	<a href="#">56.787197, -106.149460</a>	Unnamed creek	Water crossing	<2	
13	914	<a href="#">56.722340, -106.165710</a>	Unnamed creek	Water crossing	<2	
14	914	<a href="#">56.669765, -106.201149</a>	Unnamed creek	Water crossing	10	
15	914	<a href="#">56.600300, -106.252251</a>	Unnamed creek	Water crossing	<2	
16	914	<a href="#">56.572754, -106.281494</a>	Unnamed creek	Water crossing	<2	

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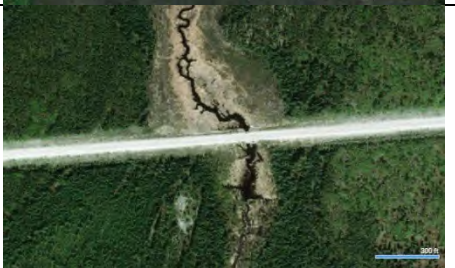


17	914	<a href="#">56.554306, -106.306236</a>	Unnamed creek	Water crossing	<2	
18	914	<a href="#">56.539055, -106.330338</a>	Unnamed creek	Water crossing	5	
19	914	<a href="#">56.444473, -106.401733</a>	Unnamed creek	Water crossing	10	
20	914	<a href="#">56.388561, -106.512726</a>	Unnamed creek	Water crossing	20	
21	914	<a href="#">56.353569, -106.565643</a>	Unnamed creek	Water crossing	<2	
22	914	<a href="#">56.329689, -106.562004</a>	Unnamed creek	Water crossing	10	








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23	914	<a href="#">56.147633, -106.613579</a>	Unnamed creek	Water crossing	35	
24	914	<a href="#">55.994797, -106.521835</a>	Unnamed creek	Water crossing	10	
25	914	<a href="#">55.967976, -106.532318</a>	Unnamed creek	Water crossing	30	
26	914	<a href="#">55.867905, -106.503120</a>	Unnamed creek	Water crossing	<2	
27	914	<a href="#">55.733261, -106.565331</a>	Churchill River	Water crossing	40	
28	914	<a href="#">55.660831, -106.585144</a>	Unnamed creek	Water crossing	<2	

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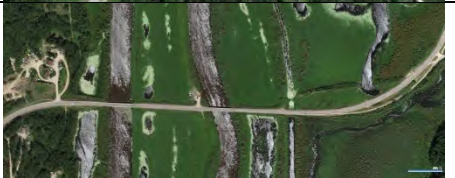


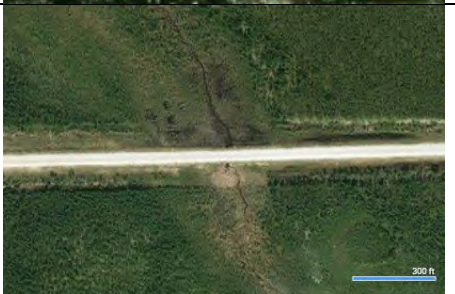

29	914	<a href="#">55.656418, -106.588326</a>	Unnamed creek	Water crossing	<2	
30	914	<a href="#">55.568588, -106.603722</a>	Unnamed creek	Water crossing	10	
31	914	<a href="#">55.494350, -106.646774</a>	Unnamed creek	Water crossing	<2	
32	914	<a href="#">55.504215, -106.714218</a>	Unnamed creek	Water crossing	7	
33	914	<a href="#">55.500674, -106.768551</a>	Unnamed creek	Water crossing	5	
34	914	<a href="#">55.474350, -106.836800</a>	Unnamed creek	Water crossing	20	

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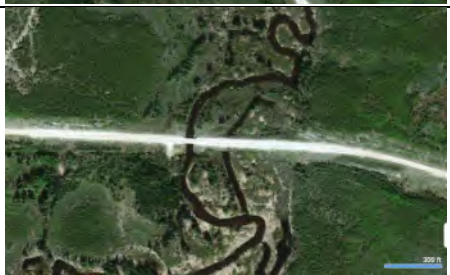



35	914	<a href="#">55.465046, -106.865280</a>	Unnamed creek	Water crossing	<2	
36	914	<a href="#">55.434074, -106.842552</a>	Unnamed creek	Water crossing	<2	
37	914	<a href="#">55.378868, -106.833595</a>	Unnamed creek	Water crossing	10	
38	914	<a href="#">55.358044, -106.839149</a>	Unnamed creek	Water crossing	<2	
39	914	<a href="#">55.282467, -106.815933</a>	Unnamed creek	Water crossing (2x)	40	








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40	165W	<a href="#">55.124847, -107.681786</a>	Unnamed creek	Water crossing	15	
41	165W	<a href="#">55.153086, -107.597933</a>	Beaver River	Crossing complex	750	
42	165W	<a href="#">55.219022, -107.403364</a>	Unnamed creek	Water crossing (minor)	3	
43	165W	<a href="#">55.222092, -107.214650</a>	Unnamed creek	Water crossing	18	
44	165W	<a href="#">55.240179, -106.869717</a>	Unnamed creek	Water crossing (minor)	3	
45	165E	<a href="#">55.229849, -106.789293</a>	Unnamed creek	Wetland complex	100	

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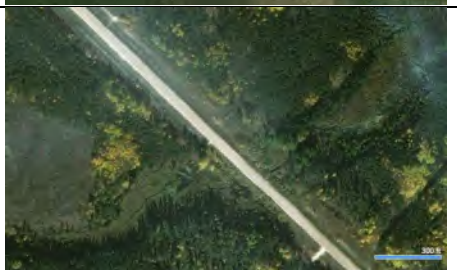

46	165E	<a href="#">55.210766, -106.789518</a>	Unnamed creek	Water crossing	6	
47	165E	<a href="#">55.190045, -106.755394</a>	Unnamed creek	Water crossing (one side ponded)	60	
48	165E	<a href="#">55.178462, -106.686886</a>	Unnamed creek	Crossing complex	13	
49	165E	<a href="#">55.164998, -106.635760</a>	Unnamed creek	Water crossing (one side ponded)	25	
50	165E	<a href="#">55.147328, -106.569588</a>	Unnamed creek	Water crossing (minor)	5	
51	165E	<a href="#">55.145846, -106.480813</a>	Unnamed creek	Water crossing	10	

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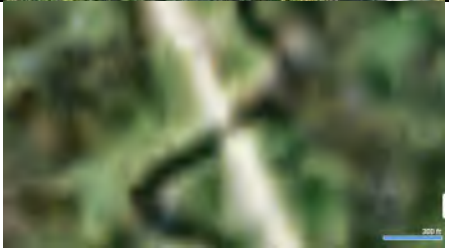

52	165E	<a href="#">55.148323, -106.465283</a>	Unnamed creek	Water crossing (minor)	3	
53	165E	<a href="#">55.155644, -106.419692</a>	Unnamed creek	Water crossing (minor)	3	
54	165E	<a href="#">55.160151, -106.391546</a>	Unnamed creek	Wetland complex	25	
55	165E	<a href="#">55.156452, -106.340823</a>	Unnamed creek	Water crossing	10	
56	165E	<a href="#">55.159666, -106.317084</a>	Unnamed creek	Water crossing	5	
57	165E	<a href="#">55.166328, -106.259241</a>	Unnamed creek	Water crossing (minor)	2	



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58	165E	<a href="#">55.163412, -106.206745</a>	Smoothstone River	Water crossing (major)	50	
59	165E	<a href="#">55.122788, -106.016421</a>	Unnamed creek	Water crossing (minor)	5	
60	165E	<a href="#">55.103940, -105.963149</a>	Unnamed creek	Water crossing (minor)	3	
61	165E	<a href="#">55.104002, -105.949567</a>	Unnamed creek	Water crossing (ponded)	70	
62	165E	<a href="#">55.076830, -105.859303</a>	Unnamed creek	Water crossing (minor)	3	
63	165E	<a href="#">55.059849, -105.821333</a>	Unnamed creek	Water crossing (minor)	5	

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64	165E	<a href="#">55.056275, -105.810201</a>	Unnamed creek	Water crossing (minor)	3	
65	165E	<a href="#">54.884914, -105.748054</a>	Montreal River	Water crossing (major)	20	
66	165E	<a href="#">54.811663, -105.671518</a>	Unnamed creek	Water crossing (ponded)	38	

## Attachment: IR-218

Number	IR-218
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1.1 and 14.6.1.4
Context and Rationale	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>
Information Requirement	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.

Updated EIS tables to support response:



Table 14.6-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	3,309 <del>2,535</del>	129
Maximum	47	2,535 <del>3,309</del>	912

Table 8-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	<u>3,309</u> <del>2,535</del>	<u>129</u>
Maximum	47	<u>2,535</u> <del>3,309</del>	<u>912</u>

## Attachment: IR-236

Number	IR-236
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 15.5.2, Expected Environmental Conditions
Context and Rationale	<p>Context: It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p>Rationale: In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics.</p> <p>Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>
Information Requirement	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p>Technical Discussion Required: Yes</p>

### Response:

During the EIS review by the FIRT, there were information requirements (IRs; mainly IR-235 and IR-236, and to a lesser extent IR-103 and IR-104) related to current and future climate precipitation, as well as the probable maximum precipitation. The information in Attachment IR-236 will be added as *Appendix D Summary of Precipitation Values Presented in the EIS* to Appendix 6-C in the final EIS. The Project design and site drainage plan are more closely linked to detailed design to support the licensing process and the precipitation information provided in the draft EIS to support an EA decision is adequate. This new appendix to Appendix 6-C serves to provide clarifications only.

The probable maximum precipitation (PMP) event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program

(1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes. As an example, during a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m<sup>3</sup> (*excluding a freeboard of 1 meter*). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In EIS Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.”

Tables 1 to 4 below provide a summary of precipitation information for both current / existing climate and future climate under different emissions scenarios, in order to 1) summarize precipitation data from various sections of the EIS (Section 6 including Appendix 6-C, Section 8, and Section 15) and 2) provide context on the PMP of 493 mm in comparison to precipitation values (annual precipitation, maximum 1-day precipitation, and 1:100 year, 24 hour return).

Table 1: Precipitation - Existing Climate – Comparisons of Observed Annual Average Precipitation and Maximum 24-hour Precipitation to PMP

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
Annual average precipitation	456 mm	Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Annual average precipitation	483 mm	Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Maximum 24-hour precipitation	45.9 mm	Occurred on August 8, 2020.  Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 10.7 x lower than PMP</i></b>
Maximum 24-hour precipitation	72 mm	Occurred July 12, 1998. Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 6.8 x lower than PMP</i></b>

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
1 in 100 year, 24 hour return	79.9 mm	Calculated using IDF_CC Tool for the Wheeler River Project. Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 6.2 x lower than PMP</b>
1 in 100 year, 24 hour return	56.4 mm	Return Period Estimate based on data from the Key Lake Mine using the IDF_CC Tool (~32 km away from Wheeler River Project). Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 8.7 x lower than PMP</b>

Table 2: Precipitation – Future Climate - Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)

Year	Total Annual (mm)				Maximum 1-day (mm)			
	Measured	RCP 2.6	RCP 4.5	RCP 8.5	Measured	RCP 2.6	RCP 4.5	RCP 8.5
<b>2011-2020</b>	455	518	509	508	48	29	27	27
<b>2030</b>		528	503	537		27	24	26
<b>2040</b>		487	498	514		28	29	24
<b>2050</b>		504	524	520		26	29	33
<b>2060</b>		513	515	523		26	33	26
<b>2070</b>		527	534	568		29	31	28
<b>2080</b>		539	551	547		30	33	28
<b>2090</b>		543	545	548		31	32	35
<b>2100</b>		546	535	559		23	25	28
<b>Overall Increase:</b>		28	26	51		-6	-2	1



Table 3: Precipitation – Future Climate - Historical and Future Precipitation Data (Total Annual and Maximum 1-day) for Tomblin Lake, Climate Atlas (provided in EIS, Section 15, Table 15.5-1 and 15.5-2)

Period	Total Annual (mm)			Maximum 1-day (mm)		
	Historical	RCP 4.5	RCP 8.5	Measured	RCP 4.5	RCP 8.5
<b>Historical mean (1976-2005)</b>	456			24.1		
<b>Near Term (2021-2050)</b>		484	487		25.9	25.9
<b>Far Term (2051-2080)</b>		500	509		26.7	27.5

Table 4: Precipitation – Future Climate - Predicted Precipitation (1:100 year, 24-hour return) for Key Lake and Wheeler River Project, 2020 to 2050 using IDF\_CC Tool (provided in EIS Section 8)

Location	1:100 year, 24-hour return
<b>Key Lake Mine</b>	62.0
<b>Wheeler River Project</b>	88.6

References:

Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.

Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.

## Attachment: IR-237

Number	IR-237
Dept.	CNSC
Project effects link	EA follow-up and monitoring program
Reference to EIS, appendices, or supporting documentation	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)
Context and Rationale	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"> <li>objectives and structure of the follow-up program and the VCs targeted by the program</li> <li>tabular summary and explanatory text of the main components of the program including: <ul style="list-style-type: none"> <li>a description of each monitoring activity under that component</li> <li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li> <li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li> <li>the specific monitoring objective for that activity</li> <li>planned schedule</li> </ul> </li> <li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li> <li><u>possible involvement of independent researchers</u></li> <li><u>program funding sources</u></li> <li>information management and reporting (reporting frequency, methods and format)</li> <li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li> </ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>

Information Requirement	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>
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Response:

Denison concurs that follow-up program documentation will evolve over the planning process and is committed to providing complete and up to date documentation as the EIS is finalized and prior to the EA Decision. Per the March 20, 2023 letter from the CNSC to Denison (Subject: Results of the Federal-Indigenous Review Team technical review of the October 21st, 2022 Draft Environmental Impact Statement Submission for the proposed Wheeler River Project), the company will be providing, as part of the final EIS documentation, a Commitments Report in order to capture all the mitigation measures, follow-up program measures and commitments that have been referenced in the EA documentation in a single location for completeness and traceability. The Commitments Report will be scoped so that it also fulfils the obligations of the commitments registry required by the Saskatchewan Ministry of Environment.

Notwithstanding the above, Denison believes that section 16-C, Summary of Monitoring and Follow-up Programs, in the draft EIS generally meets the requirements outlined in the EIS guidelines but agrees that some additional information can be provided to clarify select aspects. Specific notes per the EIS Guidelines are provided below to provide context the remainder of the response. For reference text in *italics* is taken from the EIS Guidelines; whereas text in **bold** is commentary provide by Denison. Additionally, bold text that is underlined indicates where Denison commits to revising or adding information into the EIS.

*The EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.* **Note from Denison – Table 1-5.1 in Appendix 16-C identifies a framework or preliminary program upon which EA follow-up actions will be managed, as well as all phases of the Project in which the proposed individual follow up programs will be executed.**

*The EIS should provide discussion on the follow-up program's requirements, and include:*

- *objectives and structure of the follow-up program and the VCs targeted by the program* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs, provides an overall program structure and identifies the VCs targeted by the program.**
- *tabular summary and explanatory text of the main components of the program including:*
  - o *a description of each monitoring activity under that component* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies each proposed monitoring activity for the various technical disciplines within which the environment assessment has been organized.**
  - o *which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)* - **Note from**

**Denison - Table 1-5.1 in Appendix 16-C generally identifies whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures (see column “Monitoring Program Objective(s)”; however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further column will be added to indicate specifically whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures with rational.**

- o *the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects) – Note from Denison - Table 1-5.1 in Appendix 16-C identifies the relevant section of the EIS to which each proposed follow up activity refers. however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further, more specific reference to the section / subsection / statement (as appropriate) will be added to the “EIS Reference” column for greater traceability between the assessment section of the EIS for each of the technical disciplines and the proposed follow activities.*
- o *the specific monitoring objective for that activity- Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs.*
- o *planned schedule - Note from Denison -Table 1-5.1 in Appendix 16-C identifies the phases of the Project in which the proposed individual follow up programs will be executed. It is premature in Denison’s view to develop specific “schedule” associated with all follow-up activities that are proposed. As noted in draft EIS Section 1.7.5, Licensing and Permitting, as well as in other responses to FIRT IRs, the Project is proceeding through sequential EA and licensing process. Given the sequential process to which Denison has committed it is planned that further detail will be developed to align with detailed engineering design through licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.*

*roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results - Note from Denison – At this time and commensurate with the level of detail (i.e. concept) at which the follow up activities have been defined the proponent assumes responsibility for execution of all proposed activities. This may change as the program details are developed, and Denison presumes this is likely as it continues to work with the key Indigenous groups. It is noted however that provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners and therefore it is inappropriate (and may remain so) that specific details regarding follow up activities be shared without the expressed consent of the agreement signatories. Regulatory agencies at the provincial and federal levels are expected to largely play a review/approval role consistent with their responsibilities under various laws/acts/licenses/permits under which the Project, and follow up activities, will be executed. At this time there are no specific plans with local and regional organizations as it pertains to the design, implementation and evaluation of the program results; but this may change in the future. Per the above, Denison will add additional detail into Table 1-5.1 in Appendix 16-C with respect to roles and responsibilities consistent with the information provided in this IR response. As noted full disclosure of such information may not be possible as it would be*

**subject to non-disclosure covenants between Denison and its key Indigenous partners; nevertheless more specific information will be provided as is available.**

- *possible involvement of independent researchers* – **Note from Denison** – Involvement of independent researchers in follow up activities has not been identified at this time, nor has need for such been specifically flagged. This does not preclude possible involvement of independent researchers in the future; however, need for such has not been specifically flagged. As noted above, provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners, and such follow up activities and monitoring could include independent research. The sharing of information related to this type of independent research can and would only be shared with the expressed consent of the agreement signatories. **Per the above, Denison will add narrative to the text of Appendix 16-C clarifying the role of independent research that is consistent with the understanding of such at the time the final EIS is published.**
- *program funding sources* – **Note from Denison** – As noted above, the proponent assumes responsibility for execution of all proposed follow up activities that have been identified and therefore the funding of such. Also as noted above, provisions for follow up activities and monitoring that may be included in agreements developed between Denison and its key Indigenous partners will be subject to non-disclosure covenants in those agreements. This would include information concerning any funding that may be associated with these programs. It would be inappropriate (and may remain so) that specific details regarding any funding that may be provided for follow up activities be shared without the expressed consent of the agreement signatories.
- *information management and reporting (reporting frequency, methods and format)* – **Note from Denison** – A framework for information management and reporting is provided in Section 1.2 of Appendix 16-C. As described in Section 1.2 of Appendix 16-C specific information management and reporting structures associated with follow up activities are proposed to be developed as part of the development of the Project Environmental Management System (EMS). The Project EMS will be developed during licensing and permitting and that this information, including more detailed information regarding information management and reporting (e.g., reporting frequency, methods and format) will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.
- *possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program* – **Note from Denison** – As noted above, Denison is committed to continuing the ongoing process of identifying opportunities the participation of the public and Indigenous groups as follow up activity programs evolve. There is nothing specific to share at this time but it is expected that further clarity in this respect will be provided in the near to medium terms. It is also understood that any information that can be shared only represents a snapshot in time. Since follow up activities will span the full lifecycle of the Project identification of potential opportunities for involvement is an ongoing process that will also span the full lifecycle of the Project.

Denison anticipates that the lengthy and evolving EIS review process, and consideration of the public comments received by Denison on June 27<sup>th</sup>, 2023, will bring forward additional mitigation and follow up activities. Denison will update Section 16-C, Summary of Monitoring and Follow-up Programs, per the commentary provided in response to IR-237 and will also include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project's Commitment Report which will be provided as part of the final EIS documentation.



Responses to Advice to Proponent

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-01	Canadian Nuclear Safety Commission (CNSC)	Glossary sections	<p>There are terms used throughout the EIS that may either need defining, or inclusion in the glossary.</p> <ul style="list-style-type: none"><li>· “Bounding”, “bounding case” and “bound” are used frequently throughout the EIS to describe the scope of the assessment. For example, p. 2-6 the EIS States: “Denison has bound the environmental assessment above the deposit...”</li><li>· “Laydown”. P. 2-54 states: “During Construction, Denison plans to create a laydown area next to the future domestic landfill to temporarily store construction waste. Examples of materials include clean wood, plastics, metal, and concrete. The construction laydown area will not be lined, but it will have a berm surrounding the area to minimize run-on and runoff.”</li><li>· “Deflagration” (p. 2-22)</li><li>· “Speed of sound” The EIS states: “Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds...” (p. 2-22) - Explain briefly what is meant by “speed of sound”</li><li>· “Dries” (p. 2-65): “the main dries will be located in the processing plant”</li><li>· “Scarified” 2-84 Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species.</li><li>· “Furblock” (p. 4-29)</li><li>· “Cutlines” (p. 4-101)</li></ul>	<p>Add this terminology to either one of the early glossaries, or when describing the methodology, in order to help readers understand these terms (particularly non-technical readers, such as Indigenous peoples and members of the public).</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-02	CNSC	General	<p>Mining solution and lixiviant are used interchangeably throughout the EIS. When both are used periodically, may be difficult for a member of the public to recognize that these are one in the same (mining fluid seems more often used).</p>	<p>Be consistent in how this is referred to, in order to ensure it’s clear to readers that these are one and the same.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-03	CNSC	Throughout the Executive Summary (ES) and draft EIS	<p>Errors in formatting and grammar were identified throughout ES and EIS. Some examples are underlined below:</p>	<p>Please correct these and any other formatting, spelling or grammatical errors.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-04	CNSC	Section 2.2.1 Mining (p. 2-4 to 2-5)	<p>An arial view could be useful to help a reader understand the proposed freeze wall earlier in section 2 (e.g., The shape, whether it surrounds the deposit). This is unclear but there are good images further down in the EIS (i.e., Figure 2.3-1 on p. 2-78).</p>	<p>Consider adding image to Section 2.2.1, similar to or containing aspects of Figure 2.3-1.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-05	Transport Canada (TC)	Sections 2.2.3.2, 2.2.3.10, 2.2.5.1, 2.3.1.6, 8.3.4.2.2, 11.1.4.4.2,	The two water crossings over Kratchkowsky Creek and Hart Creek and the water intake and effluent discharge/intake pipeline and diffuser at Whitefish Lake may be subject to the <i>Canadian Navigable Waters Act</i> (CNWA). However, these works may be exempt from the CNWA, if they meet the requirements of the Minor Works Order.	<p>*This advice pertains to the regulatory phase.*</p> <p>It is recommended that the Proponent self-assess each work using TC’s Project Review Tool as follows: <a href="https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet">https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet</a></p> <p>If the works do not fit the Minor Works Order, the Proponent has the option to either submit an application for approval to the NPP, or use the public resolution process, as these are all unscheduled waterways. The full text of the Minor Works Order is available here: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html">https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html</a>.</p> <p>Background information on the NPP, the Minor Works Order, the application for approval process and the public resolution process are available here: <a href="https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp">https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp</a></p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.
AD-06	Environment and Climate Change Canada (ECCC)	Section 2.2.3.8, Project Description	<p>In this section it is stated that: “The third step of the Industrial Wastewater Treatment Plant (IWWTP) is anticipated to further neutralize and improve the remaining water quality proposed to be achieved with further pH adjustments through agitated tanks and a clarifier with negligible solids generation expected at this stage. Several additional technologies including ion exchange are being evaluated as part of an ongoing Best Available Technology Study to be complete as part of future permitting.” ECCC would be interested in reviewing this study when it becomes available.</p> <p>Considering that the third step of the effluent treatment process in the IWWTP is still undergoing development, ECCC cannot make final conclusions regarding the efficacy of the treatment process. When final treatment technologies have been evaluated and selected, ECCC would like to review this information to allow for release to the environment.</p>	ECCC requests the opportunity to review the Best Available Technology Study and selected treatment technologies for the IWWTP when the report becomes available.	The BATEA information for the IWWTP will be included in Denison’s application to the CNSC for a license to operate. As such, ECCC can direct their review request for review to the CNSC.
AD-07	TC	Section 2.2.5.3	With respect to the proposed airstrip, under the <i>Aeronautics Act</i> , the proposed airstrip would be considered an “aerodrome”, which is defined as: “aerodrome means any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.” Aerodromes, including the one proposed by Denison, are subject to the <i>Aeronautics Act</i> and the Canadian Aviation Regulations (CARs).	<p>*This advice pertains to the regulatory phase.*</p> <p>The proponent must notify the Minister of Transport of the proposed airstrip (aerodrome). This notification, being a summary report to the Minister of Transport, is required by section 307 of the CARs (CARs 307). CARs 307 also requires Denison to undertake consultation in the prescribed manner before it constructs the proposed aerodrome at the mine site. Details of the consultation are to be included in the above-mentioned summary report to the Minister of Transport.</p> <p>CARs 307 identifies the requirement to consult to include anyone seeking to undertake a prescribed aerodrome work at a certified or non-certified aerodrome, whether it is the creation of a new aerodrome or, at an existing aerodrome, lengthening an existing runway or making a</p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				<p>new one. The Regulation also provides minimum expectations for how the consultation should be conducted, including timelines, who to notify and under what circumstances. The intent of the Regulation is to compel consultation in advance of an aerodrome work that will result in sustained and regular impact on interested parties as identified in the Regulation. As the proposed aerodrome will not be within 4 kilometres of a city or built-up area, under CARs 307, the proponent is required to consult the following interested parties:</p> <ul style="list-style-type: none"><li>(i) the Minister of Transport,</li><li>(ii) the providers of air navigation services,</li><li>(iii) the operator of a certified or registered aerodrome located within a radius of 30 nautical miles from the location of the proposed aerodrome work,</li><li>(iv) the authority responsible for a protected area located within a radius of 4 000 m from the location of the proposed aerodrome work,</li><li>(v) any local land use authority where the proposed aerodrome work is to be carried out, and</li><li>(vi) the owner of any land bordering the land on which the proposed aerodrome work is to be carried out.</li></ul> <p>Proponents are encouraged to share their plans with the local land use authority before the consultation period. The local land use authority may have information about other nearby projects or developments that could impact on the proponent's plans.</p> <p>In summary, regarding the airstrip (aerodrome), the proponent must complete the consultation and file the summary report with the Minister of Transport, prior to commencing construction of the aerodrome.</p> <p>Further details can be found at: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01">https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01</a>.</p> <p>TC recommends that the proponent contact TC's Aerodromes Group at CASPNR- SACRPN@tc.gc.ca before starting the consultation, to ensure it is completed in accordance with CARs 307.</p>	
AD-08	CNSC	Figs. 3.4-1, 4.3. 1, and where applicable throughout the EIS	Some maps in the EIS do not contain highway numbers.	Please consider including the highway numbers on the maps early in the Draft EIS when laying out the project location so the reader can become familiar with road network within northern Saskatchewan when discussions take place.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.

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AD-09	CNSC	Section 4, including Figures 4.3.1 and/or 4.3.2 and where applicable throughout the EIS.	The maps included in the EIS in sections do not have any Treaty boundaries. First Nation Treaties should be included on the map. Not all First Nations reserves, and boundaries are included on the map such as Cree Lake and Slush Lake, please include on map and consider adding others from the NAD.	It is recommended that Denison update the maps in these sections to include Treaty Boundaries and community locations are included on the Project location map in Figure 4.3.2 and other maps throughout the entire EIS where applicable.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-10	CNSC	Section 4	Overall, CNSC believes that Denison is abiding by the communications strategies and products identified in their PIDP, but would be interested in additional information that is available.	While CNSC staff are satisfied that the proponent meets the requirements with this EIS, further clarity and detail on the strategic planning behind these communications activities would be beneficial and would further support the overall goals of the Project’s engagement activities.	Acknowledged. Further details on the Public Information Program and Public Disclosure will form part of the documentation submitted in support of the CNSC licensing for the Project.
AD-11	CNSC	Section 4 Indigenous Engagement Report (IER)	There is a summary of what engagement activities will occur moving forward. However, it is not clear which engagement activities/meetings will occur during the different stages of the EA/ project life cycle. Please provide additional details upon submission of the Final EIS.	Denison should consider clarifying in the updated IER which engagement activities will occur during each stage of the project moving forward as per Reg Doc 3.2.2 before submitting the Final EIS.	<p>The engagement activities as outlined in the draft EIS are reflective of the iterative nature of engagement with respect to the Project.</p> <p>At the time of the filing of the final EIS, Denison will describe the status of engagement and future expected engagement activities to occur, which will continue to be aligned with the requirements of Reg Doc 3.2.2.</p>
AD-12	CNSC	Section 4 IER	Information included in the EIS Section 4 and IER regarding engagement activities, communication and issues and concerns raised will need to be updated when the next version of the EIS is submitted. The EIS and IER will need to be updated to include information from Fall of 2022 until approximately two months prior to the submission date of the next EIS.	When re-submitting the EIS, ensure that the engagement log, issues and concerns tables and information about engagement activities done to date have been updated. No action needed only advice to update this section before submission with most up to date engagement activities including any that take place with other Indigenous Nations and communities not included in the Draft EIS.	Acknowledged.
AD-13	CNSC	Section 4 IER	Denison states that validation of VC selection was completed with ERFN, the Northern Village of Beauval, the Northern Village of Pinehouse Lake, and the Northern Hamlet of Patuanak (hereafter Beauval, Pinehouse, and Hamlet of Patuanak, respectively). The EIS states that this was completed through a shared online survey. The EIS also indicates that YNLR was also included in this process.	How has Denison validated VC selection with the other Indigenous Nations and communities that have showed interest and if so, by what methods (survey’s, engagement, meetings, review of Draft sections etc.?) Did Indigenous Nations and communities select any VC’s that were not included in the EIS and if so why not? Please elaborate and provide more details in the EIS on any other methods used including engagement sessions that were completed with Indigenous Nations and communities, through in-person community workshops, VC selection approval through early review of Draft EIS sections.	<p>Section 4 of the draft EIS describes the approach taken related to the Indigenous and non-Indigenous Communities of Interest in relation to the Wheeler River Project. Denison has engaged with these entities regarding the validation of the VC selection.</p> <p>Denison has not undertaken VC validation activities with other Indigenous Nations or communities that have shown interest in the Project, owing to the systematic approach to engagement Denison has been following. This approach is consistent with the methodology presented to the CNSC by Denison in early 2020, for which confirmation was received in mid-2020 and reflected in the draft EIS.</p> <p>All activities undertaken in relation to engagement on VCs are currently described in the EIS; there are no additional details to add.</p> <p>Denison can confirm that it is unaware of additional or new VCs brought forward by other Indigenous Nations or communities that are not suitably captured within the current draft EA approach.</p>

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AD-14	CNSC	Section 4.3.1, Pg 246	On this page, Denison states that MN-S is “currently structured with a President, an Executive, a Provincial Metis Council, Regional Presidents, and Local Presidents. The wording of ‘Regional President’ is incorrect and should be changed to say, ‘Regional Director’.	Please update all wording of “Regional President” to “Regional Director” when referring to MN-S.	Thank you for the advice comment. This will be corrected in the final EIS.
AD-15	ECCC	Sections 5.3.4 (Table 5.3-3); 8.1.3.3 Climate Change; 8.1.3.4 Climate Change Influenced Extreme Events; Table 15.4-1: Summary of Potential Effects of Short-term Extreme Weather  Events on the Project and Associated Mitigation; Section 15.5 Climate Change.	<p>The Proponent indicates that the Project’s full lifetime is roughly 40 years (including the post- decommissioning phase) and that climate conditions are important design considerations for a number of sensitive aspects of the Project. Potential future climate changes and their potential effects on the Project and Valued Components (VCs) are described in various sections of the draft EIS. Notably, in Section 15.5.2, ensemble mean projections are provided for several climate variables for two future time periods and emissions scenarios (RCP 4.5 and 8.5). In Section 8.1.3.4, the Proponent describes possible future changes in short-duration precipitation extremes (based on Intensity Duration Frequency or IDF curves from the IDF_CC tool) and indicates that an increase in their frequency and magnitude may occur over the Project lifetime “... and may require consideration for greater storage and conveyance capacity for Project water management infrastructure” (p.8-41).</p> <p>The Proponent indicates that aspects of the Project are being designed to meet standards based on design values that appear to be derived from observed (i.e. historical) climate conditions (e.g. water management infrastructure; see Table 15.4-1). In Section 15.5.3, they indicate that an adaptive management approach will be used to address some aspects of future climate change as necessary. For example, page 15-19 of the draft EIS states that: “Denison will develop an Emergency Preparedness and Response Program for the Project to address forest fires and extreme weather that may occur. If unforeseen effects on the Project occur from longer and more severe forest fire seasons associated with climate change, or increased frequency or severity of extreme weather (e.g., ice storms, snowstorms, flooding), Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” (Emphasis added).</p>	<p>ECCC recommends that when considering potential future climate change and relevant effects on the Project, the Proponent consider the range of variability from the ensemble of models (not just the ensemble mean). ECCC also recommends that the Proponent consult the 2019 Canadian Standards Association Guidance on Intensity Duration Frequency for Canadian Water Resources practitioners , which provides examples of alternative methodologies to estimate future return values for design as needed.</p> <p>In terms of adaptive management, ECCC recommends that the Proponent clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p>	<p>Please see response to IR-15, IR-103, IR-104, IR-235, and IR-236.</p> <p>The probable maximum precipitation (PMP) value of 493 mm selected for design of water management infrastructure, such as ponds, is similar to total annual precipitation (456 mm from Key Lake station, and 483 mm from 1981-2020 climate normals).</p> <p>The selected PMP is well above (&gt;5 times higher): 1) current/measured 24-hour maximum precipitation, 2) modelled 1 in 100 year 24-hour return for current conditions, 3) modelled 1:100 year 24 hour return for a future (2020-2050) period, 4) the predicted maximum 1-day precipitation under different emissions scenarios for the future (including RCP8.5 in the 2021-2050 period).</p> <p>For comparison to the <b>design PMP of 493 mm</b>:</p> <ul style="list-style-type: none"><li>- the measured maximum 24-hour precipitation from Key Lake station was <b>42.9 mm</b> and <b>72 mm</b> from 1981-2020 climate normals.</li><li>- the modelled existing/current 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>79.9 mm</b> and at the Key Lake area was <b>56.4 mm</b>.</li><li>- the modelled future (2020-2050) climate 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>88.6 mm</b> and at the Key Lake area was <b>62.0 mm</b>.</li><li>- the predicted future climate (2021-2050) under the highest CO2e emissions scenario (RCP 8.5) shows maximum 1-day precipitation of <b>25.9 mm</b>.</li></ul> <p>The PMP is much higher (&gt; 5 times higher) than the observed and predicted 24-hour maximum precipitation and the 1:100 year 24 hour return. Completing the design using a large PMP provides confidence that the water management infrastructure will be sufficient and function under future climates as it relates to potential changes in precipitation.</p>
AD-16	CNSC	Section 5.10 (p.70) and throughout the EIS	<p>In section 5.10 of the ES, where the seven scenarios are listed, formatting is inconsistent. Likelihood is in quotes in some places, but not in all.</p> <p><b>Not significant</b> is bolded inconsistently throughout the EIS. As well, in many cases noted as “not significant”, where others note “are not expected to have a significant effect”.</p>	<p>Suggest making formatting consistent if going to use quotes and bolding to highlight sections of the text. Also, validate that use of “not significant” and “are not expected to have a significant effect” are consistently used (where appropriate).</p>	<p>Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.</p>



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AD-17	ECCC	Appendix 6-A Air Quality Technical Supporting Document A.10	Some of the off-road vehicles have an emission rating of Tier 2 but in Appendix 6-A Section A.10 the Proponent claims that “for non-road diesel combustion, Tier 4 emission factors were assumed”. Choosing an engine with a lower Tier will increase emissions in NOx significantly and the Proponent should be using the best available technologies to minimize environmental impacts.	ECCC recommends that the Proponent choose engines that meet the most stringent emission standards to the extent possible, which are Tier 4 for the compression-ignition engines, during all phases of the Project.	Please see response to IR-139.
AD-18	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	Understanding Project emissions is important to inform analysis of a Project’s potential impact on Canada’s emissions targets and climate change commitments. ECCC notes that Section 4.0 and Appendix C: Greenhouse Gas Emissions Calculations of Appendix 6-C identifies the source of emissions and quantifies them in the construction, operation, and decommissioning phases of the Project, in accordance with the Draft Technical Guide Related to the SACC (Draft Technical Guide). While ECCC recognizes that the emissions will be relatively small in the post-decommissioning phase, the identification and quantification of the emissions in this phase is not found in the draft Environmental Impact Statement (EIS). The post- decommissioning phase is expected to last 15 years, likely going past 2050. The draft EIS does not discuss emission intensities of the Project, only the grid electricity. The draft EIS also does not discuss the Project’s potential impacts on Canada’s climate targets.	ECCC recommends that the identification of the sources of Greenhouse Gas (GHG) emissions and quantification of these emissions be described for the post-decommissioning phase, as done for the other phases. ECCC recommends the Proponent include discussion on the emission intensities of the mining of the product, following the guidance of the SACC and the Draft Technical Guide. ECCC recommends that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the SACC and the Draft Technical Guide.	The Post-Decommissioning phase only includes monitoring (physical, chemical, and biological) and regulatory site inspections. These activities are not expected to generate any significant GHG releases. Notwithstanding, the calculated GHG emissions estimates for Construction, Operation and Decommissioning are expected to be sufficiently conservative to capture any incidental GHG releases during monitoring and inspection activities.  The EIS anticipated an annual average production rate of approximately 4,082 metric tonnes of U <sub>3</sub> O <sub>8</sub> and an annual net GHG releases of 30,702 metric tonnes CO <sub>2</sub> e over the operations phase of the project. The annualized GHG intensity during operations is estimated at 7.5 tonnes of CO <sub>2</sub> e / tonnes of U <sub>3</sub> O <sub>8</sub> .  Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.  Also see response for AD-19 (second paragraph).
AD-19	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	The draft EIS lacks information related to estimates of impact on carbon sinks and emissions from land-use changes. As land use shifts from a vegetated site prior to development, to an industrialized site, removal of vegetation and peat will have impacts on carbon sinks and construction emissions. Section 6, Appendix 6-C, 4.1.2 Land Use Change states that site-specific information of above- ground mass of vegetation was not available and default data from Table 20 of the Draft Technical Guide were applied. The default data is contained in this table is not applicable in this case, as they represent aboveground woody vegetation in cropland systems. ECCC recognizes that the usage of the median value of 0.51 for the carbon content is reasonable. From the information given in the draft EIS, it does not seem that the soil carbon was taken into account. In the absence of detailed information, the Proponent assumed that the area cleared would also be excavated (and drained in the case of wetland areas) which would create significant additional emissions from soil disturbances and drainage. Section 4.1.2 also states the Project involves clearing an area of	Land Use Change Regarding the lack of site-specific information of above-ground mass of vegetation, an initial site survey on-site using basic information such as site class and species would assist in determining the above-ground biomass. More specific data, such as regional data from provinces, forest companies, or literature may be available, and generic national data is available (e.g., Fo148-1-2E.pdf (publications.gc.ca), 4775.pdf (nrcan.gc.ca)). ECCC recommends that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands. Carbon Sinks ECCC recommends that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the Draft Technical Guide.	Limited site-specific data were available to characterize land use change and impacts on carbon sinks. As such, the use of default values from the SACC/IPCC in conjunction with some limited habitat/vegetation data (extracted from Chapter 9.2 Terrestrial Environment – Vegetation and Ecosystems, Listed Plant Species and Wetlands) was employed and is considered reasonable at this stage of the assessment. Please note that additional information on the land use change GHG calculations can be found in Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report.  In accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data becomes available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks



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			approximately 169.6 hectares. There are no estimates on the impact on carbon sinks related to the Project.		and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.
AD-20	NRCan	Section 7.3.1, Physical Geography	Drumlins and eskers in the region trend Northeast to Southwest as opposed to northwest to southeast as written on page 7, line 18. Correct orientations are used on page 7, line 23.	NRCan recommends revising the text. Please refer to 250 000 scale Surficial Geology Lines from Quaternary mapping, CSRS NAD83 Zone 13, Saskatchewan Geological Survey 2017.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS. In Section 7.3.1. the text will be updated to say the following: “The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...” See also response to IR-54.
AD-21	NRCan	Section 7.3.2.3, Metacrystalline Basement Rock	Pegmatite missing from list of basement rock types.	NRCan suggests addition of pegmatite to the list of basement tock types as shown on Figure 7.3-6.	Denison will update the final EIS per NRCan’s suggestion.
AD-22	NRCan	Section 7.3.3.1, Aquifer Properties, Section 7.3.2.3, Metacrystalline Basement Rock, Appendix 7A, 2.0, 2.3.1, 2.3.2	The terms “metacrystalline” and “metagranitic gneiss” are not frequently used terms in scientific literature. Gneiss is, by definition, a metamorphic rock.	NRCan suggests revision to “Crystalline Basement rocks” or “Basement metamorphic rocks”, and “granitic gneiss” as used in Figure 7.3-6. Please refer to Oxford Dictionary of Earth Sciences.	Denison will update the final EIS per NRCan’s suggestion.
AD-23	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Orogeny is the process, orogen (or orogenic belt) is the feature produced by orogeny.	NRCan suggests replacing “Tran Hudson Orogeny” with Trans Hudson Orogen”.	Denison will update the final EIS per NRCan’s suggestion.
AD-24	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Quartzite is by definition a metamorphic rock, and the term is used later without the meta- prefix.	NRCan suggests replacement of the term “meta-quartzite” with “quartzite”.	Denison will update the final EIS per NRCan’s suggestion.
AD-25	NRCan	Appendix 7A, 2.3.4, Athabasca Group Sandstones and Conglomerates	Sands are unlithified, whereas you are referring to grain sizes in this case.	In Table 2-1, NRCan suggests replacing the term “sands” with “grain sizes” under MFc and MFb descriptions.	Denison will update the final EIS per NRCan’s suggestion.
AD-26	NRCan	Appendix 7A, 2.3.5, Overburden	Typo on page 2, line 7: “A grain size sample was collected in GWR-033 from approximately 9 m below ground surface, and the same consisted of 8.8% clay (less than 4 µm).	NRCan suggests revision of “same” to “sample” and clay to “clay-sized” grains.	Denison will update the final EIS per NRCan’s suggestion.

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AD-27	CNSC	Section 8.2.1.3 – Spatial and Temporal Boundaries	It is noted that McGowan Lake is an identified reference lake for the Key Lake Mill site. With the establishment of the Wheeler River mine, effluent would be flowing into McGowan Lake, which could potentially interfere with Key Lake’s environmental monitoring program by compromising McGowan Lake’s baseline conditions. Depending on the loading of COPC’s into McGowan Lake and resultant water concentrations, it may no longer be accepted as an acceptable reference lake for use by Key Lake. This would require Cameco to modify their monitoring program at the Key Lake Mill.	The CNSC advises Denison to communicate with Cameco to ensure they are aware of this situation. Coordination between the two companies may be necessary to ensure Key Lakes environmental monitoring program is not compromised. It is recommended to discuss this potential issue with Cameco ahead of time to determine the best path forward.	<p>Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.</p> <p>Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.</p>
AD-28	ECCC	Section 8.2.4.2.3 Appendix 10-A, Section 3.1.1.2	Tables 8.2-9 and 8.2-10 in Section 8.2.4.2.3 Part II_S8 Aquatic Environment and Table 3-1 in Appendix 10-A Section 3.1.1.2 demonstrate predicted maximum effluent concentrations of Constituents of Potential Concern (COPCs) and maximum predicted receiving environment concentrations. The final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short-term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guideline, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe. While uranium is not a Schedule 4 substance with prescribed concentration limits under the Metal and Diamond Mining Effluent Regulations (MDMER), the MDMER requires the characterization of uranium concentrations in effluent under Schedule 5, and requires that all mine effluent released from final discharge points be non-acutely lethal. Under Schedule 5 Section 9(d) of the MDMER, the Proponent will likely be required to conduct selenium fish tissue sampling if average annual concentrations of selenium in effluent equals or exceeds 5 ug/L.	Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.	Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria.
AD-29	CNSC	Section 8.3.3 Figures 8.3.5 etc. 8.5-4	It does not appear that aquatic baseline sampling maps for Russell Lake have LAB 1 and 2 locations showing the baseline sampling locations within Russell Lake. (Figures 8.3.5). Please update the Figures throughout aquatic environment section to include of the baseline sampling studies/ locations within Russell Lake.	Please update maps and sections in EIS to reflect aquatic baseline studies that were completed.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

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AD-30	CNSC	EIS sections 8.4.3.2.4 Benthic Invertebrate Community and 8.4.7.6 Climate Change Considerations	<p>ECCC EEM guidance recommends the use of multiple reference areas as it offers the greatest statistical power to detect a meaningful difference between a reference area and an exposure area and can also give an indication of variability among reference areas. It is also important to incorporate multiple reference locations into the study design to aid in designing against spatial confounding factors.</p> <p>Section 3 of the Aquatic Environment Baseline Study Report details the similarities between benthic invertebrate communities by using the mean Bray-Curtis index between sampling locations and the median reference condition for the lake group size. It's not clear in the EIS if there are any issues expected to be able to use this data to compare project effect locations to references sites into the future, as some sampling locations are currently not very similar to the reference sites. In addition, climate change could affect the sediment and benthic communities in the future. The EIS states “the frequency and magnitude of extreme precipitation events have the potential to change water levels and flows in the RSA, which may affect sediment transport, deposition, and therefore benthic invertebrate habitat. Changes to average and upper and lower bounds of ambient temperatures may also affect aquatic habitat, which in turn may affect benthic invertebrate communities. Climate change over the life of the Project (i.e., 35 to 40 years) will be monitored as part of the Project’s environmental monitoring programs, and influences on water quality, sediment quality, and benthic invertebrates will require adaptive management to mitigate any potential effects of the Project that may be exacerbated by climate-related changes on the aquatic environment”. It is recommended to ensure that appropriate number/location of reference sites are sampled to enable any changes to sediment or benthic invertebrate communities that may be due to climate changes, and not project effects, are able to be assessed.</p>	<p>Considering climate change may change the lake conditions from baseline conditions, and that there is already natural variability between lakes that will be used as reference lakes and exposure lakes, it could become difficult to show changes to sediment/benthic invertebrates are not due to project activities, therefore there is a recommendation to ensure the current baseline data is adequate, and to consider if additional data, and addition of additional reference stations, will be needed moving forward.</p>	<p>Changes in landscape influence and lake conditions are not limited to those brought about by climate change. The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.</p>
AD-31	CNSC	Section 8.4.6.1, Residual Effects Characterization	<p>The EIS states “Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment.” Based off concerns from Indigenous communities, and the fact that phosphate is a COPC in the effluent, and elevated concentrations of mercury were measured near the</p>	<p>Please consider adding methylmercury to the environment sampling plans (such as fish dorsal muscle) in order to confirm there are no unexpected effects of the project on levels, and to satisfy stakeholder concerns.</p>	<p>Refer to response to IR-100.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
			Kratchkowsky Lake bottom, adding methylmercury to the environment sampling plans may be beneficial.		
AD-32	CNSC	Section 9.1.8.3, Appendix 10-A (ERA) section 3.2.1.5	<p>It appears there is no consistency between the assessment of soil quality in the ERA and the baseline soil sampling program presented in the EIS. The baseline program includes 10 soil permanent sampling locations (Appendix 9-B, section 2.5). Sampling at these locations is proposed to be continued during the Operation Phase, and monitoring data will be compiled and reported annually/periodically (EIS section 9.1.8.3). Conversely, the ERA estimates and predicts concentrations of COPC in soil based on atmospheric deposition. Furthermore, the location of ecological receptors in the ERA (Figure 5-2) is different from the permanent soil sampling plot locations (Appendix 9-B, Figure 2.5-1). It is unclear why measured baseline soil quality data were not discussed in the ERA and whether future monitoring data will be considered in the ERA to verify accuracy of predicted COPC concentrations</p>	<p>Please clarify how baseline measured data on COPC concentrations in soil is considered in the current and future iterations of the ERA.</p>	<p>Baseline measured soil data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. The baseline soil concentrations used in the model are provided in Section 3.5.1 and Table 3-8 of Appendix A in Appendix 10-A (ERA).</p> <p>The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.</p>
AD-33	CNSC	Section 9.3.3.1.2	<p>Indigenous knowledge is summarized with regard to moose, including:</p> <ul style="list-style-type: none"><li>· Calving sites close to the Wheeler River, with lots of muskeg in the area. A moose calving area is located in the Terrestrial RSA, southwest of the Project Area.</li><li>· A wildlife corridor is used by moose, running between Cree Lake (outside and to the west of the Terrestrial RSA) and Russel Lake (in the southern portion of the Terrestrial RSA).</li></ul> <p>It is unclear how this information is incorporated into the residual effects assessment.</p>	<p>Please clarify how Indigenous knowledge on moose calving sites and corridors in the RSA is incorporated into the residual effects assessment for the key indicator “moose”.</p>	<p>The sites identified by IK were explicitly considered in the impact assessment as indicated by their identification as overlapping with the Terrestrial RSA as noted in the question. However, the areas were not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects.</p> <p>The Indigenous Knowledge provided by ERFN and SVS (2022) identifies a moose calving site (Feature 1001-08) ~ 2 km southwest, and a wildlife corridor ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022). Both areas are within the Terrestrial RSA but outside the Wildlife LSA. The reference to “Calving sites close to the Wheeler River...” refers to a broad area that is 45 km east of the Project Area, well beyond interactions with the Project Area.</p> <p>The presence of the areas identified through IK was acknowledged in Section 9.3.3.1.2 (Information from Indigenous Knowledge, Local Knowledge, and Engagement) in Part II, Sec. 9 of the Draft EIS. The assessment (Sec. 9.3.4.2) considered alteration and/or habitat loss at the LSA and RSA scale. Section 9.3.4.2.1 (pg. 9-210) summarizes the effects on moose habitat as follows: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA....”</p> <p>Further, Sec. 9.3.6.2.1 (Alteration and/or Loss of Habitat, pg. 9-230) identifies that an area within a 500 m radius of the Project Area will be influenced by the Project and likely make the habitat within that area less suitable for use by moose. Therefore, the effects of the Project on moose calving have been appropriately assessed and are expected to be contained within the Wildlife</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
					LSA. That affected area does not overlap with the moose calving site or the wildlife corridor identified by IK.
AD-34	CNSC	Appendix 9-B	Baseline studies for birds are restricted to short time frames in one year only, for example: <ul style="list-style-type: none"><li>· Breeding Songbird Point Count Call Survey (June 7 and 17, 2017)</li><li>· Aerial Waterfowl and Raptor Stick Nest Survey (June 15 and 16, 2017)</li></ul> The Canadian Wildlife Service (2022) recommends: <ul style="list-style-type: none"><li>· Consider the potential effects of projects on birds throughout the year and document the distribution and abundance of birds in all seasons. Some species may be under-represented in existing data bases due to temporally restricted periods of detectability.</li><li>· Explicitly target species at risk and other focal species.</li><li>· Conduct at least two years of field surveys as a national standard for major projects, so that temporal variability can be considered in future comparisons to baseline data.</li></ul> <b>Reference:</b> Canadian Wildlife Service. 2022. Guidance Regarding Data Needed to Support Assessment of Project Effects on Birds. Environment and Climate Change Canada, Gatineau, Quebec. 80 p.	Please consider conducting surveys following CWS’s recommendations or provide an explanation as to how current baseline data for birds is sufficient to characterize the existing environment.	The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site. However, to supplement the species data that were collected as part of the baseline field program, Denison is willing to acquire additional information on species presence in the RSA from existing sources, specifically from the Saskatchewan Breeding Bird Atlas (Birds Canada). However, collection and consideration of this information is not expected to affect the findings and/or conclusions stated in the draft EIS as the assessment was habitat-based to address all species.
AD-35	CNSC	Section 10, IMPACT MODEL	Denison discusses details of the IMPACT model but has not provided scenario(s) used to facilitate review.	Please consider providing CNSC with the IMPACT model scenario file(s) in the spirit of regulatory cooperation.	The intent of Appendix A to Appendix 10-A is to provide the inputs used for the IMPACT model as well as all of the characteristics for human and ecological receptors. Where site-specific data were not used in the model it can be assumed that default values from CSA N288.1-20 were used in the IMPACT model. As such, Denison does not intend to provide the scenario files.
AD-36	English River First Nation (ERFN)	Section 10.1.3.2, Traditional Foods Diet (p. 10-15)	The EIS States: "The ERFN is comprised of seven reserve lands across Saskatchewan" (p. 10-15). While this is accurately reflecting a source document, the source document is incorrect.	Please update to "The ERFN is comprised of seven historical settlements that have now grown into 19 different reserves across Saskatchewan"	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-37	CNSC	Section 10.1.9, Human Health Summary and Appendix 10-A – 4.4.1 Risk Estimation	The Human Health section of the EIS, as well as the ERA, indicates that there is an exceedance for selenium for the fisher/trapper receptor, with the Project estimated to contribute to the majority of this exceedance (0.93 of the HQ). While the assessment is conservative by assuming an increase intake rate of fish solely sourced from Russel Lake, the precautionary principle should be considered to ensure in reality the HQ for selenium remains below 1, even under conservative assumptions.	Please conduct of effluent, water, and aquatic organism monitoring (as already suggested in EIS) to confirm HQ's are highly conservative in the EIS modelling and receptors remain protected. Should it be determined Se concentrations are increasing in the environment at such a rate as there may be in impact to the environment or human health, installation of a selenium removal circuit into the effluent treatment process should be considered. The proponent should ensure that the proposed wastewater treatment system design incorporates the capability for expansion or upgrades in alignment with the precautionary approach, pollution prevention, and continuous improvement.	Denison acknowledges that a robust effluent and environmental monitoring program will be developed to confirm all EIS modelling predictions. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-38	CNSC	Appendix 10-A (ERA)	It is unclear if measured or modelled COPC concentrations in blueberry were used in the calculations of human receptor dose. Similarly, it is unclear if measured or modelled COPC concentrations in lichen and blueberry were used in the calculations of ecological receptor dose. CSA N288.6-22, Clause 7.3.6 states that "Measured concentrations of COPCs should be used, where possible, in the exposure assessment." Please see the Clause for further information.	Please clarify if measured or modelled COPC concentrations in blueberry / lichen were used in the calculations of human and ecological receptor dose.	Measured baseline lichen data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. Measured baseline blueberry data were used for model calibration to determine if there was good agreement between measured data and modelled data. The IMPACT model was used to predict both baseline and Project contributions for blueberries. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-39	CNSC	Appendix 10-A (ERA), Table 2-2	Table 2-2: Estimated Home Ranges of Selected Terrestrial Ecological Receptors Based on the reference McLoughlin et al. (2016), the Home Range for Woodland Caribou is indicated as "Expected = 80 km2" which represents the mean range sizes pooled over the two study years for calving/post-calving. The indicated Minimum (67 km2) and Maximum (267 km2), however, do not relate to the calving/post-calving stage, which is not clearly stated in Table 2-2. In contrast, these values are actually mean range size values for autumn/rut and early winter, respectively, as described in the source document on Page 83 (McLoughlin et al., 2016). It should be noted that in terms of true minimum and maximum, the source document states that individual home ranges, based on up to two years of GPS locations, varied in size from 16.2 km2 to 1363.9 km2 (Page 82 of McLoughlin et al., 2016). Reference: McLoughlin et al. 2016. Population dynamics and critical habitat of woodland caribou in the Saskatchewan Boreal Shield. Interim Project Report, 2013–2016. Department of Biology, University of Saskatchewan, Saskatoon. 162 pp. Available online at <a href="http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf">http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf</a>	Please provide clear details on the source of the home range values listed in Table 2-2.	Denison acknowledges the comment and will add clarification in Table 2-2 of Appendix A in Appendix 10-A that the minimum represents the autumn/rut and the maximum represents the early winter.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-40	CNSC	Appendix 10-A (ERA) section 3.2.1.5	Although the soil type selected in the ERA for modeling of atmospheric deposition to soil is sandy soil, organic soils have been delineated and characterized (section 9.1.3.3 of the EIS) as valued component (i.e., “Organic Matter/Peat”). It is unclear if the soil quality modeling performed in the ERA is protective for soil types other than sandy soil.	Please clarify if COPC modeling based on sandy soil is protective of organic/peaty soil and provide justification.	The majority of the soil in the Project Area and LSA is considered sandy soil. Section 9.1.3.2 of the EIS states "Mineral soils are associated with upland sites and (in all likelihood) anthropogenically disturbed land that, together, correspond with >99% of the Project Area and 91.5% of the LSA (Figure 9.1-8). The predominate mineral soils within the RSA have been classified as Sandy Dystric Brunisols (Smith et al. 2011)." Organic matter/peat was included as a VC in the EIS because of the concern regarding drying and losing biological function through groundwater interactions, and not in terms of assessment of soil quality. Additionally, Section 9.1.3.3 of the EIS acknowledges that organic soils is limited in the Project Area. As such, this comment is considered not applicable.
AD-41	CNSC	Appendix 10-A (ERA), Table 5-5	Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model The exposure pathway for phytoplankton is stated as “direct contact in sediment”, however, phytoplankton live suspended in the water column. It is acknowledged that in the IMPACT modelling report, phytoplankton is described with an occupancy factor of 1 in water (Table 2-5).	Please add the pathway “direct contact in water” to Table 5-5 and revise all calculations accordingly.	Table 5-5 will be revised to state “direct contact in water” for phytoplankton. No calculation changes are needed.
AD-42	CNSC	Appendix 10-A (ERA), Table B.12	Table B.12: Sample Calculation – Adult Recreational Fisher/Hunter (McGowan Lake) Dose and Risk Calculations for Selenium  The source for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry is stated as “Table C.5”, however, this table could not be located.	Please provide the referred-to Table C.5 or an alternate source of information for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-43	CNSC	Appendix 10-A (ERA), Environmental Risk Assessment for Wheeler River Technical Support Document	The ERA is prepared by Ecometrix and submitted to Denison Mines. It is unclear if the ERA submitted has been reviewed and accepted by the proponent (Denison Mines).  CSA N286-12 clause 9.5.5 specifies that “the selected supplier’s technical documents that are required to be submitted shall be reviewed and accepted”.  Meeting these CSA N286-12 requirements will ensure that the proponent has control of the purchased services as a future licensee applicant.	Provide clarifications if ERA documents have been reviewed and accepted by the proponent.	See response to IR-202 which indicates that Denison reviewed and accepted the ERA. This text will be added to Appendix 10-A.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-44	CNSC	Section 11	It is not clear whether all of the interested Indigenous Nations and communities were engaged on the results and findings of the Heritage Resources Impact Assessments (HHRIA) or just ERFN?	CNSC staff would appreciate an update on any engagement activities that have taken place with regards to any of the HHRIAs for the Project, or any site or thing that is of historical, archaeological, paleontological or architectural significance as requested by other Indigenous Nations and communities to date.	<p>Denison confirms that the results of the Project-related HRIAs were discussed with ERFN, as they expressed interest in further understanding the nature of the work undertaken.</p> <p>The Saskatchewan Ministry of Parks, Culture and Sport, Heritage Conservation Branch (HCB) administers The Heritage Property Act. Regulatory approval as per section 63 of The Heritage Property Act (GS 80) was granted for the Project for the two separate HRIAs (HCB File No. 16-2102, December 14, 2017 and HCB File No. 19-933 February 12th, 2020).</p> <p>The results of the HRIAs were included and formed part of the draft EIS. Comments made by Indigenous communities on this section of the EIS will therefore be responded to accordingly by Denison, where appropriate.</p> <p>Additionally, as noted in Section 11.3.2, “The Heritage Resource Management Plan (HRMP) was informed by engagement with ERFN, who recommended that the HRMP should include a mechanism to involve Indigenous communities where appropriate (21-EN-ERFN-591.1; 21-EN-ERFN-591.2) (see Appendix 11-B).”</p> <p>The mechanism to involve Indigenous communities has been included in the HRMP and allows for general notification to Indigenous communities should an artefact be found, which provides flexibility to engage all appropriate Indigenous nations accordingly.</p>
AD-45	CNSC	Section 11.1.4.5.2. Perceived Suitability/Safe Use of Resources (p. 11-59)	The EIS States: “Section 2.6.1 in Section 2 describes the extensive review of mining methods that led to the decision to adopt the ISR mining method.” (p. 11-59). This reference is not correct, as this section does not contain a review of the mining methods.	Please update this to reflect the appropriate section.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-46	TC	Section 14.6.7.2	<p>Transport Canada would like to clarify that although the proponent may use a third party to assist in developing emergency response assistance plans (ERAPs), it is the proponent’s responsibility to submit the ERAP application(s) to Transport Canada, per Section 7(1) of the <i>Transportation of Dangerous Goods Act, 1992</i> as follows:</p> <p>Emergency response assistance plan</p> <p>7 (1) No person shall import, offer for transport, handle or transport dangerous goods in a quantity or concentration that is specified by regulation — or that is within a range of quantities or concentrations that is specified by regulation — unless the person has an emergency response assistance plan that is approved under this section before</p> <p>(a) importing the dangerous goods;</p> <p>(b) offering the dangerous goods for transport; or</p> <p>(c) handling or transporting the dangerous goods, in the case where no other person is required to have an emergency response assistance plan under paragraph (a) or (b) in respect of that handling or transporting.</p>	<p>*This advice pertains to the regulatory phase.*</p> <p>Transport Canada notes that the sentence highlighted in yellow below is incorrect and should be revised or removed. While a contractor could assist the proponent to develop the ERAP(s), it is the responsibility of the proponent to apply to Transport Canada for approval of the plan(s).</p> <p>14.6.7.2 Design and Mitigation Considerations Principal traffic risk mitigation measures include:</p> <ul style="list-style-type: none"><li>• traffic control measures such as speed limits;</li><li>• travel management plans;</li><li>• spill and emergency response planning; and</li><li>• driver training.</li></ul> <p>Additionally, Denison considered several provisions to make sure that the effects of a terrestrial release of hazardous materials are as low as practicable. In addition to transportation mitigations listed for Scenarios 1 and 2, the following provisions were considered.</p> <ul style="list-style-type: none"><li>• The Transportation of Dangerous Goods Act, 1992 (Government of Canada 2019) outlines the requirements for entities that transport dangerous goods to establish emergency response assistance plans. These plans list specialized personnel and equipment that are required for responding to an incident. <b><i>It is expected that a contractor responsible for the transportation of uranium concentrate, fuel, and hazardous chemicals would develop these plans.</i></b></li></ul>	<p>Acknowledged. Section 14 will be updated in the final EIS to clearly state that while a contractor could assist Denison to develop the ERAP(s), it is Denison’s responsibility to apply to Transport Canada for approval of the plan(s).</p>
AD-47	Health Canada (HC)	Appendix 14-A (p. 8-9)	<p><b>Context:</b> No emergency response plan has been provided within the draft EIS, which states that emergency response plans will be developed in the future (Section 14 Appendix 14-A, p.8-9).</p> <p><b>Rationale:</b> For any emergency event, Health Canada considers the protection of human health as a primary consideration in the development of emergency preparedness and response plans.</p> <p>This includes monitoring for human health impacts and the provision of health-related guidance. Further, this will be a requirement of the licensing process.</p> <p>The proponent should ensure that the emergency response plans consider the protection of all relevant potential human receptors that could be impacted by an onsite or project-related off- site accident involving the release of chemical and/or radiological substances.</p>	<p>It is recommended that Denison develop an emergency response plan in consultation with potentially affected communities and stakeholders that includes, but is not limited to, the following:</p> <ol style="list-style-type: none"><li>1. All relevant contact information of the communities, especially related to km 160 of Hwy 914, which is the location of a cultural camp that has been established by the English River First Nation and km 67 of Hwy 914 that is a gathering location for the Kineepik Metis Local associated with the Northern Village of Pinehouse.</li><li>2. Description of the mechanisms for communication with communities in case of an emergency.</li><li>3. Description of the partnership with and the training of local communities and local responders (see Section 14 Appendix 14-B, p.1).</li><li>4. Description of mutual aid agreements with neighboring industries/municipalities, where appropriate.</li></ol>	<p>Denison acknowledges the comment and thanks Health Canada for the recommendations as to the development of its Emergency Response Plan.</p> <p>As noted in the draft EIS, Denison has committed to the development of an Emergency Preparedness and Response Program as a component of its Environmental Management System (EMS). The objectives of the program are generically consistent with the recommendations that have been provided and Denison, as it has demonstrated to date, is committed to meaningful engagement with communities of interest and will solicit input and advice during all aspects of program development.</p> <p>For reference it is noted that as it concerns its EMS framework documentation hierarchy it is expected that three levels of documentation will be developed – Programs, Plans and Procedures. The emergency preparedness and response documentation will follow this hierarchy and input from interested parties will be solicited during all phase of program/plan/procedure development. Denison intends to develop this documentation as it advances through the licensing phase of Project realization.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-48	ECCC	Appendix 16-C, Summary of Monitoring and Follow-up Programs	Appendix 16-C does not include consideration of any monitoring and follow-up programs regarding GHGs.	ECCC recommends that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the draft EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Denison anticipates being subject to ECCC’s reporting requirements for emitters over 10,000 tonnes CO2e and the information is collected under section 26 of the Canadian Environmental Protection Act. This was noted in the draft EIS, Section 2.5 Greenhouse Gas Emissions.
AD-49	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	ECCC notes that GHG mitigation measures have not been considered for the Project. Furthermore, the Project’s lifetime is expected to extend into 2050 and beyond. Consistent with the information requirements of the SACC, and aligning with Canada’s commitment to achieve net-zero GHG emissions by 2050, the Proponent should provide a credible plan that describes how the Project will achieve net-zero emissions by 2050.	ECCC recommends that the draft EIS include an assessment of potential GHG mitigation measures throughout all phases of the Project. This could include a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the Draft Technical Guide. ECCC also recommends that the Proponent provide a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the Draft Technical Guide.	<p>GHGs were not included as a VC or KI in the draft EIS and as such, there are no specific GHG-related mitigation measures in Appendix 16. However, many of the mitigation measures for the VC Air Quality related to combustion products would also be associated with a reduction in the Project’s Scope 1 emissions. As noted in the draft EIS, Section 2.5, at this stage in the Project Denison will look for opportunities to optimize energy management and improve the energy intensity of the Project where practical. Also see response for AD-19 (second paragraph).</p> <p>Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances. Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.</p>

**Information Requirement (IR) Response Table – Denison’s Response to December 2023 FIRT Comments, February 2024**

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-06	-	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>• feasibility of meeting remediation targets.</li><li>• groundwater flow conditions and validation of flow models.</li><li>• mobilization of contaminants (e.g., Al, Se or V).</li><li>• potential for free gas evolution/two-phase flow.</li><li>• identifying composition of lixiviant and production solutions.</li><li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal</p>	<p>This response has not been accepted.</p> <p>The mining area decommissioning objectives shown in Table 2.3-3 of the original EIS (Section 2.3.3.1.1) show different numerical values when compared to those shown in Table IR-06-1 of Denison's response to IR-06. Notably, allowable proportions of Al, As, Cd, Cr, Cu, Fe, Mo, SO4, Se, U, V, and Zn are increased over the IR-159 nitial decommissioning objectives. Denison's Final Proposed EIS update for IR-06 does not include any text regarding alteration of decommissioning objectives for the mining area.</p> <p>Please also see follow-up IR-06-R1.</p>	<p>Denison acknowledges that the presentation of information in Table IR-06-1 of Attachment IR-06 has created some confusion; for clarity, Table IR-06-1 of Attachment IR-06 was never meant to replace Table 2.3-3 of the draft EIS.</p> <p>The information provided in Table IR-06-1 of Attachment IR-06 (Annex 1, Attachment IR-06 on page 90/419) was from Denison's Feasibility Field Test (FFT). The FFT was an ISR pilot program permitted by SK ENV and completed under a CNSC nuclear substances license. The purpose of the FFT was to validate previous field and laboratory testing and determine the feasibility of the ISR mining methodology. The leaching and neutralization phases of the FFT were completed in 2022. The leaching phase was designed to assess the effectiveness of the ISR mining method. This phase included controlled injection of an acidic solution into the mineralized zone with recovery of the solution through existing test wells. The neutralization phase involved the injection of a mild alkaline (basic) solution into the leaching zone to neutralize the area and verify the groundwater in the area is returned to acceptable, permitted conditions. Table IR-06-1 was included at the request of the CNSC during the 1<sup>st</sup> round of IRs and provides context to the reviewer on restoration of the leaching zone to permitted pH conditions.</p> <p>Based on the above, there are no proposed changes to the mining area decommissioning objectives shown in Table 2.3-3 of the draft EIS.</p>	No

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																						
					Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.	liquid/solid ratios, anticipated reagent consumption, etc.																																																									
IR-06	IR-06-R1	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>feasibility of meeting remediation targets.</li><li>groundwater flow conditions and validation of flow models.</li><li>mobilization of contaminants (e.g., Al, Se or V).</li><li>potential for free gas evolution/two-phase flow.</li><li>identifying composition of lixiviant and production solutions.</li><li>success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal</p>	<p>CNSC staff request that Denison provide clarification relating to the alteration of mining area decommissioning objectives. Additionally, Denison is requested to provide a discussion on how alteration of the mining area decommissioning objectives fits within the geochemical reactive transport modelling presented in Appendix 7-C (i.e., effect of increase proportions of allowable COPCs on surface water quality), given that these objectives (as shown by "Restored Solution #1" in Table 3-5 of Appendix 7-C) are used as the bounding scenario for groundwater quality during reactive transport scenarios.</p> <p><b>Original EIS – Table 2.3-3:</b> <i>Table 2.3-3: Mining Area Decommissioning Objectives</i></p> <table><tr><th>Parameter</th><th>Units</th><th>Restored Solution</th></tr><tr><td>pH</td><td></td><td>4.3</td></tr><tr><td>Aluminum</td><td>mg/L</td><td>7</td></tr><tr><td>Arsenic</td><td>mg/L</td><td>0.06</td></tr><tr><td>Cadmium</td><td>mg/L</td><td>0.015</td></tr><tr><td>Cobalt</td><td>mg/L</td><td>2</td></tr><tr><td>Chromium</td><td>mg/L</td><td>0.05</td></tr><tr><td>Copper</td><td>mg/L</td><td>0.17</td></tr><tr><td>Iron</td><td>mg/L</td><td>100</td></tr><tr><td>Molybdenum</td><td>mg/L</td><td>0.1</td></tr><tr><td>Nickel</td><td>mg/L</td><td>9.7</td></tr><tr><td>Lead</td><td>mg/L</td><td>3.1</td></tr><tr><td>Sulphate</td><td>mg/L</td><td>703</td></tr><tr><td>Selenium</td><td>mg/L</td><td>0.08</td></tr><tr><td>Zinc</td><td>mg/L</td><td>1.4</td></tr><tr><td>Uranium</td><td>mg/L</td><td>100</td></tr><tr><td>Vanadium</td><td>mg/L</td><td>0.51</td></tr><tr><td><sup>226</sup>Radium</td><td>Bq/L</td><td>2.00E+02</td></tr></table> <p><b>IR-06 Response – Table IR-06-1:</b></p>	Parameter	Units	Restored Solution	pH		4.3	Aluminum	mg/L	7	Arsenic	mg/L	0.06	Cadmium	mg/L	0.015	Cobalt	mg/L	2	Chromium	mg/L	0.05	Copper	mg/L	0.17	Iron	mg/L	100	Molybdenum	mg/L	0.1	Nickel	mg/L	9.7	Lead	mg/L	3.1	Sulphate	mg/L	703	Selenium	mg/L	0.08	Zinc	mg/L	1.4	Uranium	mg/L	100	Vanadium	mg/L	0.51	<sup>226</sup> Radium	Bq/L	2.00E+02	As noted in the response to IR-06, Denison is not proposing changes to the mining area decommissioning objectives presented in the draft EIS and therefore discussion of said changes within the context of the review comment is not applicable. The objectives presented in Table 2.3-3 of the revised draft EIS are unchanged relative to the draft EIS.	No
Parameter	Units	Restored Solution																																																													
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					Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.	liquid/solid ratios, anticipated reagent consumption, etc.	<div>Table IR-06-1: Feasibility Field Test Leaching Zone Remediation Targets compared to Interim (December 2022) Groundwater Well Monitoring Results</div> <table><tr><th>Parameter</th><th>Units</th><th>Leaching Zone Remediation Target</th><th>Neutralization Phase Results <sup>1</sup></th></tr><tr><td>pH</td><td>pH units</td><td>5.5</td><td>8.24</td></tr><tr><td>Aluminum (Al)</td><td>mg/L</td><td>9.5</td><td>3.3</td></tr><tr><td>Arsenic (As)</td><td>mg/L</td><td>0.7</td><td>0.05</td></tr><tr><td>Barium (Ba)</td><td>mg/L</td><td>0.2</td><td>0.07</td></tr><tr><td>Calcium (Ca)</td><td>mg/L</td><td>535</td><td>203</td></tr><tr><td>Cadmium (Cd)</td><td>mg/L</td><td>0.3</td><td>0.00001</td></tr><tr><td>Cobalt (Co)</td><td>mg/L</td><td>0.24</td><td>0.0001</td></tr><tr><td>Chromium (Cr)</td><td>mg/L</td><td>0.38</td><td>&lt;0.0005</td></tr><tr><td>Copper (Cu)</td><td>mg/L</td><td>0.19</td><td>0.001</td></tr><tr><td>Iron (Fe)</td><td>mg/L</td><td>390</td><td>144</td></tr><tr><td>Potassium (K)</td><td>mg/L</td><td>45</td><td>185</td></tr><tr><td>Magnesium (Mg)</td><td>mg/L</td><td>8.92</td><td>22.6</td></tr><tr><td>Molybdenum (Mo)</td><td>mg/L</td><td>0.16</td><td>0.04</td></tr><tr><td>Sodium (Na)</td><td>mg/L</td><td>626</td><td>385</td></tr><tr><td>Nickel (Ni)</td><td>mg/L</td><td>1.17</td><td>0.02</td></tr><tr><td>Lead (Pb)</td><td>mg/L</td><td>2</td><td>0.04</td></tr><tr><td>Sulfate</td><td>mg/L</td><td>4,147</td><td>1114</td></tr><tr><td>Selenium</td><td>mg/L</td><td>0.47</td><td>0.0002</td></tr><tr><td>Uranium</td><td>mg/L</td><td>501</td><td>83</td></tr></table> <div>E-doc: 6858048p. 93/419</div> <div>Annex 1 – FIRT IR Table – Technical Review of the Wheeler River Project draft EIS Denison Response - August 16, 2023</div> <table><tr><th>Parameter</th><th>Units</th><th>Leaching Zone Remediation Target</th><th>Neutralization Phase Results <sup>1</sup></th></tr><tr><td>Vanadium</td><td>mg/L</td><td>19.3</td><td>0.2</td></tr><tr><td>Zinc</td><td>mg/L</td><td>17.1</td><td>0.5</td></tr></table> <div><sup>1</sup> Results are the average of three groundwater monitoring wells (G019-036, -040, -041) sampled in December 2022</div>	Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>	pH	pH units	5.5	8.24	Aluminum (Al)	mg/L	9.5	3.3	Arsenic (As)	mg/L	0.7	0.05	Barium (Ba)	mg/L	0.2	0.07	Calcium (Ca)	mg/L	535	203	Cadmium (Cd)	mg/L	0.3	0.00001	Cobalt (Co)	mg/L	0.24	0.0001	Chromium (Cr)	mg/L	0.38	<0.0005	Copper (Cu)	mg/L	0.19	0.001	Iron (Fe)	mg/L	390	144	Potassium (K)	mg/L	45	185	Magnesium (Mg)	mg/L	8.92	22.6	Molybdenum (Mo)	mg/L	0.16	0.04	Sodium (Na)	mg/L	626	385	Nickel (Ni)	mg/L	1.17	0.02	Lead (Pb)	mg/L	2	0.04	Sulfate	mg/L	4,147	1114	Selenium	mg/L	0.47	0.0002	Uranium	mg/L	501	83	Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>	Vanadium	mg/L	19.3	0.2	Zinc	mg/L	17.1	0.5		
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IR-12	-	ECCC	Change to an environmental component due to hazardous contaminants Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p>Context: There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field,</p>	<ol style="list-style-type: none"><li>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</li><li>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</li></ol>	<p>This response has not been accepted, for the following reasons (numbers correspond with original IR):</p> <p>1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed.</p> <p>3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999</p>	<p>1-2. The water management design information presented in the draft EIS is considered appropriate at the EA stage and for this stage of the Project and fit-for-purpose to support the assessment of potential effects. The detailed design information on site water management infrastructure and runoff management requested in this IR and related IRs (i.e., IR-12-R1A and IR-12-R1B) will be provided to the CNSC and province as part of licensing and permitting.</p> <p>Nevertheless, and building on information provided previously, additional information and context regarding site water management and design concepts is provided as follows:</p> <ul style="list-style-type: none"><li>• Conceptual site drainage maps spanning the full Project Area scale has been provided in Attachment IR-12 to this IR response table as context for the reviewer.</li><li>• Design for the access roads and airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road or airstrip.</li><li>• The overall vision for non-contact water along the access roads and airstrip is to use shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems.</li><li>• The condition of the airstrip and roads would be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.</li><li>• Infrastructure features that are within 50 to 100 m (depending on grade) of waterbodies and that are associated with cleared land where there is no vegetated buffer may require additional erosion management / controls to ensure protection of the waterbodies from unmitigated suspended solids inputs.</li></ul>	No																																																																																												

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p> <p>Rationale: In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>		<p>study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value.</p> <p>CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.</p> <p>Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment.</p> <p>Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR.</p> <p>Reference: [A.1] Atmospheric &amp; Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie &amp; Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>	<p>A map showing the distance of Project components to waterbodies is available in Attachment IR-12 as context for the reviewer. The map shows for example, that four waterbodies (waterbody numbers 1, 16, 23, and 86) are within 100 m of the Project footprint where potential erosion protection measures may be employed. The details of erosion control measures at these locations will be outlined in the Environmental Management System to support licensing.</p> <ul style="list-style-type: none"><li>Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water along roads and at the airstrip would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred.</li><li>As described in the draft EIS, the proposed crossings at Kratchkowsky Creek and Hart Creek are not culverts, but clear span bridges. Clear span bridges are designed to completely span a watercourse without interfering with the channel bed and banks.</li><li>As a reminder to ECCC that the road to the Project’s proposed airstrip follows an existing, decommissioned road, the Fox Lake Road.</li><li>The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence and the well-drained characteristics of the region support the plans to divert non-contact water to ground, and as noted made surfaces would be graded to promote drainage and discourage pooling.</li><li>Please refer to our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419) for additional context on best practice and mitigation measures related to water management and also the scoping and evaluation of accident and malfunction scenarios in the draft EIS.</li><li>Importantly, the conceptual management scheme outlined above for non-contact water runoff is consistent with other roads and airstrips in the region – that is, runoff is not currently captured from other roads and airstrips in the region as envisioned by the review comment. This includes infrastructure associated with Saskatchewan Ministry of Highways and Infrastructure, existing uranium mines and mills, and communities including First Nation communities. It is not practical to do so and collection of non-contact water is not needed based on risk and moreover as noted above is to be avoided so as not to necessarily affect water quantity in local drainages and sub-drainages.</li></ul> <p>3. The reviewer is referred to the response to IR-103 for a discussion regarding the PMP and its suitability and relevance given available data and different methods of calculation included that provided by CSA guidance. Notwithstanding the information provided in response to IR-103 Denison is committed to revisiting this issued as per CNSC’s recommendations, as applicable, for the licensing phase of the Project.</p> <p>To reiterate, Denison believes it has fulfilled its information requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process. Notwithstanding</p>	

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								that, Denison recognizes that further information will be required as the Project moves past the EA and into the licensing and permitting phases. It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by the Denison as part of the licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.	
IR-12	IR-12-R1A	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<p>Context: Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern (COPCs) directly from mining operations infrastructure. However, it still has the potential to contain deleterious substances from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills, fire management practices, and snow removal practices. The Metal and Diamond Mining Effluent Regulations (MDMER) pursuant to the Fisheries Act requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. This includes deleterious substances in non-contact water from all site infrastructure including the airstrip, roads, and camp area.</p> <p>Rationale: All mine effluent and seepage that contains deleterious substances must be discharged through a final discharge point. This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices. The Proponent has not included how non-contact water runoff from site infrastructure will be captured within site water management planning. To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the capture of non-contact water.</p>	<p>1.Update site water management plans to include management of potentially deleterious substances contained in non-contact water from all site infrastructure.</p> <p>2. Provide updated estimates of water volumes to be drained and managed from overall site infrastructure (including runoff from roads, airstrip, camp area, etc.) during the different Project phases. Include updated information on water treatment flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.</p>		<p>1 and 2.</p> <p>Denison understands the prohibition related to deleterious substances under Section 36 of the Fisheries Act and Denison affirms its commitment to ensuring no such events occur. However, in the context of this IR, we interpret ECCC is connecting the concept of deleterious substances under MDMER (those constituents identified in Part 1(3) i.e., arsenic; copper; cyanide; lead; nickel; zinc; suspended solids; radium 226; and un-ionized ammonia.) with the general concept of deleterious substance per the Fisheries Act. Mine effluent associated with MDMER defined deleterious substances will be discharged through a final discharge point to Whitefish Lake, and this has been reflected in the water management information presented in the draft EIS, including Section 2.2.3.</p> <p>The IR is suggesting Denison collects runoff water from the airstrip and roads with the rationale that this is needed in order to collect potential contact water associated with hydrocarbons spills (the text in rationale notes: <i>This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices</i>). As indicated in the draft EIS and in our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419), should a spill occur, the spill response plan will be followed. The details of Denison’s response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Importantly, hydrocarbons are not mine waste-related deleterious substances perm MDMER definition. Collecting and treating non-contact runoff throughout the life of the Project would mean Denison collects an extremely large volume of clean water to protect against infrequent hydrocarbon spills which will be cleaned up in the appropriately scaled process (spill response), in terms of cost and risk to the environment. No other roads or airstrips in the region (including those associated with uranium mine and mill operations) requires the collection and treatment of runoff water from infrastructure such as roads and airstrips. It is not practical to do so and based on risk, the collection of non-contact water is not required.</p> <p>The road or trail to the airstrip is currently an unmaintained road: the decommissioned Fox Lake Road. For road upgrades and airstrip construction, Denison will be using material from the borrow area. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to upgrade roads and construct the airstrip will not be a source of metals or ARD.</p> <p>Denison will implement erosion control measures at infrastructure locations within 50 to 100 m of a waterbody (refer to response to IR-12 above and to Attachment IR-12, Figure</p>	No

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								<p>IR-12-5: Distance from Project Footprint to Waterbodies) where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies).</p> <p>In consideration of the above, Denison maintains that the runoff at the airstrip and roads are non-contact water. The water management mandate for the Wheeler River Project is to keep clean water clean and minimize the total volume of water requiring management, treatment, and discharge.</p> <p>In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p>	
IR-12	IR-12-R1B	ECCC	Water Quality - Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<p>Context: The Proponent has clarified that there is no infrastructure in place for management of non-contact water from site infrastructure that may contain COPCs, including but not limited to roads, the airstrip, and the campground.</p> <p>Rationale: To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the type of infrastructure and its location for the capture of non-contact water.</p>	Provide a map marking the locations of proposed surface drainage structures for runoff collection including collection ditches, culverts, diversion ditches, perimeter berms, collection ponds and other similar structures.		<p>It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by Denison as part of the permitting and licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.</p> <p>In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p> <p>Notwithstanding the above, Denson has provided the reviewer with additional, conceptual site drainage maps in Attachment IR-12, Figures IR-12-1, IR-12-2, IR-12-3, and IR-12-4; these are supplemental to the site drainage map provided in the draft EIS Figure 2.2-17.</p>	No
IR-13	-	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	Context: The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).	Please provide: 1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching; a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML. b. Confirm that the part of waste rock recovered	This response has not been accepted.  In the response, Denison expected that portion of basement rock will be potentially acid generating and stated that all basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. However, criteria for	The commitment for waste rock segregation provided in the draft EIS in combination with Denison’s previous response to IR-13 (refer to Annex 1, IR-13 on page 7/419) is considered appropriate for this stage of the Project and fit-for-purpose to support the assessment of potential effects. We remind the reviewer that since (1) there is no release of effluent during construction, and (2) contact water from both the clean and special waste rock pads will be collected and eventually treated in the IWWTP during operation, the details of the waste rock segregation are not required to support the assessment of potential project effects on the environment. It is further noted that Denison has committed to developing a lined storage pad for potentially acid generating (PAG) material that is of sufficient capacity to store all the waste rock that is expected to be removed from the drill holes through life of mine. From an operational risk perspective there is more than ample contingency to manage the risk that may be associated with PAG material. Due to the	No



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					<p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p>Rationale: ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>	<p>from the basement rock, will also be tested for potential ARD/ML.</p> <p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>	<p>segregating the potential acid generating waste rock from the clean waste rock are not provided.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings by either recovering uranium or placing the materials underground into the mining area at the end of a well’s production. However, it is not clear how the potentially acid generating waste rock will be disposed of in the long term.</p>	<p>relatively small volume of PAG material that is anticipated to be brought to surface through the ISR method, details for the permanent disposal will be developed as part of decommissioning plan updates. The small PAG volume and short mine life allows a number of decommissioning options; PAG rock could be decommissioned in place, moved to the industrial landfill or IWWTP precipitate pond, and/ or added to grout for well backfilling and closure.</p> <p>Despite the above, Denison continues to work towards defining waste segregation criteria. In December 2023, Denison completed an Acid Base Accounting (ABA) testing program on 34 composite samples derived from 372 individual pulp samples at the Saskatchewan Research Council (SRC). The testing was done to further the understanding of the geochemical nature of material that would be generated by ISR wellfield drilling, specifically as it concerns expectations with respect to the quantities of PAG and non-PAG material and the derivation of appropriate segregation criteria. Individual pulp samples were selected from representative drill core samples taken throughout the entire length of drillholes throughout the deposit footprint area. Samples were composited along the length of each drill hole to represent the major horizons of the sandstone and the different basement lithologies (refer to Attachment IR-13 for a figure showing the major horizons). The horizons were selected to identify horizon-specific geochemistry, and as such the composites were developed so as to not straddle between different horizons, which could influence the representativeness of the horizon-specific ABA results. The different lithologies sampled represent all of the overlying and underlying horizons at the site, and include the overlying Upper Aquifer, Intermediate Aquitard, and Lower Aquifer. The underlying horizons include the Graphitic Pelite (GFPL), Quartzite (QZIT), and Garnetiferous Pelite (GTPL).</p> <p>Samples were analyzed for:</p> <ul style="list-style-type: none"><li>• Paste pH (pH units)</li><li>• Acid Neutralizing (g CaCO3/kg)</li><li>• Acid Producing (g CaCO3/kg)</li><li>• Net Acid Generation (g CaCO3/kg)</li><li>• Sulfate, Acid soluble (%)</li><li>• Sulfide (ug/g)</li><li>• Sulfur (%)</li></ul> <p>Though definite criteria have not yet been defined, initial consideration of results suggest the following:</p> <ul style="list-style-type: none"><li>• SANDSTONE<ul style="list-style-type: none"><li>○ all upper aquifer and intermediate aquitard samples were not acid generating (non-PAG); and</li><li>○ 2 out of 8 lower aquifer samples were acid generating, and the rest were not acid generating (non-PAG).</li></ul></li><li>• BASEMENT<ul style="list-style-type: none"><li>○ Quartzite samples (n=2) are not acid generating (non-PAG); and,</li><li>○ Garnetiferous and graphitic pelite samples (n=8) range from being acid consuming to acid generating, but overall are acid generating.</li></ul></li></ul>	

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								<p>Based on these test results, the lower sandstone aquifer (MFa) and basement would likely be PAG and stored on the special waste pad, but the balance of waste rock is expected to be non-PAG and placed on the clean waste rock pad.</p> <p>Specific waste rock segregation criteria (e.g., for distinction of PAG vs non-PAG material) will be defined using the data referenced above, as well as previous test data, in procedure level documentation that support the Waste Management Program documents that are part of initial licensing with CNSC. The program and plan documents define the overall strategies for minimizing waste generation, improving waste segregation, and implementing sustainable waste management techniques and the means to systematically and effectively manage the generation, handling, storage, disposal, and recycling of waste streams generated during by the Project, respectively, whereas the procedure level documentation is focused on operationalization of high-level strategies. The detailed waste rock segregation criteria will be provided to the CNSC and part of the licensing process and with the province as part of permitting at the appropriate time.</p> <p>While appropriate management of waste rock is important at all mining operations, we note that for context in relation to management and risk to the environment that through the selection of the ISR mining method, the Wheeler River Project is unique in that it is expected to generate a fraction of waste rock (clean, mineralized, and PAG) compared to other mining methods. For the reviewer’s context and consideration, refer to Attachment IR-13 for a summary of the Wheeler River Project’s expected waste rock volumes compared to a proposed underground uranium mining project in the Athabasca Basin (NexGen’s Rook I Project), an underground mining project which recently completed the Saskatchewan EA process (Foran’s McIlvenna Bay Project), and an open pit mining project which recently completed the federal EA process (Generation PGM’s Marathon Palladium Project); Table IR-13-1, Figure IR-13-2, and Figure IR-13-3 in Attachment IR-13.</p>	
IR-14	-	CNSC	Wastes and Decommissioning	<p>Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)</p> <p>Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)</p>	<p>Context: The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)</p> <p>Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as Complete.</p> <p>Rationale: Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.</p>	<p>How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?</p>	<p>This response has not been accepted.</p> <p>The response provided in IR-28 indicates that responses will be updated in the final EIS and future iterations of the IER. Although Denison commits to provide a PDP at a later date, the commitment does not include incorporating or addressing Indigenous concerns. The current response also does not address the concerns raised by Indigenous Nations and communities regarding restoration of the environment or indicate that it was brought to their awareness).</p> <p>Additionally, IR-28 highlights examples of how engagement will be captured in future iterations of the IER and “final EIS”. Please provide proposed text for the revised EIS, for subject matter expert (SME) review and acceptance.</p>	<p>Denison will incorporate or address Indigenous concerns into decommissioning plans as the plans are developed. This was noted to in the round 1 response to IR-14; see Annex 1, IR-14 on page 8/419 and excerpt here (emphasis added): “The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan will evolve over time and the plan will become more refined as the Project advances. Denison is committed to continue to engage with Indigenous Nations and communities to solicit input.” It is consistent with engagement aspects of REGDOC-2.11.2, Decommissioning and also Denison’s commitment to conducting meaningful engagement with Indigenous communities and organizations potentially affected by the Project, and to maintain relationships with these communities and organizations throughout all phases of the Project.</p>	No



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								<p>Denison’s is of the opinion that ‘input’ can refer to a wide range of comments, issues, concerns, advice, observations, etc. We believe the information provided in the EIS is sufficient for this stage of the Project and the conceptual decommissioning plan. Future decommissioning plan updates will be overseen by both the province and the CNSC and provide ample opportunity for the review of how Indigenous input has been incorporated into decommissioning plans.</p> <p>While the CDP outlined plans to keep small area of concrete foundations in place the specifics of the decommissioning plan may change. From the revised draft EIS Section 2.3.3.1.3 “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” This detail will in no way influence Denison’s decommissioning commitment to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure.</p> <p>Denison has not asked for specific feedback by Indigenous groups on concrete foundations remaining in place as outlined in CDP. The draft EIS was reviewed by several Indigenous groups through the public review process and by ERFN in advance of submission to the CNSC. To date, no concerns have been raised regarding concrete foundations. Despite the above context for the reviewer on when Project decommissioning details will be available and when the related engagement on these details would be conducted, Denison commits to specifically engaging with ERFN and KML on details of the decommissioning plans related to concrete foundations. Denison will incorporate and address engagement related to decommissioning, including plans for structures to be left in place such as concrete foundations, into the appropriate version of the decommissioning plan updates.</p> <p>Please refer to Appendix 4B - Key Issue and Concern No 18 outlining the resolution of ERFN concern noted by the reviewer in IR-14.</p>	
IR-18	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description  Appendix 8-E	Context: In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.	1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.  2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.  3. Update Table 2.2-1 and	This response has not been accepted.  ECCC requested that the Proponent update Table 2.2-1 and Appendix 8-E to include all general water quality parameters required for environmental effects monitoring, including pH, temperature, hardness, alkalinity and conductivity. This information was not provided in the updated table in the Proponent’s response. ECCC also requested that the Proponent Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the Metal and Diamond Mining Effluent Regulations (MDMER) including aluminum, iron, nitrate, thallium and manganese. The Proponent has not provided the requested information for	<p>The effluent modelling work presented in the draft EIS focused on COPCs which were predicted based on expected Project activities and water treatment processes and selected following CSA N288.6 Environmental Risk Assessments At Class I Nuclear Facilities And Uranium Mines And Mills. The CNSC participates in CSA documents and endorses use of this document.</p> <p>Schedule 5 of the MDMER outlines the various requirements of Environmental Effects Monitoring (EEM) Studies once a mine is subject to the regulation. The MDMER requires EEM as a condition for the authorization to deposit effluent into waters frequented by fish. Environmental effects monitoring involves assessing whether effluents are having an effect on receiver water quality, fish, fish habitat, and use of fish by humans. Schedule 5 of the MDMER is not a predictive section of the regulation to be used to direct EA scope. It is applicable to operational metal mines.</p> <p>Many MDMER parameters including those in Schedule 5, Section 4 identified by ECCC were not selected for analysis during lab studies completed by Denison to support the EIS,</p>	Yes  Revised Draft EIS, Table 2.2-1 in Section 2  Appendix 8-E, Table 15.

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					<p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>Rationale: ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	<p>Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</p> <p>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</p> <p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>	<p>aluminum, iron, nitrate, thallium and manganese. In the Proponent’s response it is stated that, “Schedule 5 parameters are included where available.” However, it is unclear if this means that the requested effluent characterization concentrations for these parameters is currently unknown, or if these parameters are expected to have negligible concentrations in the effluent. Furthermore, ECCC requested that the Proponent include all acute and chronic water quality thresholds under the most stringent of the MDMER, CCME, and/or Provincial Guidelines for each parameter in Table 2.2-1 and Appendix 8-E. This information has not been provided as only chronic toxicity guidelines have been provided.</p> <p>The Proponent is legally required to meet MDMER release targets and intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project. ECCC must advise the CNSC of predicted effects of COPCs to surface water quality and recognize the Proponent’s legal requirement to comply with the MDMER. Therefore, proposed and draft effluent targets must be reviewed against the requirements of the regulations and with an eye to any potential effects to the receiving environment for both regulated and other effluent parameters. It is necessary for ECCC to review effluent targets for general water quality parameters and MDMER Schedule 5 Section 4 parameters required for effluent characterization and environmental effects monitoring to determine if effluent at the end-of-pipe from all final discharge points is not predicted to be acutely lethal. Additionally, the predicted uranium effluent concentration currently exceeds the acute water quality guidelines for the protection of aquatic life. Table 2.2-1 does not currently provide the information necessary to verify acute and chronic thresholds.</p> <p>Therefore, please see the following reiterated requests:</p> <p>1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental</p>	<p>since they were not COPCs associated with IWWTP design. Information from laboratory tests is not available at this stage for all of the MDMER parameters. Further, MDMER Schedule 5 Section 4 include a list of parameters to be monitored (not modelled) and many of the 'missing' parameters have no associated limits under MDMER. Denison is committed to meet all requirements of MDMER, which includes future EEM programs.</p> <p>With respect to the bullet items in the IR the following is noted.</p> <p>1) Table 2.2-1 and Appendix 8-E have been updated to include all general water quality parameters required for environmental effects monitoring, including pH, temperature, hardness, alkalinity and conductivity.</p> <p>2) Table 2.2-1 and Appendix 8-E have been updated to include the following missing Schedule 5 Section 4 parameters required for effluent characterization: aluminum, iron, nitrate, thallium, and manganese.</p> <p>1) Updates to Table 2.2-1 and Appendix 8-E Include all acute and chronic water quality thresholds for each parameter as well as information on the concentrations of modifying environmental factors (i.e. pH, hardness, etc.) used to calculate these guidelines as footnotes.</p> <p>Denison is committed to meet the requirements of the MDMER as previously stated. Denison is also committed to working through the process of identifying discharge criteria as stipulated under Provincial legislation for mine effluent discharge as part of the application for an approval to operate a pollutant control facility as well as per the requirements and conditions of the CNSC, the licensing body for the Project. Denison will follow the advice of the CNSC with regard to requirements for further consultation with ECCC.</p>	

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							effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.  2. Update Table 2.2-1 and Appendix 8-E to include the following missing Schedule 5 Section 4 parameters required for effluent characterization: aluminum, iron, nitrate, thallium, and manganese. Provide further explanation if this information is not available.  3. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E. Include information on the concentrations of modifying environmental factors (i.e. pH, hardness, etc.) used to calculate these guidelines as footnotes.  4. Provide a clear commitment to ECCC for continued consultation on developing effluent discharge targets including a review of final predicted effluent discharge targets once available.		
IR-23	-	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	Context: There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.  A few examples: <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There’s lots of heavy muskeg there. A lot of us have been there, and we’d like to know there’ll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn’t happen. Even the permafrost is now further down. In the Wheeler River area, where there’s some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> Rationale: Appendix 2-C, Alternative Means assessment, states (p.3): “Engagement with Interested Parties naturally included	Please explain how comments and concerns collected during Denison’s engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it’s appendices.	This response has not been accepted.  The response and additional Annex (Table 2.10-1) provided in the draft EIS submission do not address concerns listed in the examples requested by CNSC staff.  The additional row in Table 2.10-3 meant to address input received from interested parties does not clearly demonstrate how comments received regarding alternative means were incorporated into the evaluation factor. Additionally, references provided in this row are not in the submission package or the original EIS.	The reviewer is referred to the revised Draft EIS, Appendix 2-A. The column titled “Denison’s Response to Question/Concern (where applicable)” outlines additional context on how the comment was considered in the EIS. This includes the specific comments listed by the reviewer, i.e., 16-EN-DesNd-101.1, 16-EN-ERFN-100.15 and 16-EN-ERFN-100.17.  For additional context, the previous IR response (Annex 1, IR-23 on page 13/419) provided a narrative on how the comments included in Appendix 2-C were part of the fulsome consideration of alternative means. The alternative means assessment is largely a screening level exercise to identify more versus less preferred options. The fact that it is carried out at the screening level is appropriate for this stage of the Project, given the level of design that was available at the time many of the engagement discussion occurred and that is typical for such resource development projects. The alternative means assessment is conducted across a range of criteria including biophysical environment, human environment, technical factors, cost factors, and any engagement comments specific to the options or more generally on importance of environmental protection, economic/business opportunities or concern about climate change. The alternative means assessment process is outlined in Appendix 2-C and summarized in Section 2.10 of the Project Description.  In response to the second part of this comment, we would like to clarify that the tables presented in Attachment IR-24 (Annex 1, IR-24 on page 13/419; and a reminder that Attachment IR-24 is now included in the revised draft EIS as part of updates to Section 2.10 Project Alternatives) were directly from the draft EIS Appendix 2-C. Specifically, Table 2.10-3 in Attachment IR-24 is a direct copy of Table 6 from Appendix 2-C and this is stated directly in the table title. There was no new information contained in the Attachment IR-	Yes  Appendix 2-A (Updated includes a column titled “Denison’s Response to Question/Concern (where applicable)”)

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					<p>alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and Appendix 2-A Engagement Database Summary – Project Description for details of engagement information referenced in this alternative means assessment.”</p> <p>It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.</p>			<p>24 (Annex 1, IR-24 on page 13/419) tables compared to what was provided in the draft EIS, specifically Appendix 2-C.</p> <p>Denison has committed to undertaking engagement with Indigenous Communities of Interest and Communities of Interest, which if they desire it, may include discussion of project alternatives in the context of licensing, as may be appropriate.</p>	
IR-25	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p>Context: The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: “As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS.” (p. 11-36)</p> <p>Rationale: More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the Project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	<p>Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.</p> <p>In addition, please include an updated Issues and Concerns table that includes relevant information from the MN-S as a result of engagement activities and relevant MN-S studies in the next version of the EIS, as appropriate.</p> <p>Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.</p>	<p>This response has not been accepted.</p> <p>As the information from MN-S has not yet been incorporated into a version of the EIS for review, CNSC cannot accept this response as complete. MN-S has provided new information to Denison and this should be reflected in Denison’s assessment.</p> <p>CNSC requires that Denison provide additional information within the revised version of the EIS. The response should include the newly revised text within the EIS and the page numbers of where staff can find the information.</p>	<p>The information from the MN-S has been updated in the revised draft EIS in track changes form, for ease of review. The following sections have updates:</p> <ul style="list-style-type: none"><li>• 3.3.2</li><li>• 3.4.2.3</li><li>• 3.4.4</li><li>• 3.4.8</li><li>• 11.1.1.1</li><li>• 11.1.1.2</li><li>• 11.1.2.3</li><li>• 11.1.3.1.2</li><li>• 11.1.3.2.2</li><li>• 11.1.4.3.1</li><li>• 11.1.4.5.1</li><li>• 11.2.1.1</li><li>• 11.2.2</li><li>• 11.2.3.2</li><li>• 11.2.3.3.1</li><li>• 11.2.3.9</li><li>• 11.2.4.4.1</li><li>• 12.1.1.1</li><li>• 12.1.1.3.1</li><li>• 12.1.2.4</li><li>• 12.1.3.2.3</li><li>• 12.1.4.2.1</li><li>• 12.2.1.1</li><li>• 12.2.1.3.1</li><li>• 12.2.2</li><li>• 12.2.3.2</li><li>• 12.2.3.3</li><li>• 12.2.4.2.2</li><li>• 12.2.4.2.3</li><li>• 12.3.1.1</li><li>• 12.3.2</li><li>• 13.1.1</li><li>• 13.1.2</li></ul>	<p>Yes</p> <p>Revised Draft EIS sections:</p> <ul style="list-style-type: none"><li>• 3.3.2</li><li>• 3.4.2.3</li><li>• 3.4.4</li><li>• 3.4.8</li><li>• 11.1.1.1</li><li>• 11.1.1.2</li><li>• 11.1.2.3</li><li>• 11.1.3.1.2</li><li>• 11.1.3.2.2</li><li>• 11.1.4.3.1</li><li>• 11.1.4.5.1</li><li>• 11.2.1.1</li><li>• 11.2.2</li><li>• 11.2.3.2</li><li>• 11.2.3.3.1</li><li>• 11.2.3.9</li><li>• 11.2.4.4.1</li><li>• 12.1.1.1</li><li>• 12.1.1.3.1</li><li>• 12.1.2.4</li><li>• 12.1.3.2.3</li><li>• 12.1.4.2.1</li><li>• 12.2.1.1</li><li>• 12.2.1.3.1</li><li>• 12.2.2</li><li>• 12.2.3.2</li><li>• 12.2.3.3</li><li>• 12.2.4.2.2</li><li>• 12.2.4.2.3</li><li>• 12.3.1.1</li><li>• 12.3.2</li><li>• 13.1.1</li></ul>

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								<ul style="list-style-type: none"><li>13.1.3.1</li><li>13.1.4</li><li>13.2</li><li>13.2.1.3</li><li>13.2.1.6</li><li>13.2.3</li><li>13.3.2.1</li><li>13.3.2.1</li></ul>	<ul style="list-style-type: none"><li>13.1.2</li><li>13.1.3.1</li><li>13.1.4</li><li>13.2</li><li>13.2.1.3</li><li>13.2.1.6</li><li>13.2.3</li><li>13.3.2.1</li><li>13.3.2.1</li></ul>
IR-28	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p>Context: The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p>Rationale: Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community,</p>	<p>This response has not been accepted.</p> <p>Denison provided information about the verification process for KML with an example chart that CNSC staff deem acceptable. CNSC requires that Denison complete this process with all identified Indigenous Nations and communities.</p> <p>It will be expected that a fully updated IER and issues and concerns tables for each Nation as per the original IR, in a future version of the revised EIS for SME review and acceptance.</p> <p>For part 3 of the IR, Denison must have validation from all Nations and Communities. Validation from ERFN, YNLRO and other Nations with interest in the Project should also be obtained. Alternatively, a path forward to complete the validation can also be provided.</p>	<p>Section 4 of the EIS and the IER have been fully updated with engagement information as recent as January 2024.</p> <p>The Interests, Issues and Concerns tables have been fully updated with responses from Denison to the items identified, including whether or not the Denison responses have been deemed acceptable and validated, or whether or not the engagement efforts in this regard are ongoing. Where engagement efforts are ongoing, if possible, a definitive indication of next steps is provided in respect of the resolution process. Denison notes that it is not always possible to specifically outline next steps with respect to validation, but the commitment to working toward a resolution should also be acceptable, as Denison alone cannot determine an engagement process for Indigenous nations; the Indigenous nations and communities may wish an alternative course of action.</p> <p>It is also important to note that Denison’s engagement efforts may not yield positive validation on all Interests, Issues and Concerns raised by all Indigenous Nations and Communities (i.e., consensus on every topic may not be achieved), but wherever possible, Denison’s efforts to be transparent about what those issues are, and the process associated with the attempts to find positive resolution will be identified.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 4</p>



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						through mitigation and monitoring measures, this should be documented, and a rationale provided.  4. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).			
IR-35	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	Context: The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.  Rationale: This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.	Please consider acrolein in the assessment or provide a rationale for its exclusion.	This response has not been accepted.  Although the requested assessment is provided in response to IR-35, this information also needs to be reflected in a revised version of the EIS. Please provide proposed text for the revised EIS, for SME review and acceptance.  Please also see follow-up IR-35-R1.	The quantitative screening analysis of acrolein has been included in the revised Draft EIS as Appendix D to Appendix 6-A to support the conclusion that acrolein is not a COPC. A summary of this analysis is also provided in Section 6.1.1.2 in the revised Draft EIS. Tables 3-10 and 3-11 in Appendix 10-A were also updated to be consistent with the changes made in Section 6.  The assessment includes estimated concentrations of 1-hour and 24-hour acrolein compared to Ontario Ambient Air Quality Criteria. It has also been updated to include estimated annual acrolein concentrations. The annual concentrations are predicted to be below the Tolerable Concentration (0.4 µg/m3) from Environment and Climate Change Canada and Health Canada’s Priority Substances List Assessment Report as well as the chronic reference concentration (0.02 µg/m3) from the US EPA. As such, acrolein can be screened out as a COPC from further assessment.	Yes  Revised Draft EIS Section 6.1.1.2, and Appendix 6-A  Revised Draft EIS Appendix 10-A, Table 3-10 and Table 3-11
IR-35	IR-35-R1	Health Canada (HC)	Change to an environmental component due to hazardous contaminants  IR-35 Response from Denison	Section 6, Chemicals of Potential Concern	Context: Potential health risks from long-term exposure to acrolein were not considered in the Proponent’s response to IR-35.  Rationale: No annual predicted concentrations for acrolein were provided in the draft EIS or in the response to IR-35. Concentrations were modelled for short-term exposure (1h and 24h) only in the draft EIS and compared to the 1-hour and 24-hour Ontario Ambient Air Quality Criteria for acrolein. It is Health Canada (HC) guidance to assess both potential short and long-term health effects. The predicted annual concentrations for acrolein should be compared against chronic reference concentrations (e.g., the USEPA Reference Concentration (RfC) <sup>1</sup> (0.02 µg/m3) and the Tolerable Concentration (TC) from Environment and Climate Change Canada and Health Canada’s Priority Substances List Assessment Report <sup>2</sup> (0.4 µg/m3)).	Use predicted annual concentrations and available chronic reference concentrations to account for potential health risks from long-term exposure to acrolein to support the decision to screen out acrolein as a COPC from further assessment.		See response to IR-35.	See response to IR-35

<sup>1</sup> [https://iris.epa.gov/static/pdfs/0364\\_summary.pdf](https://iris.epa.gov/static/pdfs/0364_summary.pdf)  
<sup>2</sup> [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf)



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-37	-	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<p>Context: "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist Proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."</p> <p>Rationale: Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry” OR “Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.</p> <p>Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).</p>	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.	<p>This response has not been accepted.</p> <p>Although a summary is provided in response to IR-37, this also needs to be reflected in revised version of EIS. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	A summary of consultation described in the previous IR response (Annex 1, IR-37 on page 17/419) has been added to the revised Draft EIS in Section 6.1.4.2. The references in Appendix 6-A have also been revised for consistency with the EIS.	Yes  Revised Draft EIS Section 6.1.4.2 and Appendix 6-A
IR-41	-	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<p>Context: The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."</p> <p>Rationale: If La Loche monitoring station is located near anthropogenic sources and the Project is not, use of this data is not a conservative or realistic representation of background.</p> <p>For a realistic approach, background data considered should be upper 95th percentile (or max if n&lt;10) from an area representative of project location</p> <p>For a conservative approach, background data from an area located even further from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact</p>	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.	<p>This response has not been accepted.</p> <p>Please propose a more suitable background site to use as background subtraction. La Loche is not a suitable background site as it is potentially impacted from other industrial sources; it is expected that another background site removed from other industrial sources be identified and used.</p>	<p>Denison and its SME restate its assertion that the La Loche station provides data that suit the intended purpose of the EIS. For context, the rationale for using the Saskatchewan Ministry of Environment regional air quality data set (which is derived from the La Loche station data) has been included in the revised draft EIS. La Loche is a small village and Clearwater River Dene Nation community in northwest Saskatchewan with a population of around 3,600 people. While the regional air quality data set was described as being ‘near anthropogenic sources’ we would like to clarify that there are no major industries with emissions in the community. The anthropogenic sources would be expected to be associated with vehicles and dust from gravel roads.</p> <p>The regional air quality data set was applied in the air quality modelling assessment to meet the requirements of the Saskatchewan Air Quality Modelling Guideline. This approach is used so that worst-case concentrations in air are predicted and evaluated against applicable air quality standards. We also note that northern Saskatchewan does not have an abundance of stations where parameters relevant to this assessment are measured and no stations are in truly remote areas (e.g., located away from small communities). For instance, the next closest station after La Loche is at Buffalo Narrows. which is about 200km away from the Project and would be expected to have similar air quality to La Loche as the communities are somewhat comparable in terms of size and industries, or lack thereof.</p> <p>Denison commits that it will consider and evaluate the potential use of alternative data sets that may be representative of baseline conditions in northern Saskatchewan, should</p>	Yes  Revised Draft EIS 6.1.3.2.7

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					from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.			such be available, for future measurement programs and air quality modelling. Denison notes again, however, that use of the La Loche station data was appropriate and fit for purpose.	
IR-44	-	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p>Context: Section 6.2.8 discusses Monitoring and Follow- up. The Proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p>Rationale: Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see Health Canada, 2017).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per Health Canada (2017).</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>	<p>This response has not been accepted as preliminary details for mitigation and monitoring plans for noise impacts and complaints resolution process were not provided.</p> <p>The response partially addresses IR-44 through the commitment to developing the complaints resolution process. However, CNSC expects that the noise complaint resolution and response procedure will be included for review in the EIS.</p> <p>Section 9 (p. 44) of the EIS Guidelines state that the EIS “Shall present an outline of the preliminary environmental monitoring program, including:</p> <ul style="list-style-type: none"><li>the description of the characteristics of the monitoring program where foreseeable (e.g., location of interventions, planned protocols, list of measured parameters, analytical methods employed, schedule, human and financial resources required),</li><li>plans to engage Indigenous groups in monitoring, where appropriate.”</li></ul> <p>Please provide proposed text for the revised EIS, for SME review and CNSC acceptance.</p>	<p>Denison notes that it believes the specific the request for the Noise Complaint Resolution and Response Procedure is beyond the scope of the requirements of an EA of a designated project under the Canadian Environmental Assessment Act, 2012. This request is also outside the scope of the Project Terms of Reference (Draft EIS, Appendix 1-A). Denison will submit management system documentation (procedures, plans) as part of the future licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process. As noted previously, Denison has committed to developing a community complaints and response procedure and the response procedure will be consistent with the appropriate Health Canada guidance. It would be premature to define the details of such a procedure without having engaged with the Indigenous Communities of Interest first. To this, it is also relevant to provide some spatial context that will inform engagement and the nature of the procedure. The Project is located on crown land in a remote area of Saskatchewan’s boreal forest. No communities are located within the immediate proximity of the Wheeler River property. Travelling by existing roads, the closest community to the Project is approximately 260 km away. Calculated using a straight line, the closest communities are approximately 150 km from the site and Saskatoon is 600 km south. The majority of crown land leases in the LSA are assumed to contain rustic, remote cabins which are typically used seasonally.</p> <p>Notwithstanding the above, we have provided additional details for Health Canada's consideration and the details, along with Denison’s commitment to developing a community complaints and response procedure consistent with the appropriate Health Canada guidance, will be added to Section 6.2.8 of the revised Draft EIS and Appendix 6-E. Prior to the commencement of the first routine noise monitoring campaign during Construction, Indigenous Groups and other Interested Parties will be notified of the monitoring schedule and planned locations. Initially, the proposed locations will be the same locations as were used in the baseline program for direct comparison of the data to the baseline conditions. These locations may be revised or expanded upon to include other locations based on feedback received. At the same time, Indigenous Groups and other Interested Parties will also be notified of how noise complaints may be registered. If a noise complaint is received, the associated monitoring would then take place at the location of the complainant. Upon receiving a noise complaint, the responsible Denison environmental staff will implement a complaints response and resolution process, documented using a complaints management form. The information to be recorded during the registration of the complaint will include the name and contact details of the complainant, the nature of the complaint, a description of the possible source(s) at the site associated with the complaint. Sound levels will then be monitored at the location of the complainant according to the description below, and a recommended action will be identified within two days with a timeline for implementation. Follow-up with the complainant will then take place to ensure that the issue has been resolved and follow-up monitoring will be completed where appropriate. Once the complainant is satisfied that that the issue has been resolved, the complaint will be formally closed out and a summary report will be completed by Denison and kept on file.</p>	<p>Yes</p> <p>Revised Draft EIS, 6.2.8</p> <p>Appendix 6-E</p>

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IR-48	-	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p>Context: Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p>Rationale: The noise assessment typically includes a map illustrating modelled noise levels from the Project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.	<p>This response has not been accepted.</p> <p>The map provided in the response did not include the contour lines requested in IR-48 to illustrate the maximum baseline and predicted noise levels. Furthermore, the map does not provide labels for receptor locations that appropriately describe the type of noise-sensitive receptor.</p> <p>HC requests that a map showing the following be provided:</p> <ol style="list-style-type: none"><li>1. Contour lines representing the maximum baselines and predicted noise levels at the location of the receptors;</li><li>2. Labels for receptor locations that are more descriptive of receptor type (e.g., hunting camp, ceremonial area).</li></ol> <p>It was also noted that the receptor location of Risk 2 (i.e., Trapper/Intensive Land User) in the provided map was not consistent with other receptor location maps in the Draft EIS (e.g. Section 10, Figure 10.1-7 Human Receptor Locations for the Project Human Health Risk Assessment). These differences included both the receptor location (i.e., opposite sides of McGowen Lake) and type (i.e. Trapper/Intensive Land User vs. Seasonal Resident). The receptor locations and types should be confirmed and consistently used throughout the EIS, and any discrepancies should be explained.</p> <p>Finally, a portion of Figure 8 – Adjusted Ldn (p.19 – appendix 6-E) is cut off from the page, preventing proper review. HC requests that the full/complete version adjusted to fit the page be provided.</p>	<p>We remind the reviewer that the Project is located on crown land in a remote area of Saskatchewan’s boreal forest. No communities are located within the immediate proximity of the Wheeler River property. Travelling by existing roads, the closest community to the Project is approximately 260 km away. Calculated using a straight line, the closest communities are approximately 150 km from the site and Saskatoon is 600 km south. The majority of crown land leases in the LSA are assumed to contain rustic, remote cabins which are typically used seasonally in the summer.</p> <p>The figure provided with the previous IR response (Annex 1, IR-48 on page 21/419) is included in the revised draft EIS as Figure 6.2-4. The purpose of this figure was to introduce the study areas and receptors. This figure is not meant to present results of the noise assessment and as such, the request to include contour lines representing the maximum baselines and predicted noise levels at the location of the receptors is not appropriate. Denison has included the receptor locations on the contour maps with the predicted noise levels (Appendix 6-E, Figures 8 to 15). Denison and its SME believe it is appropriate to have the detailed figures contained in Appendix 6-E, and there is no need to repeat them within Section 6.</p> <p>In response to this IR, we have completed the following revisions in Section 6 of the revised draft EIS:</p> <ul style="list-style-type: none"><li>• Updated Section 6.2.4.2 to include reference to specific Appendix 6-E figures for cross-referencing ease.</li><li>• Added a summary table that describes the sensitive noise receptors (Table 6.2-3) which may provide additional context to Figure 6.2-4.</li><li>• Updated the human risk receptor names for Risk 2 and Risk 4 as we recognize the earlier version of the names may have caused some confusion when compared to the HHRA receptors in Section 10.<ul style="list-style-type: none"><li>○ “Risk 2 - trapper” is now “Risk 2 - seasonal resident at McGowan Lake.”</li><li>○ “Risk 4 - seasonal resident” is now “Risk 2 - seasonal resident at Russell Lake.”</li></ul></li><li>• Adjusted Figure 8 in Appendix 6-E to fit the page.</li></ul> <p>We thank the reviewer for highlighting a mapping error in the Section 10 receptor locations. In the revised draft EIS Section 10, Figure 10.1-7 has been updated to correct the location of the McGowan recreational fisher/hunter. The location was incorrectly shown on the east side of the lake in the draft EIS when it should have been placed on the west side of the lake. Please note this was a mapping error only and the location and assessment of the receptor within the HHRA was correct and matches the updated figure in the revised draft EIS.</p> <p>It is noted that this IR response does not change the outcome of the noise assessment. Information added to the EIS documentation as noted above is for editorial purposes.</p>	<p>Yes</p> <p>Revised Draft EIS, 6.2.4.2.1, Appendix 6-E</p> <p>Revised Draft EIS, Section 10, Figure 10.1-7 was updated and the corresponding Appendix 10-A figure (Figure 4-2)</p>
IR-52	-	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater	Context: According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid,	1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the	This response has not been accepted as the Proponent did not provide the information that	Containment of mining solution during operation will be confirmed by a robust groundwater monitoring network comprised of numerous wells located at various vertical depth horizons above the mineralized zone. Data generated from the groundwater	No

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				Appendix 7	<p>hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.</p> <p>Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the center surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long’’. </p> <p>As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.</p> <p>Rationale: The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.</p>	<p>injection and extraction wells was not presented.</p> <p>2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.</p>	<p>would allow validation of the conclusion that hydraulic containment was successful.</p> <p>Hydraulic containment is to be utilized as a process to prevent the migration of contaminants away from injection well locations by groundwater. The Proponent indicated that tracer testing demonstrated hydraulic containment of the injected solution (as per the response to IR-6).</p> <p>Hydraulic containment is an important process as part of a multi-pronged approach to preventing the migration of contaminants to Whitefish Lake by groundwater migration. Consideration of all field test data will allow ECCC to review the Proponent’s conclusions about hydraulic containment.</p> <p>Provide all field test data to allow ECCC to review the conclusion that hydraulic containment was successful.</p>	<p>monitoring plan would serve various purposes, such as to assess performance and the controls associated with the ISR process. Denison provided the CNSC with the results of the tracer test (“Hydrologic Report, Summary of Findings, 2019 to 2021” prepared by Petrotek) as part of the response to the first round of IRs. The first-round response to IR-06 (Annex 1, IR-06, starting at page 90/419) summarized the results of the tracer test pertaining to hydraulic control of the injected solutions. Hydraulic control of the injected solution was demonstrated through analysis of groundwater samples from monitoring wells surrounding the test well pattern. No elevated values of the tracer were observed in the monitoring wells.</p> <p>To eliminate potential excursion of mining solutions to the regional groundwater Denison will engineer and create an artificial freeze wall to encompass the uranium deposit and isolate the mining area; the freeze wall will extend vertically approximately 400 m from the basement rock up to surface (details in EIS Section 2.2.1.3, 2.2.1.4.2.3, and 2.3.2). The freeze wall is a no flow boundary and will prevent the mining solutions from travelling out of the mining area and into the regional groundwater system. Denison reiterates that contaminants will not be able to migrate to Whitefish Lake during Operations and into the Decommissioning period until mining area remediation objectives are met and the freeze wall is allowed to thaw. The inclusion of a freeze wall isolates the mining area from the regional groundwater system and this design feature provides a high level of protection to groundwater resources.</p> <p>Denison believes it has fulfilled its requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on this topic for concluding the EA process. Notwithstanding that, Denison recognizes that further information may be required as the Project moves past the EA and into the licensing and permitting phases.</p> <p>The ISR mining model for the Wheeler River Phoenix deposit and the hydraulic containment on the mining solutions within the assessed area has been validated and signed off by a Qualified Professional, a legal requirement of a 43-101 Feasibility Study. The detailed data is not available publicly however, should the CSNC wish to further discuss the details with the Qualified Professional to support licensing requirements, Denison will arrange such a meeting.</p>	
IR-53	-	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<p>Context: The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.</p> <p>However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p>Rationale: It is not clear how representative the calibrated K</p>	<p>Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).</p>	<p>This response has not been accepted.</p> <p>Please include figure(s) (y axis representing depth below ground, x axis representing K, different length of vertical line segment representing different packer testing intervals, etc.) showing the field measured K values, as well as the calibrated K value for the upper sandstone aquifer, intermediate aquitard, and lower sandstone aquifer. This would help demonstrate the distribution of field measured K values and representativeness of calibrated K values.</p>	<p>All hydraulic conductivity (K) values for the intermediate sandstone aquitard considered in developing the regional model are presented in Appendix C of Appendix 7-A of the draft EIS. This Appendix includes the depth range for all packer intervals. Note that when reviewing these data, any K values that are prefixed with "&lt;" (e.g., &lt; 1.0e-7), indicate that the fractured rock has very low hydraulic conductivity. Denison does not feel a figure illustrating the data included in the table would add additional value to the information presented (as it would be redundant to the information provided) and the K values selected for the used in the model in Appendix 7-C of the Draft EIS.</p> <p>Note that hydraulic conductivity values applied in the numerical modelling reflect not only the packer tests, but also our conceptual model, which is based on core logging, lithology and mineral contents, and geochemistry sampling. Further the interpretation of the lower</p>	No



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					<p>values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>			hydraulic conductivity for the Intermediate Sandstone is consistent with the AECL published interpretation at Cigar Lake (i.e., a very similar setting).	
IR-55	-	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;  Appendix 7-C, section 2.8	Context: According to the Proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The Proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the Proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the Proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The Proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The Proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters < 50 years old) in the Lower	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the Proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.	This response has not been accepted.  In response to IR-55, the Proponent states “The viewpoint from the third party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed.”  If the alternative model requested in IR-55 has been developed by the Proponent, NRCan requests that full details of this model be provided in an attachment.	Additional documentation has been provided in Attachment IR-55 for the groundwater flow system that results from a calibrated condition where the Intermediate Sandstone Aquitard has a hydraulic conductivity of 1.0E-7.  An acceptable calibration was able to be achieved with the higher hydraulic conductivity in the Intermediate Sandstone Aquitard. As is appropriate to maintain a calibrated condition, the hydraulic conductivity within other hydrogeologic units were also varied. The match to the observation data is not as good as the base case calibrated model, but it is within acceptable limits. The alternative calibrated groundwater flow model, with a higher hydraulic conductivity in the Intermediate Sandstone Aquitard, results in higher volumes of groundwater flow converging upon Whitefish Lake, resulting in a decreased contribution of flow from the deep aquifers to the total volumetric groundwater flow to the lake.  Geochemical reactive transport of COPCs is further discussed as part of IR-89-R1, including for the groundwater flow conditions described in IR-55. Reflecting the smaller relative contribution of deep groundwater to flow to Whitefish Lake, there is an overall reduction in peak COPC concentrations in groundwater beneath the lake.	No

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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					<p>Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the Proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p>Rationale: The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated in the Proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).</p>				
IR-56	-	CNSC	Geology and Groundwater	Section 7.3.3.2	<p>Context: It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p>Rationale: It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?	<p>This response has not been accepted.</p> <p>Although Denison’s response is acceptable, in order for the response to be accepted the following text should be incorporated in the EIS:</p> <p>“During Operation, select exploration boreholes will be re-utilized for narrow diameter injection wells that will be developed with monitoring devices for the determination of excursions and water levels. Exploration boreholes not selected for the use of narrow injection wells will be grouted to surface to seal off any remaining conduit.”</p>	The requested text has been added to Section 7.3.3.2 of the revised draft EIS.	Yes  Revised Draft EIS, Section 7.3.3.2.
IR-57	-	NRCan	Fish and fish habitat	Section 7.3.3.2  Appendix 7-A, sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p>Context: The Proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the Proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the Proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).	<p>This response has not been accepted.</p> <p>Using data provided in Attachment #57 (observed and simulated static water levels, screen mid-point elevations), NRCan was unable to reproduce the head gradient values reported by the Proponent in their table.The Proponent should check the gradient calculations.</p>	Denison thanks NRCan for their careful review of the information provided. Gradient calculations have been checked and corrections made. The calculation error does not affect the discussion however, as the same formula was used for observed and simulated gradient calculations. The technical contents of the original response (Annex 1, IR-57, starting at page 200/419) have been added to Appendix 7-C as Section 2.5.2.4., including a Table (Table 2-7) with the calculated gradients shown.	Yes,  Appendix 7-C, Section 2.5.2.4



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					<p>flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p>Rationale: In NRCan's opinion, the Proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the Proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the Proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>				
IR-61	-	CNSC	Geology and Groundwater	Section 7.4.2	<p>Context: There is no discussion of potential induced seismicity from mining processes.</p> <p>Rationale: Induced seismicity may lead to a loss of process as identified for natural seismicity.</p>	Please provide information on the potential mining-induced seismicity.	<p>This response has not been accepted.</p> <p>CNSC staff expect a discussion of the occurrence of mining-induced seismicity in general in Saskatchewan, and the inclusion of a summary of potential sources of induced seismicity related to ISR mining (such as the response that Denison provided for IR-61) and the corresponding mitigation measures in the EIS. The paucity of records of seismicity in northern Saskatchewan (as stated in EIS Section 15.2) does not necessarily indicate a lower potential for future induced seismicity. It should be noted that earthquakes of up to magnitude (ML) 4.4 are spatially correlated with locations of extractive industries with ongoing activity.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The following has been added to Section 7.4.2.4 of the revised Draft EIS:</p> <p>“Within the broader context of terrain stability, it is noted that natural seismic activity in Northern Saskatchewan is quite rare with no significant events in recorded history (refer to Section 15.2 Seismic Events).</p> <p>Mining induced seismicity has been of interest for some time, with mining-induced seismicity reported in Canadian hard-rock mines since the 1920s (Hudyma et al, 2017) and the first formal Canadian research on the problem starting in the 1930s (Hedley, 1992). Hasegawa et al. (1989) and Ortlepp (1992) describe several mechanisms by which induced seismicity may be capable of occurring in relation to underground (excavation based) mining; though, those mechanisms generally relate to discrete, large-scale rockmass failures whereas more than 90% of seismic events can be categorized as micro seismic events with moment magnitude &lt; 0 (Hudyma, 2008).</p> <p>In Saskatchewan, investigations of inducted seismic have been completed in association with potash mining and uranium operations. Sedghizadeh et al. (2023) applied statistical methods to investigate the nature of micro seismicity in a potash mine. Clustering analysis of micro seismicity indicated that the majority of events could be treated as independent background events mostly driven by underground mining operations; however, there is some clustering of seismicity and the formation of limited aftershock sequences of the “burst-type” (i.e., those that have only one parent event and many children). For example,</p>	<p>Yes</p> <p>Revised Draft EIS, Section 7.4.2.4</p>

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								<p>with respect to uranium mining (Barghwal and van der Baan) investigated the source mechanisms and possible causes of micro seismicity recorded in an underground Uranium mine for a period of one month in January 2011. The events occurred near the main working level at 480 m depth and show some temporal correlation with the daily rate of rock removal. The study concluded the observed micro seismicity occurred due to reactivation of pre-existing faults that were favourably oriented in the static stress state created by the extensive horizontal tunnel network and due to dynamic stress due to rock crushing activities.</p> <p>Despite the above noted link between seismicity and conventional hard-rock mining techniques / operations, as well as compared to high pressure liquid injection processes, the potential for mining-induced seismicity from the nature of the ISR mining that is proposed by the Project is interpreted as being quite low, given that the mechanisms that are purported to create or induce seismicity will not occur. Nevertheless, potential for mining-induced events for the Project that could be postulated to occur as the result of a few sources are discussed below for completeness: 1) collapse of cavity voids from leaching, 2) hydraulic fracturing, and 3) use of permeability enhancement techniques.</p> <p>1. Collapse of cavity voids. To clarify, the portion of the deposit being mined is never truly a void (as in a large empty underground cavern); rather, what remains will be a honeycomb textured environment with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses. In terms of void space creation and collapse of the overlying strata, modelling has demonstrated that only 0.05% by volume of desilicified material immediately overlies the ore zone and would be subject to collapse (Appendix 7C, Attachment K). This low volume and percentage are determined to not be of significant seismic concern.</p> <p>2. Hydraulic fracturing. EIS Section 2.2.1.4.2 Wellfield Operation provides a comparison of ISR mining pressures to conventional fracking pressures used in the oil and gas industry. Conventional fracking pressures used in the oil and gas industry can vary; however, common pressures to induce fracturing can range up to 15,000 psi and require injection of fracking fluids of up to 16,000 liter per minute over periods of three to four days. Fracking fluids are comprised of a slurry of water, proppant (generally silica sand), and chemical additives to support and maintain the open fracture system after fracking is conducted. Conversely, ISR mining for the Project is planned at nominal pressures of 100 psi, intermittent pressures of up 250 psi, and average flow rates of 30 liters per minute within a recovery well. The ISR mining method proposed for the Project is markedly different than fracking. For example, looking at intermittent pressures alone, ISR pressures are anticipated to be 60 times lower than fracking pressures.</p>	

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								<p>3. Permeability enhancement techniques. EIS Section 2.2.1.4.3 Permeability Enhancement outlines the three types of techniques being considered for the Project: mechanical, Propellant, and hydraulic options. Propellants are classified as a low hazard explosive (S.1 special-purpose explosives, low hazard explosives, per Explosive Regulations, section 36). Propellants technically do not explode (like classic mine explosives which detonate) but rather burn through a process called deflagration. Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds. Neither ISR mining or permeability enhancement is expected to produce mining-induced seismicity.</p> <p>Under normal operating conditions there is no expected mining-induced seismicity. See also Bounding Scenario 4 Failure of the Freeze Wall in Section 14.”</p> <p><b>References:</b></p> <p>Barghwal H. and M. van der Baan. 2020. Microseismicity observed in an underground mine: Source mechanisms and possible causes. Geomechanics for Energy and the Environment. Volume 22, May 2020.</p> <p>Hasegawa, H.S., R.J. Wetmiller, and D.J. Gendzwill. Induced seismicity in mines in Canada- An overview. Pure Appl Geophys. (1989) 129:423–53. doi: 10.1007/978-3-0348-9270-4_10.</p> <p>Hedley, D.G.F. 1992. Rockburst handbook for Ontario hardrock mines. CANMET Special Report SP92-1E, 305 p.</p> <p>Hudyma, M.R. Analysis and Interpretation of Clusters of Seismic Events in Mines. PhD thesis. University of Western Australia Perth (2008).</p> <p>Hudyma, M.R., L. Brown and O. Carusone. 2017. Seismic Hazard in Canadian Mines. Conference Proceedings. CIM AGM - May 2017, Montreal, Canada.</p> <p>Ortlepp, W.D. 1992. Invited Lecture: The design of support for the containment of rockburst damage in tunnels – An engineering approach. Proceedings of Rock Support and Underground Construction, (Editors: P.K. Kaiser and D.R. McCreath), Rotterdam, A.A. Balkema, pp. 593-609.</p> <p>Sedghizadeh, M. van den Berghe and R. Shcherbakov. 2023. Statistical and clustering analysis of microseismicity from a Saskatchewan potash mine. Frontiers in Applied Mathematics and Statistics. March 2023.</p>	
IR-64	-	ECCC  CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation	Context: The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case	Explain: <ul style="list-style-type: none"><li>Will this be revisited with updated data based on extraction feasibility results?</li><li>How will the surface expression of a subsidence will</li></ul>	This response has not been accepted.  CNSC staff expect Denison to include within the EIS a summary of the results of RESPEC’s most recent numerical modelling study that suggests negligible ground subsidence associated with the proposed	<p>Additional geomechanical modelling undertaken by Denison subsequent to the filing of the draft EIS, with refined, more granular inputs is included as Appendix K (RESPEC, 2024) to Appendix 7-A of the EIS. This report replaces earlier reporting.</p> <p>A brief summary of the RESPEC (2024) approach and results has been included in Section 7.4.2.2 of the revised Draft EIS. In summary, based on the modelling results presented</p>	Yes  Revised Draft EIS Executive Summary, Section 7, Section 9 and Section 16

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				Appendix 7-A, Appendix K (p. 12)	<p>bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.</p> <p>Rationale: ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.</p> <p>It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.</p>	<p>be limited to 7.5 cm and localized?</p> <p>Suggestions for mitigation and follow-up measures: ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.</p>	<p>volumetric extraction as this is an important consideration for designing an appropriate implementation plan for subsidence control and remediation measures.</p>	<p>therein, Denison does not anticipate the need for remediation measures, with the surface subsidence being negligible (on the order of millimetres) within the context of changes in terrain as it relates to decommissioning objectives.</p> <p>For clarity, the text added to Section 7.4.2.2 of the revised Draft EIS is as follows:</p> <p>“To aid in advancing the Project, a study was undertaken to evaluate the geomechanical stability of rock mass within the Phoenix deposit, overlying sandstones, and underlying basement rock following ore extraction with ISR and including the presence of the proposed freeze wall. The geomechanical study is presented as Appendix K of Appendix 7-A. Specifically, a full-scale 3D model of northeast extent of the ore zone, and specifically the northern half-length of Zone A shown in Figure 7.3-3, was developed to evaluate stress redistribution in the case of failure of remnant rock from rock mass removal. Average material properties were assumed for hydrostratigraphic units in the Pheonix deposit and surrounding rock, including hydrostratigraphic units shown in Figure 7.3-3. In the numerical model, instantaneous and random rock removal representing 30% by volume and 3% by volume for the high-grade ore zone and low-grade ore zone, respectively, was assumed.</p> <p>Quantified in the model was the competency of the remnant rock based on the predicted stress field and the potential for tensile fracturing of the rock. The modelling results indicated that the highest predicted failure volumes in remnant rock are associated with the ore zone (41%), but that predicted failure volumes decrease substantively to 8-26% in the immediately surrounding clay zones, and are very limited (0.02%) in the overlying sandstones, including within the desilicified zone, and underlying basement rock. In addition, no (0%) failure was predicted within the freeze wall itself. Importantly, associated vertical displacement of host rock into the mined cavity is predicted to be limited to values of no more than 49 cm in the ore zone and decrease to 0-7 cm only 4-5 m from the low-grade ore zone. Overall, predicted failure conditions are limited to 5-8 m of the extent of the low-grade ore zone and there is limited potential instability in the freeze wall.</p> <p>Subsidence at ground surface from displacement of host rock was predicted to be negligible. The average vertical displacement at ground surface is 2.5 mm.”</p> <p>Additionally, and for consistency with the information presented in the updated Appendix K of Appendix 7-A, surface subsidence estimates have been updated in the Executive Summary, Sections 7, 9 and 16 of the revised draft EIS from “7.5 cm” to “2.4 to 2.8 mm”.</p>	<p>(subsidence estimate clarification)</p> <p>Revised Draft EIS Section 7.4.2.2.</p> <p>Appendix K, Appendix 7-A.</p>
IR-65	-	CNSC	Geology and Groundwater	Section 7.4.2.2	<p>Context: It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?</p> <p>Rationale: Surface facilities and wells may be impacted if there is unaccounted for subsidence.</p>	<p>Please provide additional details for any dewatering/pumping induced subsidence.</p>	<p>This response has not been accepted.</p> <p>CNSC staff expect Denison to include within the EIS a summary of their response to IR-65 to establish their basis for a low probability of pumping and/or dewatering subsidence. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>Per the comment the following text has been added to Section 7.4.2.2 of the revised Draft EIS.</p> <p>The potential for subsidence related to changes in fluid balance within the freeze wall during Operation was also considered. The freeze wall will provide hydraulic containment between the internal wellfield and the external regional groundwater system with each well pattern maintaining a 1.7% 'bleed' to maintain hydraulic gradients towards recovery wells. This results in an isolated hydrogeological environment within the freeze wall, separate from the regional groundwater system but considered an unconfined aquifer within the freeze wall, being open to atmosphere. The "extra" water pumped (i.e., the water pumped in excess of injection) will be derived from stored groundwater within the</p>	<p>Yes</p> <p>Revised Draft EIS, Section 7.4.2.2</p>

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								<p>sandstone units above the ore zone, and from the underlying paleoweathered zone, within each phase of Operation that is surrounded by freeze walls. The volume of stored water was estimated using the calibrated groundwater flow model (Appendix 7-C), which contains 3D volumes for the saturated soil and rock within each of the walled phases, including appropriate porosity values. These volumes of stored water were compared to the volume pumped within each phase of operation, over the expected period of extraction based on the mining plan. The stored volume of water was calculated to be 3.4 (Phase 1) to 9.7 (Phase 4) times the estimated excess pumped volume. In other words, there is ample stored water within each walled phase to supply the excess pumped volume. The excess pumping creates a hydraulic gradient toward the ore zone within each walled phase and help vertical spreading of the UBS during operations. If monitoring during operations indicates water levels are falling quicker than anticipated, additional water could be added within the walled phase, within the Upper Sandstone Aquifer.</p> <p>Given the above, a fluid balance (or flow rate balance) was conducted as part of wellfield planning to inform Feasibility Study production rates within the mining zone contained within the confines of the freeze wall. Freeze studies concluded a no flow boundary once closure of the freeze wall is established along the perimeter of the mining area. Additional modelling within the mining area, including groundwater (FEFLOW) and production (Goldsim) modelling, were applied and although a net increase in volume is anticipated over the life of mine, a net draw is maintained on a well pattern basis to maintain 'bleed' and inward hydraulic gradient during active mining operations. To maintain fluid balance and not draw down the water table in the overlying sandstone units, additional sources of water from groundwater wells outside the freeze wall will be injected inside of the freeze wall as part of normal drilling operations during wellfield development and will be accounted for in the balance. This ensures potential for subsidence related to water table drawdown in the upper sandstone units is mitigated. Operating parameters rely on a relative net water balance for successful operations and would not support a significant drawdown of the water table owing to ground subsidence concerns.</p>	
IR-66	-	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<p>Context: Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.</p> <p>Rationale: Subsidence may impact wells and surface infrastructure.</p>	Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.	<p>This response has not been accepted.</p> <p>Denison claims that the expected risk from subsidence is negligible. Granted that updated models by RESPEC indicate negligible ground subsidence, in practice, modelled and actual subsidence measurements usually vary. Therefore, CNSC staff still deem it necessary to include additional details on subsidence monitoring and contingency plans (including triggers for implementing these). Moreover, since Denison plans to survey well collar elevations notwithstanding the negligible ground subsidence modelled by RESPEC, they might as well discuss the techniques that they plan to employ. Currently, it is not clear what method they plan to utilize to potentially detect elevation changes in well collars that cannot also be used to detect subsidence of</p>	<p>The response below has been added to Section 7.8.1 of the revised Draft EIS, and a reference to these details added to Section 7.4.2.2.</p> <p>“Initial wellfield construction primarily consisting of earthworks to level the pertinent wellfield phases will be guided by Lidar surveys to provide a consistent datum prior to the installation of any well type (monitoring, injection, recovery, freeze) within the wellfield.</p> <p>The subsequent installation of any well type is located on a ‘easting’ and ‘northing’ basis guided by a differential global positioning system (DGPS) with accuracy of within 5 cm. Although DGPS systems can measure a point in the vertical or ‘Y’ direction with a comparable level of accuracy to the ‘X’ and ‘Y’, the vertical datum of any installed well will be further validated by use of stadia rods, which have accuracy to within 5 mm.</p> <p>The top of collar elevation of all newly installed wells will be measured to a known datum located off the wellfield. As part of annual inspections well collar elevations will be measured on a regular basis and recorded relative to the prior years’ measurements to determine the degree (if any) subsidence occurring within the well itself that may be attributable to sloughing or shifting of a well at depth. Measurements of the well collar</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 7.8.1, 7.4.2.2, and 16.2.1, and Executive Summary Section 5.3.1.</p>



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							the overall terrain. Denison has discussed the limitations (i.e., resolution) of Lidar, which is a good start. However, it must be noted that vertical accuracy and precision are more important considerations than spatial resolution for evaluating the applicability of subsidence monitoring techniques for this project, especially considering the size of the study area. CNSC staff also recommend that Denison further explore the applicability of methods such as DGPS, InSAR, and UAV-based Lidar change detection for their monitoring plan.	<p>elevations are a surveying industry standard tool for determination of any vertical movement within a well itself.</p> <p>Satellite system’s such as InSAR may be utilized to complement the stadia rod measurements on an as needed basis; however, due to the negligible subsidence (&lt;10 mm) anticipated the system is envisioned to have its limitations with emphasis and reliance placed on site specific measurements.</p> <p>The proposed monitoring program, as conceptually described above, will be documented more formally as part of the overall operations management program prior to establishment of the well field. The monitoring program will include a contingency plan whose objective would be to facilitate the timely identification of, and response(s) to, potentially emerging conditions whereby routine monitoring data indicate performance is not meeting expectations (e.g., levels of subsidence are outside the range of expectations). The contingency plan conceptually would identify performance objectives, key performance indicators and measurement endpoints, triggers that would describe conditions, when met, where a response is required and a tiered-response plan in which an emerging issue would be confirmed (or not), with successive levels of response, including investigation of cause and risk, investigation of strategies to mitigate risk and implementation of preferred risk mitigation."</p>	
IR-67	-	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<p>Context: Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.</p> <p>Rationale: The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).</p>	<p>1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.</p> <p>2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.</p>	<p>This response has not been accepted, as this information should be provided in the EIS.</p> <p>CNSC staff request that Denison either include a high-level summary of the results of the metallurgical tests (including the data) or include appendices to the EIS that contain the data provided in attachments IR-20, IR-67, IR-69 and cite these within the EIS.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The response to IR-67 from the initial round of FIRT review comments that included consideration of issues raised in IR-20, IR-67 and IR-69 has been included as Appendix F to Appendix 7-C of the revised Draft EIS. References to the new appendix (Appendix F of Appendix 7-C) have been made in Appendix 7-C and Section 7 of the EIS as appropriate. Appendix F of Appendix 7-C has been included within the revised Draft EIS documentation provided as part of the overall response to the second round of FIRT review comments.</p>	<p>Yes</p> <p>Appendix F (a new appendix) has been added to Appendix 7-C.</p>



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						3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.			
IR-70	-	CNSC ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p>Context: The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p>Rationale: A hydraulic conductivity (K) value of 5x10-6 m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	<p>Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.</p>	<p>This response has not been accepted.</p> <p>In the discussion of K values for the Ore Zone in Section 2.3.1.7 of Appendix 7-C, Denison notes that available measurements are derived from permeameters and likely underestimate actual conditions because they do not account for macro-scale fracture flow in the ore zone. Section 4.4.2 of Appendix 7-C indicates that a hydraulic conductivity value of 5E-06 m/s (5 times greater than value assumed for the ore zone in the 3D regional-scale model) was assigned to represent mining post-decommissioning for the base case scenario. The description for Scenario #7 of the sensitivity analysis reads "higher hydraulic conductivity within the ore zone". In their response to IR-70, Denison states that for Scenario #7, "the hydraulic conductivity in the ore zone was raised to be a uniform value of 2E-07 m/s to represent the effective dissolution of any clay cap minerals". No information relating to permeability or hydraulic conductivity is provided in the IR-20/IR-67/IR-69 attachment outside of qualitative observations of increased permeability following leaching with lixiviant. The information provided to CNSC staff thus far indicates that hydraulic conductivity (K) values for the base case scenario was 5E-06 m/s, and 2E-07 m/s for the higher ore zone hydraulic conductivity scenario (Scenario #7). Clearly this interpretation is not logical given that 2E-07 &lt; 5E-06. Furthermore, Denison's assertion that the post-mining conductivity of the ore zone is unimportant relative to the hydraulic conductivity of lower sediments and desilicified zone is not supported by the data presented in Table 4-6 of Appendix 7-C. The table below provides a summary of predicted groundwater concentrations for key COPCs (As, Se, U) for Scenarios 5, 6, and 7, as well as the relative percent difference to values predicted by the base case scenario. For these COPCs, it appears that increased ore zone hydraulic conductivity brings about the same order of magnitude changes as does varying K values for the lower sandstone (LSS). As such, it is important that the</p>	<p>There are a number of second round IRs associated with the theme of 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p>Our earlier responses to this and related IRs referred to the ore zone as being a relatively small portion of the Draft EIS-characterized source volume as being part of our rational for not considering it a critical element. As stated in the Draft EIS, the source volume was conservatively estimated assuming a flare zone above and below the ore zone, within the confines of the freeze-walled zones. To further expand on that, as described in Draft EIS, the source volume includes the ore zone (core and barrier layers), the underlying paleo-weathered zone, and the overlying Lower Sandstone Aquifer (i.e., the restored solution extends 50 m above and below the ore zone). As such, the ore zone represents 2.75% of the source zone fluid volume, and less than 6% of the source mass of uranium, for example. As such, mass contained within the ore zone represents a relatively small portion of the overall source.</p> <p>Further, the most transmissive portion of the source zone is within the lower sandstone aquifer, and the most persistent portion of the source zone is within the paleo-weathered bedrock horizons where matrix diffusion is expected to result in source persistence.</p> <p>The hydraulic conductivity varied within prediction uncertainty scenario #7, reflects a higher hydraulic conductivity for the barrier layers of the ore zone, rather than the ore zone core. This was considered the most relevant parameter to vary to reflect a higher potential for ore zone mass to enter the overlying altered and desilicified units.</p> <p>To further demonstrate the robust nature of this hydrogeologic setting, an additional sensitivity scenario was run in direct response to the IR. This transport simulation was performed with the conductivity of the ore zone set to 5e-5 m/s (10 times higher than the overlying lower sandstone aquifer and desilicified zone). Under this scenario, similar peak COPC concentrations reaching Whitefish Lake to the base case scenario are predicted. COPC concentrations in groundwater remain below groundwater quality screening criteria at Whitefish Lake and do not change the conclusions of the original analyses. Details of this additional scenario are included in Attachment IR-89-R1.</p> <p>The table produced by the reviewer highlights changes of up to 200% between scenarios; however, that is to be expected since the results as presented simply reflect the variation between the scenarios based on scenario assumptions. All peak COPC concentrations in</p>	No

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							<p>parameterization for Scenario #7 of the sensitivity analysis is valid - Denison is requested to provide clarification on this matter.</p> <p>From Table 4-6 of Appendix 7-C (p. 4.43). Relative percent difference compared to base case scenario shown in brackets. Values represent groundwater concentrations at Whitefish Lake.</p> <table><tr><td>Scenario</td><td>As, µg/L</td><td>Se, µg/L</td><td>U, µg/L</td></tr><tr><td>Base case</td><td>0.782</td><td>0.835</td><td>0.550</td></tr><tr><td>5 (highest combined K values for LSS and ISA)</td><td>0.982 (25.6% )</td><td>1.28 (53.3 %)</td><td>1.54 (180 %)</td></tr><tr><td>6 (highest K value for LSS)</td><td>1.10 (40.7% )</td><td>1.44 (72.4 %)</td><td>1.81 (229 %)</td></tr><tr><td>7 (increased ore zone K)</td><td>1.58 (102%)</td><td>1.47 (76.0 %)</td><td>0.769 (39.8 %)</td></tr><tr><td>Screening Criteria</td><td>5</td><td>2</td><td>15</td></tr></table> <p>The Proponent also should provide an explanation for the chosen parameter values for Scenario 7. Post-mining hydraulic conductivity (K) of the ore zone is consequential to understanding contaminant migration in groundwater.</p> <p>It should also be noted that the fate and transport simulations of the COCs are highly dependent on groundwater flow in the desilicified zone and acceptance of this IR will depend on the response to IR-89. Additional modelling has been requested in response to IR-89 that considers higher K values in the desilicified zone. Such additional modelling would assist in assessing if ore zone permeability is not important to the fate and transport of COPCs, as asserted by the Proponent.</p>	Scenario	As, µg/L	Se, µg/L	U, µg/L	Base case	0.782	0.835	0.550	5 (highest combined K values for LSS and ISA)	0.982 (25.6% )	1.28 (53.3 %)	1.54 (180 %)	6 (highest K value for LSS)	1.10 (40.7% )	1.44 (72.4 %)	1.81 (229 %)	7 (increased ore zone K)	1.58 (102%)	1.47 (76.0 %)	0.769 (39.8 %)	Screening Criteria	5	2	15	scenarios presented in the revised Draft EIS and additional scenarios presented in IR-89-R1 remain below groundwater quality screening criteria (except for a small number of constituents that have naturally elevated concentrations relative to criteria).	
Scenario	As, µg/L	Se, µg/L	U, µg/L																														
Base case	0.782	0.835	0.550																														
5 (highest combined K values for LSS and ISA)	0.982 (25.6% )	1.28 (53.3 %)	1.54 (180 %)																														
6 (highest K value for LSS)	1.10 (40.7% )	1.44 (72.4 %)	1.81 (229 %)																														
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Screening Criteria	5	2	15																														
IR-71	-	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	Context: The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge	<p>This response has not been accepted.</p> <p>The effect of climate change on groundwater recharge in Prairies or Canada is generally</p>	In response to the comment, the following text has been added to the revised Draft EIS, Section 7.7.1.	<p>Yes</p> <p>Revised Draft EIS Section 7.7.1.</p>																								

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p> <p>Rationale: It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.</p>	<p>for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.</p>	<p>uncertain due to the large degree of uncertainty in the modelling of future recharge although future changes in temperature and precipitation are expected to alter groundwater recharge (through changes to runoff, evapotranspiration, and snow accumulation). While CNSC staff accepts the response on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area, no justification has been provided on why quantitative analysis was not completed to address the effect of climate change on groundwater recharge.</p>	<p>“Quantification of the effects of climate change were not specifically addressed because the case of reduced groundwater recharge (i.e., the most relevant parameter which could change within the groundwater flow system), and thus a lower driving force for transport, was considered less conservative than the scenarios tested.”</p> <p>The text above has been added to Section 7.7.1 of the revised Draft EIS based on the following. To confirm this assumption, (two) additional modelling sensitivity scenarios were run where groundwater recharge was varied by +/- 20%, which recognizes the uncertainty in future climatic conditions. The 20% range of recharge variability is conservatively estimated based on predictions from Environment Canada (climatedata.ca – Key Lake; Precipitation will increase by 11 to 15%, and temperature will increase by 2.5 to 4.6°C) and is consistent with the range of variability that others (e.g., Erler et. al, 2019) have found for the foreseeable future (i.e., end of century). Details of these additional scenarios are included with Attachment IR-89-R1.</p> <p>Both scenarios did not appreciably change peak COPC concentrations in groundwater reaching Whitefish Lake relative to the base case conditions, and all constituent concentrations remain below groundwater quality screening criteria. Consequently, climate change is not considered to change the overall groundwater risk as presented in the EIS documentation provided to date.</p> <p><b>References:</b></p> <p><i>Erler, A. R., Frey, S. K., Khader, O.,d’Orgeville, M., Park, Y.J., Hwang, H. T., et al.</i> (2019). Evaluating climate change impacts on soil moisture and groundwater resources within a Lake affected region. Water Resources Research, 55, 8142–8163. <a href="https://doi.org/10.1029/2018WR023822">https://doi.org/10.1029/2018WR023822</a></p>	
IR-72	-	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<p>Context: Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.</p> <p>Rationale: It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?</p>	<p>Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.</p>	<p>This response has not been accepted.</p> <p>CNSC staff request that Denison discuss the potential for excursions of brine from freeze wells and that they include a summary of plans to monitor these using key indicators of freeze wall brine migration, such as electrical conductivity (EC) and chloride (CaCl2), in the EIS (even at a high level if these are still being currently developed).</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>In consideration of the review comment, the following text has been added to the revised draft EIS to address this IR.</p> <p>Section 7.8.2: “One additional parameter, chloride, has been included as a key parameter. It is possible that mobilized chloride concentrations are higher in the injected fluids than in groundwater; however, this is not the primary intent of including this parameter in the routine monitoring. Rather, calcium chloride brine makes up fluids that maintain the freeze wall. Thus, a change in the concentration of chloride - and EC - may indicate that a loss of freezing capacity has occurred in the freeze wall, representing an excursion, and delineate the extent of brine migration. However, loss of freezing is considered as an accident and malfunction, and loss of freezing is expected to be signaled much earlier by operational monitoring (e.g., pressure changes in the cooling circuit) than through monitoring of water quality.”</p> <p>Section 7.8.2.2.2: (The text in italics has been added)</p>	<p>Yes.</p> <p>Revised Draft EIS, Sections 7.8.2 and 7.8.2.2.2, Executive Summary Section 3.4.2.1.</p>

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								“The groundwater monitoring network during Operation will focus on groundwater conditions within and on the outside perimeter of the freeze wall, and evaluation of changes in groundwater quality including detection of excursions from potential loss of freezing capacity.”	
IR-75	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<p>Context: The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the Proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.</p> <p>Rationale: By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the Proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.</p>	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.	<p>This response has not been accepted.</p> <p>As stated in the original comment, the geomechanical study (Appendix K of Appendix 7-A of EIS, RESPEC 2021) showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays. Although the Proponent has conducted additional numerical modelling by adding the desilicified sandstone into the model with conservative mechanical properties for this zone, the mechanical properties of other materials are basically same as the original modelling (i.e., empirically derived average material properties of key stratigraphic layers). The new modelling (RESPEC 2023, i.e., Attachment IR-21) does not address the uncertainties associated with the non-site specific physical and mechanical parameters of different rock formations used for the modeling. Some mechanical parameters used appear to be inadequate, e.g., the mechanical properties of overburden and rock-mass modulus of desilicified sandstone. The use of isotropic in-situ stress state is non-conservative. No sufficient justification/rationale is provided on the excavation of 30 percent of rock by volume from the high-grade ore zone to which 50% was used in the RESPEC (2021), which could have significant impact on the modelling results. In addition, Figure 2 of Attachment IR-21 does not show the desilicified sandstone although it is stated that the desilicified sandstone is considered in the modeling. Also see CNSC’s disposition to Denison’s response to IR-83.</p>	<p>There are a number of second round IRs on the theme of effectively 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p><u>Material Properties and the Desilicified Sandstone:</u> An update to the geomechanical study (RESPEC, 2024) is presented as Appendix K to Appendix 7-A, that clearly shows the Desilicified Sandstone in Figure 2a and 2b (versus the previous version of the report; Annex 1, Attachment IR-21 starting on page 134/419). In the modelling, sandstone that has been hydrothermally altered includes the Altered Sandstone and Desilicified Sandstone. Details on how the Altered and Desilicified Sandstones were delineated is provided as part of IR-83. The Desilicified Sandstone was included in the updated modelling to provide a more conservative approach from prior models. Cohesion values were set to ‘0’ to demonstrate a conservative approach. Material properties for the Altered Sandstone and other stratigraphy remained unchanged from prior models as these values are deemed appropriate based on site-specific knowledge and comparable to other Athabasca Basin uranium deposits of similar settings.</p> <p><u>Excavation of rock mass:</u> Random rock removal was adopted to represent the in-situ leaching process in the numerical model and included the instantaneous removal of 30% of the rock mass by volume from the high grade zone and 3% volume from the low grade zone. The volume of rock removed in the model is consistent with values achieved through site specific long-term testing of high and low grades cores at an accredited lab facility. As the high and low grade zones of the deposit encompass several stratigraphic layers, these values incorporated into the model represent a conservative approach.</p> <p>Denison believes it has fulfilled its requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on this topic for concluding the EA process. Notwithstanding that, Denison recognizes that further information may be required as the Project moves past the EA and into the licensing and permitting phases. To support licensing, Denison will provide further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their potential impacts on the mine operation and closure.</p>	No



IR Response Table  
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February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								We also highlight the role of the Project's decommissioning plan and associated cost estimate as a core document guiding Project aspects in the post-decommissioning period in general, and the mining area decommissioning objectives in particular. As the Project advances, the details of the decommissioning plan will naturally become more refined and will build on experience gained during operations, including mining, monitoring, and additional laboratory studies. The decommissioning plans are built on a 'decommission tomorrow' scenario and the financial guarantees will be developed in consideration of potential well breakages.	
IR-76	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<p>Context: Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.</p> <p>Rationale: Failure of steel casing may result in process loss or alter groundwater flow and quality.</p>	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.	<p>This response has not been accepted.</p> <p>CNSC staff request that Denison include summary of the potential for steel casing failure and plans for monitoring and mitigating its effects (such as the response to IR-76) within the EIS, for SME review and acceptance.</p>	<p>With regards to steel casing failure and plans for monitoring and mitigating its effects, the following is noted:</p> <p>Mitigation of steel casing failure is accomplished by the injection and recovery well designs and operational monitoring of the wellfield. The well design is already described in the revised draft EIS in Sections 2.2.1.4.1 and 2.2.1.4.2. Each well will have double containment: mining solution will travel inside an inner casing with the outer casing acting as secondary containment for the mining fluids. See below for operational monitoring discussion.</p> <p>Potential for steel casing failure: Conditions with respect to the potential for steel casing failure are addressed in IR-75. An additional hazard scenario has been added to the revised Draft EIS (Annex 1, IR-213 on page 76/419), to further address the potential for failure conditions associated with the steel piping. The new hazard scenario was added to Table 3-2 in Appendix A of Appendix 14-A (Accidents and Malfunctions Assessment) as Scenario 2.4 Well Casing Yield and/or Damage. For reference and based on hazard screening analysis provided in Appendix A of Appendic 14-A, this scenario is evaluated to be a low likelihood scenario (2) with moderate consequence (score 3) for an overall risk ranking of low, and accordingly was not advanced for further more detailed analysis beyond initial risk screening. The scenario is viewed as a low likelihood scenario due to the proposed multilayer design of the injection / recovery well design.</p> <p>Monitoring: The following details of monitoring of injection and recovery wells will be added to Section 2.8 of the revised Draft EIS: “Well casing integrity will be monitored in a rigorous fashion, thereby allowing Denison to respond to any steel casing failures in a timely manner. A network of monitoring wells installed within the freeze wall area will be equipped with pressure instrumentation for the determination of the vertical strain/stresses placed on the formation. This monitoring network is designed to detect if these strains may be deviating from their acceptable levels and beyond the design tolerance prior to failure. The injection and recovery wells will also be equipped with continuous monitoring devices for pressure and temperature that can detect a breach in the well casing if one were to occur. These data will be transmitted to the processing plant for remote monitoring through a master control system. Through the master control system, operators will be capable of controlling pumphouse production lines remotely. Wellfield monitoring will facilitate detection of any issues with the injection and recovery wells. As a further preventative measure, annual mechanical integrity testing is conducted on the wells to ensure their containment and compliancy. Active monitoring will allow for operational shutdown of the individual well in</p>	<p>Yes</p> <p>Revised Draft EIS, Section 2.8</p>

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								the instance that conditions that could lead to a failure are indicated to prevent loss of process related chemicals into the freeze wall area”.	
IR-78	-	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity  Appendix 7-C, Section 2.3.2.1, Porosity Values	<p>Context: This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally,, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p>Rationale: The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests, were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.</p>	<p>This response has not been accepted.</p> <p>Effective porosity is an important parameter to understanding groundwater flow and contaminant transport. The Proponent states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, including porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to explain this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p>In response to the IR, the Proponent explained and supported their methodology for selecting a value for effective porosity. This method included consideration of literature values and a regional analogue at Cigar Lake. ECCC notes that a tracer test was conducted, the results of which were not considered in the selection of the effective porosity parameter.</p> <p>If field test data is available that is potentially relevant to determining effective porosity, it should be included in the EIS when discussing effective porosity. The field test data should also be made available for ECCC to review, to confirm the conclusions reached by the Proponent. ECCC acknowledges that other sources of information can be useful when explaining the most appropriate value for effective porosity such as literature values and regional analogues, as per the Proponent’s IR response. However, field test results should be presented in the EIS and considered as a part of such an explanation. If the</p>	<p>There are a number of second round IRs associated with the theme of 'failure scenarios' related to well breakage, hydraulic containment, and GW model parameters. Denison and its SMEs have interpreted these IRs to be asking effectively how far outside the bounds of the design basis will failure occur. Within that context, Denison and its SMEs believe the work done to date adequately describes expected effects for design basis, has sufficiently considered appropriate levels of conservatism and has tested assumptions with sensitivity cases so as to render the need for such failure analysis as envisioned by the review comment as unnecessary. Such analyses would be based on assumptions that would not be defensible and in Denison and its SMEs view would cause confusion.</p> <p>The forced gradient tracer test undertaken by Petrotek (2022) was designed to evaluate the degree of capture that could be achieved using injection and extraction wells oriented in a star pattern within a relatively small (i.e., 5 to 10 m radius surrounding GWR-040) portion of the ore zone. Based on the purpose and relatively small scale of the test, Denison and its SMEs do not consider the test conditions/results to be representative of groundwater migration pathways post-decommissioning. Further, the tracer test was performed after permeability enhancement efforts (e.g., MaxPerf, Gas Gun and Kraken tools) which are designed to enhance the effective porosity beyond the natural state. Effective porosity values from this testing were never published and were not considered relevant to the scale of the EA modelling based on the small scale of the evaluation, and the impact of permeability enhancement measures. However, effective porosity values derived from the peak arrival time at extraction wells were computed to range from 1 to 7%, which is in line with the effective porosity value assigned for the ore zone pre-mining (i.e., 1%); higher values are expected within the ore zone post-mining which will result in increased travel times.</p> <p>The discussion above has been summarized in the revised Draft EIS, in Section 4.5. Additionally, it is noted that effective porosity values applied in the groundwater flow and transport models were selected to be consistent with the available literature, including those applied by AECL at Cigar Lake (AECL, 1994).</p> <p>Despite the above, and in consideration of the review comment, an additional conservative sensitivity geochemical reactive transport scenario was performed to evaluate a lower effective porosity within the paleo-weathered zone (PWZ). The PWZ is simulated to be the area wherein mass is most persistent and so reducing the effective porosity within this zone allows initial source mass to migrate out of the paleoweathered zone toward receptors faster. For this scenario, the effective porosity was lowered by a factor of 10 for this unit to reflect a more fracture-dominated transport condition, with limited matrix diffusion. Slightly higher peak concentrations were simulated for a number of COPCs (including As, Cd, Co, Cu, Ra-226, Se, and Zn) relative to base case concentrations, but all peak concentrations remained below groundwater quality screening criteria beneath Whitefish Lake. Details of the scenario are provided in Attachment IR-89-R1 for reference.</p>	Yes,  Appendix 7-C, Section 4.5



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							<p>Proponent feels that not utilizing field test data is the most accurate approach when selecting an effective porosity value, then this conclusion should be reached with consideration of the field test data as a part of the evaluation.</p> <p>Provide a discussion of how the effective porosity values are selected, including a discussion of how field test results were considered. This information is necessary to confirm that the selected effective porosity values are valid. This also relates to IR-52.</p>	<p>The results of the additional simulation confirm our understanding that uncertainty in effective porosity does not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon.</p>	
IR-81	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p>Context: The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p>Rationale: Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	<p>Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., <math>\delta^2\text{H}</math>, <math>\delta^{18}\text{O}</math>) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.</p>	<p>This response has not been accepted.</p> <p>CNSC staff agree with the interpretations drawn from the information presented in the response to IR-81. However, it remains that the EIS does not contain an assessment of the tritium data presented, aside from the text quoted in the original IR-81 relating to Section 4.3.3 of Appendix 7-A. As such, CNSC staff request that Denison revise the EIS to include a high-level summary of the tritium data presented in the response to IR-81, being (i) the data is limited in value to conceptual model development, (ii) conclusions from tritium data at Cigar Lake at not reproducible with the current dataset, and (iii) Denison will continue to monitor tritium to further evaluate the usefulness in refining the conceptual model.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The discussion of tritium has been added as Appendix L of Appendix 7-A of the revised Draft EIS. Text referring to Appendix L of Appendix 7-A has been updated in the following Sections:</p> <p>Section 4.2.2. of Appendix 7-A: “Groundwater Ageing: Tritium Values”.</p> <p>This new subsection has the following text, summarizing what is presented in Appendix L to Appendix 7-A</p> <p>“The potential for analysis of tritium concentrations in groundwater to support ageing of groundwater and the development of the CSM for the Wheeler River program was evaluated using the available analytical data and information on tritium concentrations in precipitation. The analysis is presented in Appendix L. It was concluded that, beyond supporting recent groundwater recharge in the overburden and the upper sandstone aquifer – discussed further below (Section 4.3.3) - tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface for the Wheeler River Project. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.”</p> <p>Section 4.3.3 of Appendix 7-A, subsection: “Local Groundwater Flow System”. The following text has been added:</p> <p>“Recharge Conditions: Analysis of tritium values in groundwater from the Local Groundwater flow system is presented in Appendix L. Results suggest that groundwater in this flow system has been recently recharged, in the last approximately 12-25 years, but that residence times can be longer in localized areas of the flow system”.</p> <p>Revised draft EIS Section 7.8.2:</p> <p>“In addition to the above parameters, tritium concentrations will also be measured in groundwater to further analyze the potential to age groundwater in the subsurface.”</p>	<p>Yes</p> <p>Appendix L of Appendix 7-A.</p> <p>Appendix 7-A Section 4.2.2 and 4.3.3</p> <p>Revised Draft EIS, Section 7.8.2</p>
IR-83	-	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p>Context: Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the</p>	<p>Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip</p>	<p>This response has not been accepted.</p> <p>As stated in the CNSC’s disposition to Denison’s response to IR-75, Figure 2 of Attachment IR-21</p>	<p>The RESPEC (2024) study is provided as Appendix K to Appendix 7-A and has been updated to show the desilicified zone in Figures 2a) and 2b). The material properties of the</p>	<p>Yes</p> <p>Appendix K to Appendix 7-A.</p>

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					<p>developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p> <p>Rationale: Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.</p>	<p>model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.</p>	<p>(RESPEC 2023) does not show the desilicified sandstone although it is stated that the desilicified sandstone is considered in the numerical modeling. Therefore, the extent of desilicified sandstone modelled is not clear. It is also not clear where the vertical plane represented by Figure 2 is cut from Figure 1. The linkage between the geomechanical model represented by Figure 2 in RESPEC (2023) and the geological model in EIS S07 is not provided.</p> <p>Please provide the requested information.</p>	<p>desilicified zone are given in Table 1 of Appendix K, and represent conservative values for the purpose of collapse / subsidence analysis.</p> <p>The vertical plane represented in Figure 2a) is now explicitly shown as part of Figure 2a).</p> <p>To clarify the linkage between the models presented in the geomechanical study and the regional hydrogeology Conceptual Site Model (CSM) developed in Appendix 7-A and associated groundwater flow and transport model presented in Appendix 7-C, the following text was added to the revised Draft EIS as a preface to Appendix K of Appendix 7-A (page K.1 of Appendix 7-A).</p> <p>“The information presented in Appendix K was based on the same geologic information as was used herein to develop the regional hydrogeology CSM for the Project. A clarification is provided, however, on differences in terminology for the desilicified zone used between the two reports.</p> <p>Herein, the desilicified zone was delineated using rock core RQD, friability and fracture frequency (Section 3.4.4). Specifically, to delineate the desilicified zone in the hydrogeology CSM, core with a friability of 3 or greater was interpreted to be hydrothermally altered sandstone of high relative porosity and permeability in comparison to the unaltered Athabasca Supergroup Sandstones, through substantive loss of matrix silica content (10% or more; Sorba and Tetland, Personal Communication).</p> <p>In the RESPEC (2024) report, differentiation was made with respect to the level of desilicification of the altered sandstones using the terms “Altered Sandstone” and “Desilicified Zone”. The “Altered Sandstone” was delineated using the same friability criteria as was used in the hydrogeology CSM to define the desilicified zone (i.e., a friability of 3 or more). The “Desilicified Zone” was delineated in RESPEC (2024) using a friability of 4, which represents extreme desilicification of the rock matrix (loss of matrix silica of up to 30% or more; Sorba and Tetland, Personal Communication). The zones of extreme desilicification were differentiated from the rest of the Altered Sandstone and ascribed very conservative average material properties presented in Table 1 of Appendix K. These average material properties included zero cohesion. As the objective of the geomechanical study was to evaluate the potential for bedrock collapse within the freeze wall above the ore zone, it was important to differentiate these zones of no cohesion for a worst-case scenario assessment.</p> <p>Thus, the linkage between the two studies is as follows: the combined Altered Sandstone and Desilicified Zones shown in Figure 2a and 2b of Appendix K correspond to the “Desilicified Zone” shown in this report as Figures 9, 10, 12, and 29.”</p> <p><b>References:</b></p> <p>Sorba, C. and Tetland, M. Discussion of Project geology and minerals in once open fractures. Oral communication, Chad Sorba and Mikkel Tetland, Denison Mines to the Ecometrix team.”</p>	
IR-84	-	CNSC	Geology and Groundwater	Appendix 7-C	<b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge	1. Please clarify in Figure 2-10 where the point streamflow measurements were conducted	This response has not been accepted, as the issue has not been sufficiently clarified.	The reviewer is perhaps confused about what is being referred to as Whitefish Lake in the reporting, and this may be due to the placement of the label for the lake on the referenced figures. Whitefish Lake consists of two lobes. A northern lobe and southern	Yes

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					<p>to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.</p> <p><b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.</p>	<p>upstream and downstream of Whitefish Lake.</p> <p>2. Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.</p>	<p>1. In Appendix 7-C of the EIS, Figure 2-10 shows that Whitefish Lake is between SA-5 and SA-6, not SA-2 and SA-6. Additionally, under the heading "Surface Water Stations" of Table 2-7 are “SA-6 <b>to</b> SA-2”, not “SA-6 <b>and</b> SA-2”.</p> <p>2. Figure 2-10 does not show SA-7. Surface water flow direction should be illustrated to help understand the relative location of upstream and downstream. Additionally, under the heading of “feature monitored” of Table 2-7 is “flow from LA-6 to Whitefish Lake”. Figure 2-10 shows LA-2, but no LA-6.</p>	<p>lobe, separated by a narrow segment where station SA-6 is located. To avoid the label for Whitefish Lake interfering with information presented on multiple figures, the label appears overlying the northern portion Whitefish Lake. However, the northern portion of the lake is upstream and distant from the ore zone. There is no discharge of groundwater from the ore zone to the northern portion of Whitefish Lake, and that is why it is not discussed within the EIS.</p> <p>Conversely, the southern portion of Whitefish Lake (i.e., between SA-6 and SA-2) is the area of primary interest with respect to potential environmental effects due to groundwater discharge, as that portion overlies the interpreted desilicified zone. The southern portion of the lake is entirely within the groundwater model domain and receives groundwater discharge from both the east and west directions. As such, simulated discharge to the lake can be directly compared to the measured increase in stream baseflow between the monitoring station upstream (SA-6) and downstream (SA-2) of the portion of Whitefish Lake which is of interest.</p> <p>For brevity, we have referred to the southern portion (i.e., also referred to as LA-5) as “Whitefish Lake” in the modelling assessment (Appendix 7-C).</p> <p>The revised draft EIS has been revised by updating the label location for Whitefish Lake on the figure, and adding a bold outline of the portion of the lake we are referring to as “Whitefish Lake”. In addition, have updated the text within Table 2-7 to clarify that the “Feature Monitored” is the “Flow through the Southern portion of Whitefish Lake as indicated on Figure 2-10”.</p>	Appendix 7-C, Section 2.5.2.5 (Table 2-7) and Figure 2-10
IR-86	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.</p> <p><b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.</p>	<p>Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.</p>	<p>This response has not been accepted.</p> <p>The response is acceptable, but the information as explained in the response should be incorporated in the appropriate sections of Appendix 7-C.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The text in Appendix 7-C, Section 2.7.2, of the draft EIS has been updated with the following paragraph:</p> <p>“The calibrated, steady-state model was used as the basis for the transient model used to evaluate drawdown during operations. Only conditions immediately at the mining zone were altered within the transient model to reflect the proposed changes during mine operation. All boundary conditions that drive regional groundwater flow were unchanged for the transient model, and all hydrogeologic properties outside of the mining area were left unchanged. Changes made to the hydrogeologic properties were implemented transiently to represent the phased implementation of the freeze wall. Groundwater recharge changes were made to reflect alterations to surficial land use and the implication to groundwater recharge, and transient pumping boundary conditions were added to simulate the planned pumping demand for camp and ISR water requirements. The transient version of the model was used to evaluate changes to the groundwater discharge occurring at Whitefish Lake.”</p>	Yes  Appendix 7-C, Section 2.7.2
IR-88	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water</p>	<p>It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active:</p> <p>1. Determine the groundwater residence</p>	<p>This response has not been accepted, as the following point was not adequately addressed:</p> <p>1. It is recommended that groundwater residence time in the lower sandstone aquifer be estimated and compared with the simulated residence time in</p>	<p>We believe that the reviewers’ question on residence time is a function of a misunderstanding of the figures presenting the groundwater plume evolution, and the portions of the model which represent the lower sandstone, ore zone, and paleoweathered zone on Figures 4-6, 4-7, 4-8, and 4-9 of Appendix 7C. This includes an apparent misunderstanding of the conservative distribution of the source area assumed to contain “Restored solution” post-decommissioning (see Figure 4-1, Appendix 7-C).</p>	Yes  Revised Draft EIS, Section 7.6.2.2.3

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					<p>for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p> <p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left</p>	<p>time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</p> <p>2. Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</p> <p>3. Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</p>	<p>the numerical model. Otherwise further justification should be provided why this is not possible.</p> <p>Groundwater residence time can be estimated using isotopes (the reference below is an example paper in this regard).</p> <p>Reference: Martin Kralik (2015), How to Estimate Mean Residence Times of Groundwater. Procedia Earth and Planetary Science, Volume 13, Pages 301-306.</p>	<p>To avoid cluttering the time-snapshot sequence figures (Figures 4-6 to 4-9), the location of the hydrogeologic units is labelled on Figure 4-6 only. As indicated on this figure, the most persistent portion of the source area for all constituents is contained within the paleoweathered zone (PWZ). The source is persistent within the PWZ due to the lower hydraulic conductivity of this weathered basement rock. The portions of the source area containing restored solution (refer to Figure 4-1) overlying the PWZ in Figures 4-6 to 4-9, are shown to contain significantly lower concentrations over time and eventually return to inflowing background concentrations.</p> <p>To clarify the above within the revised Draft EIS, the following has been added to Section 7.6.2.2.3:</p> <p>“The area simulated to be a source of contaminant mass Post-Decommissioning includes the Ore Zone, the overlying Lower Sandstone Aquifer (i.e., 50 m above the Ore Zone), and the underlying Paleoweathered bedrock (Section 7.6.2.1). As indicated in Figure 7.6-7, elevated concentrations of even conservative COPCs persist within the Paleoweathered zone due to its lower hydraulic conductivity (i.e., it takes longer for COPCs to be flushed out of this zone).”</p> <p>For addition reference the following are noted.</p> <p>Isolation of Ore Zone: There is no simulated isolation of the ore zone or the lower sandstone aquifer. In contrast, the mass contained within the ore zone is simulated to freely exit that zone and migrate through the overlying desilicified zone, as is the source mass that originates within the overlying lower sandstone units.</p> <p>Residence times within the lower sandstone aquifer include both the time for advective transport as well as the time for sorbed mass to de-sorb and re-join the advective-dispersive transport. The desorption process continues over time, with the mass of a given constituent partitioned to groundwater from this process continually decreasing (i.e., as sorbed mass overall decreases), resulting in a source tail effect within the lower sandstone, ore zone and within underlying PWZ.</p> <p>Regardless, to demonstrate the robust nature of the hydrogeologic setting, an additional transport simulation was performed wherein the effective porosity of the paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate out of the paleoweathered zone toward receptors 10-times faster. The results of that simulation are discussed as part of the response to IR-78 and do not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon. Details of the scenario are presented as part of Attachment IR-89-R1.</p> <p>With respect to the use of isotopes, although potentially informative, the isotope methods presented in Kralik (2015), are for the most part impractical, in that they require substantive volumes of water (e.g.&gt; 200 L of water), and thus would be required to be applied in a very targeted fashion to address very specific matters. This is worthy of consideration, but outside of the scope of the EIS. The use of stable isotopes of oxygen and hydrogen in water (<math>\delta^2\text{H}</math>, <math>\delta^{18}\text{O}</math>) were determined to offer little value for CSM</p>	



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					<p>unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be If the mined-out zones collapse.</p>			<p>development for the Project in terms of source of groundwater. Determining water source and groundwater ageing in the study area was discussed in the first-round response to IR-81 (Annex 1, IR-81 starting on page 216/419). Tritium concentrations in groundwater are considered potentially informative to the CSM and will be measured as part of ongoing groundwater monitoring for the Project as outlined for IR-81.</p>	
IR-89	-	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REdox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more</p>	<p>This response has not been accepted.</p> <p>The Proponent used calibration-constrained uncertainty analysis to establish boundaries when conducting sensitivity analysis of hydraulic conductivity in the groundwater model.</p> <p>For sensitivity analysis to adequately manage uncertainty, parameter values that are outside of those determined by calibration-constrained uncertainty analysis should be used. There always exists some degree of uncertainty in using hydrogeologic data as a complete representation of a regional groundwater system. This uncertainty can be accounted for by broadening parameter</p>	<p>In our SME’s experience, traditional “sensitivity analysis” where individual parameters are arbitrarily varied by within a subjective range can produce simulations which are inconsistent with the field-observed data. Such simulations should not be part of an EIS, as they can provide misleading results.</p> <p>Calibration-constrained uncertainty approach does not assume the data or the representation of the system are perfect or complete. Calibration-constrained models do not require a perfect fit to all the observed data, which is a recognition that there is measurement noise and structural noise present in every model. In addition, potential error in that data was accounted for by rounding the observed water levels to the nearest 0.1m (i.e., the data were not considered “perfect”) and allowing a general fit to all data (i.e., residuals are present at each observation point). Further, the analysis does not consider the data provide a “complete representation of the broader groundwater system” nor does it imply the data provides a “perfect and complete representation of the broader groundwater system”. Instead, the calibration-constrained approach tests sets of</p>	No

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					<b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.	conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.  See also related: IR-96.	ranges in a sensitivity analysis. Limiting sensitivity analysis to calibration-constrained values implies that available field data is a perfect and complete representation of the broader groundwater system, which may not be an accurate assumption.  Considering the limitations of available physical data in the Desilicified Zone, a more conservative sensitivity analysis is required in order to adequately assess how contaminants may flow towards Whitefish Lake.  Please also see follow-IR-89-R1, and AD-66 in the Advice to Proponent table.	parameters within a broad range, wherein only parameters which are well informed by available observation data are constrained, while parameters not constrained by calibration data are allowed to vary more freely (i.e., to the degree that they do not otherwise impact the well-informed parameters).  For the uncertainty assessment presented in the draft EIS, hydraulic conductivity parameters along the flow path between the ore zone and Whitefish Lake were allowed to vary within a 4-order of magnitude range (i.e., 1x10 <sup>-8</sup> to 1x10 <sup>-4</sup> m/s) to find alternative parameter sets that achieve a reasonable match to observation data. With this approach, values are not varied independently, but rather parameter combinations are sought that explore the potential 4-order of magnitude range for parameters, while maintaining a match to field-observed conditions.  The most conservative of the calibrated scenarios obtained through the calibration-constrained approach presented within the EIS (i.e., those which achieved acceptable calibration statistics) were chosen for additional transport simulations. The scenarios tested hydraulic conductivity values for the desilicified zone as high as 3.7x10 <sup>-5</sup> m/s (realization 7 – predictive uncertainty case 5), which is two times higher than any measured value within this hydrogeologic unit, and 7.4 times higher than the base case calibration. Hydraulic conductivity values as high as 8.1x10 <sup>-5</sup> m/s were also tested within portions of the lower sandstone aquifer. In addition, the simulation documented as part of IR-55 presents a model wherein the hydraulic conductivity of the desilicified zone is 1x10 <sup>-4</sup> m/s, which is 20 times higher than the base case.  In summary, we reaffirm that we have already provided an ample demonstration of the potential range of outcomes which are supported by the observation data at the site.	
IR-89	IR-89-R1	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone  IR-89 Response from Denison	<b>Context:</b> The Proponent states that the range of hydraulic conductivities considered in sensitivity analysis was limited to values that fit within a calibration constrained uncertainty analysis of the model.  Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on the aquatic environment.  The Proponent clarified the details of the calibration-constrained uncertainty analysis that was used for parameter bounding within the model, with hydraulic conductivity sensitivity bounds determined based on model calibration values that were supported by the available physical data.  <b>Rationale:</b> ECCC agrees that calibration constrained uncertainty analysis using hydraulic head field data is useful to	Expand the sensitivity analysis of hydraulic conductivity outside of calibration constrained parameters to account for the lack of physical data in the Desilicified Zone.		See the Response to IR-89 for discussion regarding the calibration-constrained uncertainty analysis approach. As stated, we believe that asking for scenarios outside of the range supported by the available monitoring data is inappropriate as it suggests that unrepresentative, potentially misleading scenarios should be tested, documented, and presented as potential outcomes. We do not believe that should be part of an EIS.  While we do not support development of un-calibrated scenarios for inclusion within the EIS, additional scenarios that did not violate field observation data were evaluated as part of this response and presented as Attachment IR-89-R1. These scenarios further demonstrate the robust nature of the hydrogeologic setting, which has been shown to have a high assimilative capacity.  Additional groundwater flow and transport modelling scenarios were performed in response to:  <ol style="list-style-type: none"><li>IR-55, wherein the hydraulic conductivity of the Intermediate Sandstone Aquitard was increased to a maximum value of 1.0E-7 m/s, and other parameter values, including the hydraulic conductivity of the Desilicified Zone, were increased to maintain a calibrated condition.</li></ol>	No



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					determine probable upper limits of K values. However, there is always some degree of uncertainty in groundwater data and models. Sources of such uncertainty may include errors, lack of complete and representative field data to determine key parameters, or any number of heterogeneities associated with groundwater systems over large scales. Such uncertainties will always exist and can be accounted for by conducting a sensitivity analysis that accounts for the lack of physical data in the Desilicified Zone by running modelling scenarios using parameters that are outside of the calibration constrained values.			<div>2. IR-70, wherein a higher hydraulic conductivity within the Ore Zone post-decommissioning was tested. This is an uncertain parameter which is unconstrained by calibration data.</div> <div>3. IR-71, wherein uncertainty in future groundwater recharge rates were evaluated by varying rates by +/- 20%. Future groundwater recharge is an uncertain parameter which is unconstrained by calibration data.</div> <div>4. IRs 78 &amp; 88, wherein the effective porosity of the Paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate toward receptors 10-times faster. Effective porosity of the Paleoweathered zone is an uncertain parameter which is unconstrained by calibration data.</div> <div>5. IR-96, wherein the transverse dispersivity was reduced to 1m to be consistent with ratios of longitudinal-to-transverse dispersivity published in the literature (e.g., Gelhar et al.; 1992) based on anisotropic settings. Transverse dispersivity is an uncertain parameter which is unconstrained by calibration data.</div> <div>The results of these simulations are presented as part of an attachment, however in summary all scenarios produced concentrations of primary COPCs at Whitefish Lake that are below the Groundwater Quality Screening Criteria established. Exceptions include pH, iron and manganese due to naturally high background levels, as reported within the EIS.</div> <div>The scenarios presented do not change the outcome of the scenarios already reported within the EIS documentation, nor in conclusions based thereon. Thus, we did not see the need to modify the EIS.</div>	
IR-96	-	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (1x10-9 m2/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)” . The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.</p>	<div>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</div> <div>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</div> <div>See also related: IR-89.</div>	<div>This response has not been accepted.</div> <div>CNSC staff appreciate the comprehensive information provided relating to longitudinal dispersivity and variation based on scale. However, it should be noted that guidance from Gelhar et al. (1992) and the BC MOE (2012) indicate that horizontal transverse dispersivity values should be approximately 1 order of magnitude lower than longitudinal dispersivity values, and vertical transverse dispersivity values should be approximately 2 orders of magnitude lower than longitudinal dispersivity. For the model presented in the EIS, transverse dispersivity is represented by a singular value of 5 meters, with the supporting rationale that the Gelhar et al. (1992) identified 5 meters as a representative value. It is important to note that the Gelhar et al. (1992) paper considered 5 meters to be representative for horizontal transverse dispersivity and identified that vertical transverse dispersivity is smaller than horizontal transverse dispersivity. Additionally, it is important to note that Petrotek (2021) used a transverse dispersivity of 1 m in their numerical models of the</div>	<div>As with all parameters, the values applied in the modelling analyses were intended to provide appropriate, but conservative transport predictions. It is the opinion of Denison and its SME that the dispersivity values applied are appropriate, conservative and supported by the literature values, as highlighted within the previous response to this IR (Annex 1, Attachment IR-96 starting on page 251/419). We acknowledge that Gelhar et al. (1992) recommend a 1 order of magnitude lower horizontal transverse dispersivity value, and a 2-order-of-magnitude lower vertical transverse dispersivity value, but note that such recommendation was based on observations of horizontal plume migration within overburden sand aquifers with highly anisotropic conditions (i.e., Borden and Cape Cod), which is <b>not</b> representative of the current setting. In their paper they state: “The vertical transverse dispersivity is seen to be much smaller than the horizontal transverse dispersivity, apparently reflecting the roughly horizontal stratification of hydraulic conductivity encountered in permeable sedimentary materials“. The BC MOE Guidance (2012) is considered to be a derivative of the Gelhar paper and does not add any further value.</div> <div><b>Transverse</b> dispersivity refers to spreading of the plume in the directions perpendicular to the primary advective (i.e., groundwater flow) direction. As noted in the previous response to this IR (Annex 1, Attachment IR-96 starting on page 251/419)., the transverse dispersivity value of 5 m is supported by Gelhar et al. (1992) for the scale of this site. If a 10:1 ratio of longitudinal to transverse dispersivity were implemented, a much higher longitudinal dispersion coefficient would be suggested (and supported by Gelhar et al. (1992)), which would result in even lower breakthrough concentrations at Whitefish Lake.</div>	<div>Yes</div> <div>Appendix 7-C, Section 4.4.4</div>

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					<p>Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p><b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>		<p>ore zone aquifer. CNSC staff thus request that Denison provide further information relating to why horizontal and vertical transverse dispersivity are represented using a singular value, and how this value is considered appropriate to represent both dimensions.</p> <p><b>Reference:</b> Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.</p>	<p>Recognizing this, we submit that the values applied within the scenarios documented as part of the EIS are already conservative.</p> <p><b>Vertical and Horizontal transverse</b> dispersion were treated as being equivalent (i.e., as having the same value) for this site as the dominant plume transport occurs within the desilicified zone, which is interpreted to be, and simulated, as isotropic. In isotropic media, transverse spreading should be allowed to occur equally in any transverse direction; this differs in anisotropic media, where vertical transverse spreading of the plume is lower than horizontal transverse spreading due to restricted vertical connections (i.e., joints in fractured rock, or sediment layers in sedimentary media). Further, during the vertical migration through the desilicified zone, transverse dispersion is in the X, and Y cartesian coordinates; we have no reason to expect dispersion in either of these directions is preferential, and therefore the horizontal and vertical transverse dispersivity values should be the same.</p> <p>The above discussion, supporting the dispersivity values used in the numerical modelling for the EIS, has been summarized (and references provided) in Section 4.4.4 of Appendix 7-C of the revised Draft EIS.</p> <p>Regardless, to demonstrate the robust nature of the hydrogeologic setting, an additional geochemical reactive transport simulation was performed with a longitudinal dispersivity of 10, and a transverse dispersivity of 1 for both the horizontal and vertical directions. The results of that simulation indicate that with lower transverse dispersion the concentrations reaching Whitefish Lake would be higher than the base case for some COPCs. All simulation constituents were below the groundwater quality screening criteria within the 10,000 year simulation. Details of the scenario are presented as part of Attachment IR-89-R1.</p>	
IR-100	-	HC	Indigenous Peoples' health / Socio- economic conditions	<p>Section 8, (p. 8-195)</p> <p>Section 8.5.3, Table 8.5-2, (p. 8-226)</p>	<p>Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.</p> <p><b>Context:</b> Section 8 states “Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.</p> <p>However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment” (p. 8-195).</p> <p>Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies</p>	<p>1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the Project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.</p> <p>2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health</p>	<p>This response has not been accepted.</p> <p>Health Canada does not support the responses to points 1 and 2 of IR-100.</p> <p>1. The response to IR-100 point 1 indicates that mercury (including methylmercury) was not included as a COPC in the assessment because mercury is not associated with the local geology and therefore not expected to be released in the effluent at measurable levels, and because prediction of methylmercury production, based on a variety factors, is not practical. Health Canada continues to recommend that mercury (including methylmercury) be included in the assessment given</p> <p>1) the detected presence of mercury in fish under baseline conditions, and</p> <p>2) the high consumption rates of fish and other country foods by Indigenous land</p>	<p>1. The EA scope does not include quantifying current risks that don’t have project activity connections. Per CSA N288.6 <i>Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines and Mills</i>, Section 6.2.5.4 "<b><u>The goal is to identify and describe the contaminants and physical stressors that are relevant to the site and operations and that require further quantitative evaluation</u></b>". The contaminants identified for further evaluation are then referred to as COPCs. These decisions are based on information gathered during site characterization."</p> <p>Mercury was not identified as a project issue based on mining and milling methods and though it is understood that mercury is a ubiquitous earth element at trace levels it is not identified as uniquely being associated with the local geology; as such, Denison does not believe it is appropriate to quantify existing risk when there is no incremental project risk. Public or existing concerns about mercury do not make this topic an EA question. At this time there is no way to accurately predict potential methylation rates.</p> <p>While the draft EIS (Section 8) highlights increased sulphate concentrations downstream of the Site during period of effluent discharge as a potential factor related to increased methylation (in the presence sulphate reducing bacteria in sediment), it is one of several factors in combination that would need to occur. For example, the IR highlights nutrient enrichment as a contributing factor –significantly increased primary productivity via enrich</p>	No

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					<p>within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.</p> <p>In Section 8.5.3, fish tissue concentrations are compared to Health Canada’s human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.</p> <p><b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.</p> <p>Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day (<a href="#">Health Canada, 2007</a>) is a more appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing fetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>	<p>Canada’s pTDI for methylmercury (<a href="#">Health Canada, 2007</a>).</p> <p>3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.</p> <p>See also related Advice to the Proponent: AD-31.</p>	<p>users, particularly intensive land users such as the Trapper receptor.</p> <p>2. The response to IR-100 point 2 continues to state that the HC maximum level (ML) for mercury of 0.5 µg/g (or 0.5 ppm) will be used to assess risks to human health from fish consumption during monitoring. The use of the HC ML for mercury is not appropriate in this case as it was developed for retail fish using consumption rates for the Canadian general population. Health Canada’s provisional tolerable daily intake (pTDI) values of 0.20 µg/kg bw/day day for young children and women of childbearing age (<a href="#">Health Canada, 2007</a>) are more appropriate reference levels when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from those used to develop the ML for retail fish and is protective of the most sensitive sub-group (i.e., developing fetus).</p> <p>For instance, the HC Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption (<a href="#">Health Canada, 2007</a>) currently employs 40 g as an estimate of daily fish intake by adults who are at the high end of fish intake. This rate is below the rate of consumption for intensive land users for the Project, which is ~500g of fish per day, meaning that the HC ML may not be protective of all land users/receptors.</p> <p>Health Canada reiterates its recommendation to assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada’s pTDI values for methylmercury (<a href="#">Health Canada, 2007</a>).</p>	<p>resulting in high levels of organic carbon in sediments (through algal senescence, deposition, decomposition). This could in fact be a contributing factor, but no such nutrient enrichment has been predicted in the draft EIS as no incremental Project-related nutrient source has been identified. Additionally, the draft EIS does not raise a concern that the Project would cause anoxia in study area lakes, another prerequisite for methylation driven by sulphate reducing bacteria. Denison and its SME’s believe that the treatment of mercury in the draft EIS is appropriate given the level of risk related to the Project. Denison acknowledges the concerns that have been raised by the Indigenous Communities of Concern through its engagement process, as well as those by the FIRT, and in response to those concerns has committed to implementing a mercury monitoring program.</p> <p>In addition to Denison's future monitoring programs, there are provincial fish consumption guidelines for consumers available at: <a href="https://pubsaskdev.blob.core.windows.net/pubsask-prod/76439/76439-Mercury_in_SK_Fish_-_Guidelines_for_Consumption_-_2015.pdf">https://pubsaskdev.blob.core.windows.net/pubsask-prod/76439/76439-Mercury_in_SK_Fish_-_Guidelines_for_Consumption_-_2015.pdf</a>. The guidelines in Saskatchewan for Russell Lake indicate the recommended number of meals per month for northern pike for the general and sensitive population. Further, the Eastern Athabasca Regional Monitoring Program (<a href="https://www.earmp.ca/">https://www.earmp.ca/</a>) provides information on community monitoring programs which includes analysis of mercury in fish tissue. In the most recent 2022 EARMF report mercury was measured in lake trout and lake whitefish and the conclusions were that mercury levels were low (ranging from &lt;0.01 mg/L to 0.5 mg/kg) and it was concluded that fish are safe to eat. Monitoring will continue as part of the program (<a href="#">EARMF+2022+2023+Community+Report.pdf (squarespace.com)</a>). The results of the Wheeler River baseline fish tissue sampling program showed measured fish tissue concentrations near the Project in the range of 0.01 to 0.48 mg/kg, which is consistent with that observed in the EARMF. This would indicate that based on baseline conditions fish are considered safe to eat, and no further baseline assessment is warranted.</p> <p>2. As previously indicated, it is currently not practical to calculate hazard quotients for baseline and predicted methylmercury levels in country foods as there is no information on baseline methylmercury and no way to realistically predict the project related methylmercury. Denison has previously committed to a mercury monitoring program which will include assessment of mercury and methylmercury in fish tissue. That information can feed into future hazard quotient calculations if warranted. Denison agrees to use Health Canada’s 2007 provisional tolerable daily intake (pTDI) values of 0.20 µg/kg bw/day for young children and women of childbearing age for future assessments, or the relevant updated value at that time. Denison has committed to a monitoring and follow-up program, which will include measurements of fish health for comparison to baseline data and regulatory criteria (i.e., Canadian Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota [e.g., CCME 2000], MDMER [Government of Canada 2022], CSA N288.4-19 (CSA Group 2019), and applicable United States Environmental Protection Agency criteria (e.g., US EPA 2021). At a minimum, this will include collection of representative fish species from multiple trophic levels and size classes to investigate the bioaccumulation potential of non-radiological (e.g., molybdenum, selenium, mercury, methyl mercury and other metals) and radiological parameters. Fish will also be assessed for their general health condition</p>	

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								through assessment of condition and growth metrics consistent with those described in current or updated MDMER EEM technical guidance (e.g., Environment Canada 2012) (See commitments register – commitment #s 834 and 844).  <b>References:</b>  Health Canada. 2007. Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption. March.	
IR-101	-	ECCC  CNSC	Fish and fish habitat  Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>This response has not been accepted for the following reasons:</p> <p>1. The response (#1(d)) by the proponent states that “Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 Figure 1 Elevations of wetland features in the LSA” but it is not indicated that this information will be placed in the EIS. CNSC staff requests proponent to include the information provided in response #1(d) and Attachment IR-101 Figure 1 (Elevations of Wetland Features in the LSA) and Attachment IR-101 Figure 2: (Denison Wheeler River Project SSA and Wetland Feature Distribution) in the EIS.</p> <p>2. The Proponent stated in response #2 (a) and (b) that “surface water quality and sediment quality in wetlands were not specifically sampled in the wetland complexes adjacent to the Project footprint during the original baseline assessment.” CNSC staff requests the proponent to provide justification why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas. It is recommended to conduct direct measurements in the wetland areas.</p> <p>3. The information provided did not satisfy the IR. Additional information regarding the potential impacts to wetlands due to changes in surface water quality and sediment quality should be included within Section 8.3 of the main EIS. This is needed to fully understand the scope of potential effects to the aquatic environment.</p> <p>a. Update Section 8.3 to include additional information on predicted water and sediment quality impacts to wetlands from the</p>	<p>1. This information has been incorporated into the EIS as Appendix 8-F.</p> <p>2. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the effectiveness of mitigation measures.</p> <p>3(a). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of their potential to provide fish and fish habitat. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>3(b). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of changes to water quality and sediment quality within the LSA due to the Project. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>4. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the success of mitigative measures.</p>	<p>Yes</p> <p>Appendix 8-F (added as a new appendix in support of Section 8 of the revised Draft EIS)</p> <p>Revised Draft EIS, updates to sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9, Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 for alignment with Section 8.</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>Proponent’s response to directly consider wetlands as fish and fish habitat for the purpose of assessing water quality impacts.</p> <p>b. Update Section 8.3 to provide an assessment of potential effects to wetlands from water and sediment quality changes within the LSA.</p> <p>4. It is stated in response #4 that “[...] Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project” and CNSC staff agrees with the proponent and recommend collection of monitoring information on the wetland areas.</p>		
IR-102	-	ECCC CNSC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including Appendix II, Table 1 (p. 2)	<p><b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>	<p>1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.</p> <p>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</p> <p>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</p>	<p>This response has not been accepted for the following reasons:</p> <p>1. Given the limitation of data availability extension of flow records based on the nearest active WSC hydrometric station (Wheeler River (06DA005)) is acceptable although other methods are not shown to be explored by the proponent including rainfall-runoff modelling techniques (such model can be calibrated at 06DA005 thus computed flow at subbasins or sub watershed can be estimated with good degree of confidence), drainage area ratio method, etc. CNSC staff recommends proponent to consider aforementioned methods or similar or provide justification why other methods were not considered.</p> <p>2. In Attachment IR-102 Figure 1 to 7 show the plots of measured versus the estimated daily flows using the relationship developed for extension of daily flows at SA-1, SA-2, SA-3, SA-4, SA-5, SA-6, SB-3, LA-1 and LA-5. CNSC staff however finds it difficult to determine the predictive accuracy of the relationships based on visual comparisons. Therefore, CNSC staff requests that the proponent provide quantitative measures of prediction accuracy, for example in the form of Root Mean Square Error, correlation coefficient, etc., for the Equations presented in Table 1 of Attachment IR-102.</p>	This response is provided in Attachment IR-102	Yes  Appendix 8-C – the Attachment IR-102 added as Appendix III.

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							<p>In addition, CNSC staff requests that the proponent provide clarification on whether the current relationships are only limited to baseline characterization or will also be considered for estimation of design flows at SA-4 and SA-5 for culvert/crossing design for the access road.</p> <p>3. Response to third part of the IR to be re-assessed when proponent addresses the above two comments ([1] and [2]).</p>		
IR-103	-	ECCC CNSC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<p><b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.</p> <p>The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.</p> <p><b>Rationale:</b> IDF trends exhibit random behavior at some locations and correlated behavior at other locations. The choice of gauged locations will infer the statistics for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.</p>	Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.	<p>This response has not been accepted.</p> <p>In the Context and Rationale of AD-15 in the Annex 1 – Denison Response, ECCC recommends that the Proponent consult CSA PLUS 4013:19 (2019) <i>Technical guide: Development, interpretation and use of rainfall intensity-duration-frequency (IDF) information: Guideline for Canadian water resources practitioners</i> regarding the consideration of future changes in short-duration precipitation extremes. In IR-103, ECCC indicated that in order to assess the accuracy of the Intensity duration frequency (IDF) curves, ECCC required that the Proponent provide the gauged stations generating the values for the modelled data. The Proponent provided the closest gauged stations, however, the future short duration precipitation values were based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes.</p> <p>Additionally, on page 15-19 of the draft EIS states that: “Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” Denison did not provide details on how climate factors will be considered within their adaptive management plans.</p> <p><b>Rationale:</b> Estimates of future short duration precipitation that are based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes, such as the approach used by the</p>	Please see Attachment IR-103	No



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>Proponent, are unlikely to provide reliable projections. This is because the amount of information regarding changes in local-scale observed extreme precipitation contained in short records is not sufficient to constrain a regression (model the statistical relationship) between local and larger scale simulations (Li et al., 2019; ECCC 2022). An alternative approach is to base future projections on a comprehensive assessment that integrates climate science understanding and model projections over a large region. The recent Canadian Standards Association (CSA 2019) guidance on IDF for Canadian Water Resources practitioners provides such an assessment.</p> <p>In terms of adaptive management, the Proponent should clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p> <p>In order to assess the Proponent’s adaptive management strategies for future extreme precipitation events, ECCC requests that the Proponent consult the CSA (2019) guidance when using future IDF projections in the Project design and provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration.</p> <p>1. Provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration as relevant to the Project design.</p> <p>2. Demonstrate how the CSA (2019) guidance will be incorporated in the Project design when developing and considering future IDF projections and estimates of the potential future changes in short-duration precipitation extremes.</p> <p><b>References</b> CSA Group. (2019). Technical guide: Development, interpretation and use of rainfall</p>		

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							intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners. <i>CSA PLUS 4013 :19.</i> <a href="https://www.csagroup.org/store/product/2703080/">https://www.csagroup.org/store/product/2703080/</a> ECCC (2022). Draft Technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience. <a href="https://www.strategicassessmentclimatechange.ca/28896/widgets/117114/documents/77106">https://www.strategicassessmentclimatechange.ca/28896/widgets/117114/documents/77106</a> Li, C., Zwiers, F., Zhang, X., & Li, G. (2019). How much information is required to well constrain local estimates of future precipitation extremes? <i>Earth’s Future</i> , 11-24.																																	
IR-104	-	ECCC	Fish and fish habitat Fish and fish habitat	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>This response to part 1. has not been accepted.</p> <p>There are an additional 24 years of meteorological datasets since the 1999 study thus all historical rainfall extremes including those since 1999 study should be considered to estimate up to date PMP at the Project site The proponent’s justification on whether the 1999 or 1994 PMP estimates are current and conservative should be substantiated based on meteorological data analysis. An estimation of updated PMP is achievable by the proponent as meteorological data is freely available and accessible from ECCC and the proponent should provide a revised PMP.</p> <p>The Proponent should also clarify how recent the data used to calculate the PMP or the time series is and explain the use of an older data set that will not produce as accurate of a PMP value as a more recent data set would produce, even when estimates are conservative.</p> <p>Specifically, a. Explain the rationale for the use of the data set which was used to derive the PMP. B. Clarify if the PMP and/or the time series was calculated using more recent data.</p> <p>This will allow for an accurate evaluation of the validity of results derived from the data sets selected by the Proponent.</p>	<p>To provide comfort to the reviewer that the PMP of 493 that was retained for design purposes is appropriate, we have undertaken an analysis of the available empirical data available for the Max 1-day precipitation annual average historical data for Tomblin Lake, high carbon (RCP8.5) is provided with 90% confidence intervals. The data set used is from 1950 to 2016 and is historical measured precipitation data (<a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line</a>) . The period of 2023 to 2065 is considered a good representation of the period of mine life from construction through to early post-decommissioning (i.e. &gt; 40 years).</p> <p>As shown in Table 1, the maximum 1-day precipitation event from historical records for the area is 52 mm. This average is based on empirical collected data and not a simulated or predicted hindcast value. As, such the PMP that has been adopted for design basis measures is 9.6 x the maximum 1-day precipitation event that has been recorded since 1950 and is inclusive of data up to 2016. The predicted Ensemble data shows a reduction in the maximum 1-day precipitation event. Therefore, we assessed the maximum value of all 24 models that make up the ensemble values. For Tomblin Lake grid, the greatest maximum 1-day value was shown for the period of 2023 to 2065 was 96.1 mm, which is 5.2x less than the design basis PMP. Denison feels strongly that the presentation of this historical data provides clear indication that the design basis PMP is of a magnitude that will be reasonable for water management at the site during in the short-term and for the life of the mine.</p> <table><tr><th colspan="4">Table 1: Maximum 1-Day Precipitation for the Tomblin</th></tr><tr><th rowspan="2">Statistic</th><th colspan="3">Maximum 1-Day Precipitation Event (mm)</th></tr><tr><th>Historical (1950-2013)</th><th>Predicted Ensemble (2023 to 2065)</th><th>Predicted (2023 to 2065)</th></tr><tr><td>Mean</td><td>23.82</td><td>25.91</td><td>32.35</td></tr><tr><td>SD</td><td>8.75</td><td>2.09</td><td>14.90</td></tr><tr><td>Min</td><td>9.40</td><td>21.00</td><td>13.20</td></tr><tr><td>Max</td><td>52.00</td><td>31.00</td><td>96.10</td></tr><tr><td>10% Confidence Interval</td><td>22.06</td><td>25.38</td><td>31.82</td></tr></table>	Table 1: Maximum 1-Day Precipitation for the Tomblin				Statistic	Maximum 1-Day Precipitation Event (mm)			Historical (1950-2013)	Predicted Ensemble (2023 to 2065)	Predicted (2023 to 2065)	Mean	23.82	25.91	32.35	SD	8.75	2.09	14.90	Min	9.40	21.00	13.20	Max	52.00	31.00	96.10	10% Confidence Interval	22.06	25.38	31.82	No
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IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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								90% Confidence Interval	25.57	26.44	32.88		
								Despite Denison’s reiteration that the PMP is adequate for the EA level design basis, Denison is committed to revisiting the estimates per CNSC’s recommendations, as applicable, for the licensing phase of the Project.					
IR-107	-	CNSC  ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the Project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”</p> <p>In addition, the “applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”</p>	<p>Please clarify which data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline</p>	<p>This response has not been accepted.</p> <p>From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions.</p> <p>CNSC and ECCC staff have the following expectations:</p> <ol style="list-style-type: none"><li>1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices.</li><li>2. Confirm which federal requirements were used when assessing potential impacts through EA.</li><li>3. Confirm which data quality objectives were used to establish the baseline, provide references if available</li><li>4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.</li></ol>	The response to this IR is provided in Attachment IR-107.					No
IR-108	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance</p>	<ol style="list-style-type: none"><li>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</li><li>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds,</li></ol>	<p>This response has not been accepted.</p> <p>There are incorrect guidelines remaining in the updated tables, and the supporting information on parameter values used to derive benchmarks has not been provided. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect</p>	The response to this IR is provided as Attachment IR-108 and details can be found therein. Briefly, Tables 8.2-2 and 8.2-3 in Section 8 of the revised Draft EIS have been updated as requested.					Yes  Revised Draft EIS, Section 8.2.3.3, Tables 8.2-2 and 8.2-3.

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<p>and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>	<p>threshold could allow for effluent to be discharged at concentrations exceeding MDMER limits.</p> <p>See also follow-up IR-108-R1.</p>		
IR-108	IR-108-R1	ECCC	Change to an environmental component due to	<p>Section 8.2.3.3 Aquatic Environment</p> <p>IR-108 Response from Denison</p>	<p><b>Context:</b> Incorrect benchmark environmental quality guidelines and guidelines that cannot be verified remain within the updated Tables 8.2-2 and 8.2-3 provided in the Proponent’s response. The Proponent provided an Aluminum Saskatchewan Environmental Quality Guidelines (SEQG) value of 0.005 mg/L in both tables. This is incorrect and appears to be the guideline for irrigation, not the guideline for protection of aquatic biota. The Proponent provided a Molybdenum SEQG of 26 mg/L in both tables. This value is incorrect. The correct SEQG for Molybdenum is 31 mg/L and the Canadian Water Quality Guideline (CWQG) is 0.073 mg/L. The Proponent provided a Nitrate SEQG of 13.29 mg/L in both tables. This value is incorrect. The correct SEQG for Nitrate is 3 mg/L and the CWQG is 13 mg/L.</p> <p><b>Rationale:</b> In order to verify the benchmark environmental quality guidelines that are calculated based on environmental modifying factors such as pH, hardness and dissolved organic carbon (DOC), the specific concentrations of these environmental modifying parameters used in the calculations must be provided. Additionally, incorrect benchmarks for Aluminum, Molybdenum, and Nitrate remain within the updated tables provided by the Proponent. No benchmark was provided for Manganese. It is not clear if Total Chromium or Hexavalent Chromium was measured as the table does not specify, and the benchmark provided was for Hexavalent Chromium. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect threshold could allow for effluent to be discharged at the wrong concentration.</p>	<p>1. Update Tables 8.2-2 and 8.2-3 to include footnotes with the concentrations of environmental modifying parameters such as pH, hardness and DOC used to derive guidelines for Aluminum, Cadmium, Copper, Lead, Manganese, Nickel and Zinc.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include the correct benchmark guideline value for Aluminum, Molybdenum and Nitrate. Include the concentrations of environmental modifying parameters needed for deriving guidelines. If the most stringent guideline value is not selected for use, provide a rationale for use of the chosen guideline.</p> <p>3. Update Tables 8.2-2 and 8.2-3 to include the calculated guideline value for manganese and the environmental modifying parameter concentrations used to calculate the guideline. A benchmark environmental quality guideline has not been provided for Manganese, however a chronic CWQG guideline exists that can</p>		<p>Please see response to IR-108 and Attachment IR-108.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 8.2.3.3, Tables 8.2-2 and 8.2-3.</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
						be derived based on environmental modifying parameter concentrations.  Update Tables 8.2-2 and 8.2-3 to specify if Total Chromium or Hexavalent Chromium was measured.  See also related IR-115-R1.			
IR-109	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. From the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.	<p>This response has not been accepted.</p> <p>There are statements made throughout the EIS that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the Proponent has confirmed that all treated effluent will be discharged to Whitefish Lake through a final discharge point to ensure it meets <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER) requirements.</p> <p>It is not clear why the above statement regarding effluent release to groundwater via deep well injection has been included in the EIS when this is not part of the confirmed effluent discharge management plan. The Proponent should update the EIS to remove text regarding effluent release to groundwater via deep well injection or provide explanation as to why this information has not been excluded from the EIS to clarify if this is an intentional part of the Project design or if this was an accidental inclusion.</p> <p>The Proponent should update the EIS to remove text regarding effluent release to groundwater via deep well injection or provide additional explanation.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	Section 8 of the revised Draft EIS has been revised to remove text on effluent release to groundwater via deep well injection.	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.1.1, 8.2.6.1, 8.3.6.1, and 8.4.6.1.</p>
IR-110	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0</p>	Provide confirmation of the diffuser depth and location.	<p>This response has not been accepted.</p> <p>ECCC requests confirmation that the finalized diffuser design will be available for review once it is completed as reviewing it will be necessary to</p>	It is noted that basic design criteria (e.g., depth, location, port configuration) have been provided in the Draft EIS (Section 8.2) and Appendix 8-E on which modeling was based. While some minor adjustments may be made during preparation of the final diffuser engineering design, the level of mixing predicted in the assessment will be maintained	No



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
				Appendix 8-E, Section 2.1	<p>of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Updated Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p> <p>A review of the final discharge design is necessary to confirm the location and depth of the proposed diffuser and modelling predictions for effluent discharged into the receiving environment.</p>	ECCC requests the opportunity to review the finalized diffuser design once it is available.	confirm the location and depth of the proposed diffuser and modelling predictions for effluent discharged into the receiving environment.	<p>(minimally). The final designs will follow standard engineering practice and be stamped and signed by a professional engineer.</p> <p>As for Denison’s understanding of the regulatory process, the finalized diffuser design information will be included in Denison's license to operate application that will be submitted to the CNSC. Such information will also be provided to the province as part of the provincial approvals process. Should CNSC, or the province, choose to provide this information to ECCC that is their discretion, but Denison doesn’t believe it is within their purview (or appropriate) to make commitments on behalf of others, nor act outside the normal licensing/ approvals processes.</p>	
IR-113	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>This response has not been accepted.</p> <p>Based on the information provided it is not possible to assess the resiliency of the Project to potential adverse effects from climate change and potential impacts to surface water and sediment quality. The Proponent should review the guidance documents available on the <a href="#">Strategic Assessment of Climate Change</a> (SACC) website with regards to climate change resilience and provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling.</p> <p>Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, lake levels, flow rates, etc., on COPC concentrations in surface water and sediment. The Proponent should refer to the <a href="#">SACC website</a> for guidance on conducting this quantitative analysis.</p> <p>See also follow-up IR-113-R1.</p>	Please refer to Attachment IR-113_IR-113-R1 for the response.	No
IR-113	IR-113-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment  IR-113 Response from Denison	<p><b>Context:</b> The Proponent states the following, “The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change)”. This statement suggests that the PMP value utilized considers future climate changes such as possible changes in the frequency or intensity of extreme precipitation events.</p>	Clarify if climate change has been considered in the PMP value provided. If it has not been considered, discuss how potential increases in PMP have been and/or need to be considered in the Project design.		Please refer to Attachment IR-113_IR-113-R1 for this response.	No



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<b>Rationale:</b> As noted by the Proponent, increases in extreme rainfall are anticipated with a warmer climate. For precipitation extremes across Canada, the relative change in event frequency is expected to be larger for more extreme and rarer events. Given that the extreme precipitation is expected to intensify in the future (Kunkel et al. 2013), the Proponent should consider how these potential changes will influence design values such as PMP.	<u>Reference</u> Kunkel, K., Karl, T. R., Easterling, D. R., Redmond, K., Young, J., Yin, X., & Hennon, P. (2020). Probable maximum precipitation and climate change. <i>Geophysical Research Letters</i> , 1402-1408.			
IR-114	-	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface</p>	<p>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</p> <p>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p> <p>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</p> <p>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</p>	<p>This response has not been accepted.</p> <p>The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER.</p> <p>The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations.</p> <p>All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds.</p> <p>Please:</p> <p>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</p> <p>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO<sub>3</sub>) in effluent and the receiving environment.</p> <p>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</p> <p>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p>	Please see Attachment IR-114. Briefly, Tables 8.2-9, 8.2-10 and 8.2-13 have been updated in the revised Draft EIS as requested.	Yes  Revised Draft EIS, Sections 8.2.4.2.3 and 8.2.4.2.4, Tables 8.2-9, 8.2-10 and 8.2-13

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>				
IR-115	-	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p><b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>	<ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li><li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li></ol>	<p>This response has not been accepted.</p> <p>Items 1. And 3. In the Proponent’s response adequately responded to the IR. However, the water quality thresholds in item two have not been derived using baseline receiving environment concentrations and not all COPCs which require monitoring under the MDMER have been included in the updated table. Additionally, the Proponent did not account for changes in baseline hardness concentrations in the receiving environment due to the deposition of effluent. Water hardness is an environmental modifying factor which can influence the toxicity of COPCs in the aquatic environment, therefore requiring the mentioned COPCs as well as background concentrations of total hardness in the receiving environment to accurately determine potential effects of COPCs upon the receiving aquatic environment. The Proponent should also provide rationale to support that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also follow-up IR-115-R1.</p>	<p>Please see Attachment IR-115_IR115-R1. Briefly, Table 8.2-8 has been updated in the revised Draft EIS as requested.</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.2.3 Table 8.2-8</p>
IR-115	IR-115-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> In the Proponent’s response to item two, it is mentioned that the derived water quality thresholds used in Table 8.2-8 and in the assessment (Section 8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) are based on hardness concentrations found in effluent. The Proponent mentions that hardness derived from IWWTP discharge will consider IWWTP discharge on the receiving environment and provide “a reasonable estimate of expected hardness in</p>	<p>1. Update Table 8.2-8 to include the following COPCs: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS).</p>		<p>Please see Attachment IR-115_IR115-R1. Briefly, Table 8.2-8 has been updated in the revised Draft EIS as requested.</p>	<p>Yes</p> <p>Revised Draft EIS, Sections 8.2.4.2.3 Table 8.2-8</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
				IR-115 Response from Denison	<p>effluent”. However, this does not consider induced hardness (i.e., hardness concentration increases in the receiving environment over the lifecycle of the Project) from effluent contributions as a Project effect; the receiving environment baseline concentrations of hardness have been altered due to inputs from Project effluent. Providing only one estimate of expected effluent hardness in the receiving environment is not an appropriate means of conducting the effects assessment.</p> <p>Additionally, the following COPCs have not been included in the updated table provided in the Proponent’s response: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS). It is noted that these COPCs are also subject to monitoring requirements under the <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER).</p> <p><b>Rationale:</b> Background concentrations of un- ionized ammonia, aluminum, iron, thallium, manganese and TDS are required to determine potential effects to the environment. The Proponent will also require this information to satisfy their obligations under the MDMER.</p> <p>The purpose of the surface water quality assessment is to determine if changes to the receiving environment over the project lifecycle will have significant adverse effects on biota. Changes from baseline in hardness concentrations in the receiving environment due to the deposition of effluent is a Project related effect and therefore providing a single baseline water quality threshold which is applicable only to one set of conditions is not an appropriate method to evaluate impacts across a shifting hardness baseline.</p> <p>Water hardness is an environmental modifying factor, various concentrations of hardness influence the toxicity of other COPCs in the aquatic environment. Using water quality thresholds that have been derived from high effluent hardness concentrations will not be protective of aquatic biota, particularly in the early stages of the project lifecycle when receiving environment water quality will be similar to baseline water quality.</p>	<p>2. Update Table 8.2-8 to include background concentrations of total hardness (in mg/L CaCO<sub>3</sub>) in the receiving environment.</p> <p>3. Provide rationale that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also related IR-108-R1</p>			
IR-124	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment	<b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated:	<p>1. Provide the information on baseline exceedances of COPCs in sediment.</p> <p>2. Provide an assessment of risk for any COPCs that have baseline</p>	<p>This response has not been accepted.</p> <p>An updated risk assessment for COPCs that requires monitoring under the MDMER with effluent concentrations that exceed guidelines has not been completed. This information is necessary</p>	<p>1. Section 8.4.3.2.3 of the Draft EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines. Table 8.4-3 and Table 8.4-7 of the revised Draft EIS were updated to include sediment quality guidelines as recommended.</p>	<p>Yes</p> <p>Revised Draft EIS Section 8, Table 8.4-3, Table 8.4-7</p>

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<div><div><div>1. COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</div><div>2. COPCs that exceed water quality guidelines in effluent, and,</div><div>3. COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</div></div><div><b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.</div></div>	<div>exceedances of sediment quality thresholds in the receiving environment.</div> <div>3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.</div>	<div>to facilitate the determination on risk to sediment quality and aquatic biota.</div> <div>See also follow-up IR-124-R1.</div>	<div>2. The were no instances where constituent concentrations in the baseline sediment samples were greater than their respective of sediment quality guidelines; therefore, no further action is needed to address this part of the IR.</div> <div>3. This is not applicable. No additional COPCs need to be carried forward in the environmental risk assessment as the concentrations of COPCs in effluent do not exceed water quality guidelines (see Table 3-1 in the ERA in Appendix 10-A). All relevant constituents identified in Schedule 4 and Schedule 5 in MDMER were considered in the ERA screening with the exception of cyanide and mercury which are not identified as present in the effluent (see IR-100 regarding mercury). Phosphorus and nitrate will be present in the effluent at low levels and estimates of these constituents via the near-field water quality model indicate that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment (see Tables 8.2-10 and 8.2-13 of Section 8).</div>	Appendix 8E
IR-124	IR-124-R1	ECCC	Change to an environmental component due to hazardous contaminants	<div>Section 8.4.4.2.3, Aquatic Environment</div> <div>IR-124 Response from Denison</div>	<div><b>Context:</b> In the Proponent’s response it is stated, “Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.”</div> <div>If concentrations of Schedule 5 parameters in effluent exceed water quality thresholds, these parameters are necessary for ECCC to examine in the risk assessment to determine the potential for effluent to be acutely lethal and for adverse effects to aquatic biota. These parameters will also be required to be characterized under Section 4, 5 and 7 of the MDMER. As per CSA N288.6-22 Section 7.2.5.2.1, “Screening of environmental concentrations of chemical and radiochemical substances released to the environment should be performed to identify COPCs for further evaluation in the risk assessment. Both measured concentrations and concentrations calculated from release rates may be used in the screening analysis. The screening concentrations should be compared to screening criteria, and chemicals that exceed screening criteria should be identified as COPCs.”</div> <div>As per CSA N288.6-22 Section 7.2.5.4.2, “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit.”</div> <div>Additionally, updated Table 8.2-13 of attachment IR-114 has been found to be insufficient due to maximum concentrations in</div>	<div>Provide an assessment of risk from any MDMER Schedule 5 parameters that are required to be characterized in effluent and in surface water quality in the receiving environment and that have effluent concentrations that will exceed water quality guidelines derived from environmental baseline conditions.</div>		<div>See response to IR-124 and revised Draft EIS Section 8, Table 8.4-3 and Table 8.4-7 and supporting updated documentation in Appendix 8E.</div>	<div>Yes</div> <div>Revised Draft EIS Section 8, Table 8.4-3, Table 8.4-7</div> <div>Appendix 8E</div>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																							
					surface water for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus being absent and the use of incorrect water quality thresholds.  <b>Rationale:</b> Due to the lack of information on COPCs with concentrations that exceed water quality thresholds in effluent, a determination on risk to sediment quality and aquatic biota cannot be made.																																																											
IR-126	-	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	<p>This response has not been accepted.</p> <p>The selenium fish tissue assessment has not been updated to reflect the ECCC Federal Environmental Quality Guidelines (FEQG). A predicted effluent concentration of 0.042 mg/L of selenium has been provided for the Project (updated Tables 8.2-9 and 8.2-10 Attachment IR-114 Denison’s Response). ECCC acknowledges that the Proponent prefers the use of the US EPA guidelines due to the ability to perform fish tissue muscle TRV, however, Environmental Effects Monitoring (EEM) would require a study on fish tissue selenium whole- body or egg-ovary concentrations. The current baseline data will not be comparable to future EEM studies using fish tissue muscle concentrations of selenium and US EPA guideline methodology. There is currently EEM guidance under development for conducting selenium fish tissue sampling in fish populations that will utilize the FEQG which applies to fish tissue egg-ovary and whole-body concentrations of selenium. Additionally, the Proponent has made a commitment to utilize the most stringent guidelines available.</p> <p>Based on the Project’s proposed effluent concentrations of selenium, fish tissue sampling will be required as part of the EEM monitoring for the Project. The ECCC FEQG is the guideline applied to these studies, and the current use of this guideline will facilitate the comparison to future monitoring studies.</p> <p>Furthermore, the Proponent has not provided sufficient explanation in their response for the use of the less stringent US EPA guideline compared to the more conservative FEQG.</p>	<p>The EIS assessed selenium in fish in terms of muscle tissue because the available baseline data were for muscle tissue. Since the review comment highlights the EEM program and the fish tissue selenium study component more specifically we note that the MDMER (2023) allows use of muscle tissue in the EEM study of selenium in fish (see Schedule 5, 12(1)(e)(iv). It is further noted that Denison has committed to a pre-operational EEM study and will conduct that study in accordance with the regulation and available federal guidance. The pre-operational EEM study will include a study respecting selenium in fish tissue.</p> <p>Regarding the EIS, Denison and its SME stand by the current assessment approach, using muscle tissue. Nevertheless, to address the reviewer’s concern, we have calculated whole-body concentrations from the predicted selenium in muscle (Table B.5 of the revised draft EIS Appendix 10-A), using EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. No change to the EIS is warranted.</p> <table><tr><th>Fish Species</th><th>Lake</th><th>Muscle ug/g fw</th><th>Muscle ug/g dw</th><th>Whole ug/g dw</th></tr><tr><td rowspan="6">N. Pike</td><td>Ref</td><td>1.89E-01</td><td>7.56E-01</td><td>5.95E-01</td></tr><tr><td>WL North</td><td>1.86E-01</td><td>7.44E-01</td><td>5.86E-01</td></tr><tr><td>WL Mid</td><td>1.57E+00</td><td>6.28E+00</td><td>4.94E+00</td></tr><tr><td>WL South</td><td>1.51E+00</td><td>6.04E+00</td><td>4.76E+00</td></tr><tr><td>McGowan</td><td>1.02E+00</td><td>4.08E+00</td><td>3.21E+00</td></tr><tr><td>Russell</td><td>8.12E-01</td><td>3.25E+00</td><td>2.56E+00</td></tr><tr><td rowspan="6">W. Sucker</td><td>Ref</td><td>1.46E-01</td><td>5.84E-01</td><td>4.60E-01</td></tr><tr><td>WL North</td><td>1.43E-01</td><td>5.72E-01</td><td>4.50E-01</td></tr><tr><td>WL Mid</td><td>1.74E+00</td><td>6.96E+00</td><td>5.48E+00</td></tr><tr><td>WL South</td><td>1.66E+00</td><td>6.64E+00</td><td>5.23E+00</td></tr><tr><td>McGowan</td><td>1.06E+00</td><td>4.24E+00</td><td>3.34E+00</td></tr><tr><td>Russell</td><td>8.06E-01</td><td>3.22E+00</td><td>2.54E+00</td></tr></table> <p><u>Notes:</u> dry wt = fresh wt / (1-0.75) [EPA (2021)] whole = muscle / 1.27 [EPA (2021)]</p> <p><b>References:</b>  MDMER. 2023. Metal and Diamond Mining Effluent Regulations. SOR/2002-222. Last amended June 9, 2023. Minister of Justice.</p>	Fish Species	Lake	Muscle ug/g fw	Muscle ug/g dw	Whole ug/g dw	N. Pike	Ref	1.89E-01	7.56E-01	5.95E-01	WL North	1.86E-01	7.44E-01	5.86E-01	WL Mid	1.57E+00	6.28E+00	4.94E+00	WL South	1.51E+00	6.04E+00	4.76E+00	McGowan	1.02E+00	4.08E+00	3.21E+00	Russell	8.12E-01	3.25E+00	2.56E+00	W. Sucker	Ref	1.46E-01	5.84E-01	4.60E-01	WL North	1.43E-01	5.72E-01	4.50E-01	WL Mid	1.74E+00	6.96E+00	5.48E+00	WL South	1.66E+00	6.64E+00	5.23E+00	McGowan	1.06E+00	4.24E+00	3.34E+00	Russell	8.06E-01	3.22E+00	2.54E+00	No
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							<p>The Proponent should explain their use of the US EPA guidelines over the ECCC FEQG or update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA as needed using ECCC’s FEQG.</p> <p>As noted in IR-126, please update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10- A (ERA) in Section 10) as needed using ECCC’s FEQG. If the FEQG will not be used, provide further rationalization for the use of the US EPA guidelines when creating the study on fish tissue selenium concentration in the EEM.</p>	<p>EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.</p> <p>ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</p>	
IR-130	-	CNSC	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the Project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the Project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the Project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the Project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>	<p>This response has not been accepted.</p> <p>Denison has agreed to update the final EIS (Sections 9.3 and 9.4) to include vibration as a physical stressor to fauna in the project area.</p> <p>Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>The text in Section 9 of the attached revised Draft EIS includes vibration as a physical stressor on fauna.</p> <p>Updates can be found in Section 9.3.3.3.2, pages 9-197 and Section 9.3.4.2.1, pages 9-211, 9-212, and 9-274.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 9.3.3.3.2, pages 9-197 and Section 9.3.4.2.1, pages 9-211, 9-212, and 9-274</p>
IR-134	IR-134-R1	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided. Knowing the survey methodology for pre-construction and pre-clearing for little brown myotis and northern myotis is important for assessing cumulative impacts, effectiveness of adaptive management strategies as well as determining how bat species were considered in the EIS.</p> <p><b>Rationale:</b> ECCC can determine whether the methodology the Proponent will use to collect data is appropriate and if the methodology would contribute to a more complete understanding cumulative effects and adaptive management strategies.</p>	<p>The information provided by the Proponent regarding the roosting dates and potential habitat for bats is complete, however, the information related to the pre-construction and pre-clearing surveys is missing details on important habitat features for bat species at risk. As two Species at Risk Act (SARA) schedule 1 listed bat species, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis) have been identified in the Project</p>		<p>For clarification, the pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will to be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and</p>	<p>No</p>



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					A clear outline of how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods for bats, such as roosting, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the effectiveness of mitigation strategies and adaptive management strategies which are being developed by the Proponent.	area, effects need to be identified, avoided, lessened and monitored.		appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.	
IR-137	-	ECCC	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The</p>	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"><li>Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>Re-do the assessment with the RSA at the scale of the range</li></ul>	<p>This response has not been accepted.</p> <p>A biologically relevant explanation for the chosen RSA for caribou was not provided. It is not clear if the RSA is representative of the SK1 range for factors such as variability and biophysical features. Describe how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range. This clarification is necessary to ensure the RSA is representative of the entire SK1 Caribou range, including the natural variability of the landscape, and to assess any project effects that may be affected by an inaccurate RSA. It is also required to verify the Proponent’s assessment of cumulative impacts to caribou.</p> <p>See also AD-56 in the Advice to Proponent table.</p>	<p>The SK1 conservation unit as envisioned by the province is not meant to represent a biologically relevant area based on our understanding of this through discussion with the province as implied by the review comment. Per ECCC (2020) information available to delineate boreal caribou ranges varies in certainty and therefore caribou ranges are categorized into three types: conservation units (low certainty), improved conservation units (medium certainty) and local population units (high certainty). ECCC (2020) also recognizes that there will be changes to conservation units and improved conservation units as more information becomes available. The SK1 conservation unit is a conglomerate of various habitats and ecosites types (rocky shield, sandy plains and varying topography of the Athabasca Plain ecoregion in the northwest and Churchill River Upland ecoregion in the southeast). Denison and its SME believe the approach utilize in the analysis provides an appropriate scale on which to consider local caribou populations relative to the Project. The EA guidelines do not require the proponent to do a range-wide assessment, nor does the delineation of the SK1 range imply that such an assessment is an appropriate scale on which to consider effects. As we understand it, the delineation of SK1 and SK2 is a function of the separation of more southern productive habitat types vs more northern ones, and even that distinction (though maybe useful and appropriate from a planning perspective) is arbitrary from a life history point of view since it is known that animals move between the ranges freely.</p> <p>As per accepted environmental assessment methodology, the spatial boundaries were established to capture the extent of the expected/likely adverse effects, both direct and indirect, on the various valued components, that were expected as a result of the Project.</p> <p>The Project Footprint was delineated as the maximum extent of physical, direct disturbance resulting from the Project.</p> <p>The LSA was delineated to capture the extent of all direct, and most indirect effects of the Project on the wildlife VCs, including woodland caribou.</p> <p>The RSA was delineated to capture the extent of all potential Project indirect effects, in consideration of the life-requisites and behavior of the various VCs being assessed (i.e., a habitat-based assessment) including ungulates (e.g., woodland caribou) which are known to have large home ranges. The RSA was also delineated in the context of the cumulative effects assessment. Further the RSA is considered representative, as it includes habitat (ecosite types) that are found throughout the SK1 range. In particular, the habitat (and its potential to support woodland caribou, as classified by the Saskatchewan Ministry of Environment) in the RSA is relatively consistent with the remainder of the habitat in the SK1 range. To help display habitat suitability an appendix to Section 9 of the revised Draft EIS (Appendix 9-F) has been developed and is provided with the IR response package and</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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					<p>Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA</u>: The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above-mentioned effects.</p> <p>For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p> <p><u>RSA</u>: The Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul> <p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada.</p> <p><b>Reference:</b></p>	See also related IRs: IR-154 and IR-156.		<p>revised Draft EIS submission. The reader is referred specifically to Figure 2-1 in revised Draft EIS Appendix 9-F as it concerns the above reference to habitat in the SK1 range.</p> <p>These study areas are appropriate, in that they capture the extent of the likely adverse effects of the Project on the VCs, to provide an ecologically relevant determination as to the likely adverse effect on the regional population of all assessed VCs, including woodland caribou (i.e., no dilution of the effects over the entire SK1 range – although this has been provided for context).</p> <p>The 500 m buffer around a physical disturbance was considered in the context of the extent of sensory disturbance, to allow Denison to determine the geographical extent of an effect (i.e., limited to the LSA, limited to the RSA) to allow the appropriate characterization of the effect to inform the determination of significance.</p> <p>Cumulative effects occur when the adverse effects of the Project, overlap in time and space, with the adverse effects from other projects and activities. As such, the RSA is the appropriate scale to appropriately conduct a defensible cumulative effects assessment – i.e., the effects of projects that are beyond the RSA spatial extent would not likely result in residual effects that could act cumulatively with the Project’s effects, and consideration of effects that do not overlap spatially or temporally, are not cumulative, by definition.</p> <p>For the reviewer’s context and consideration, refer to Attachment IR-137 for a summary of the Wheeler River Project’s expected direct footprint (74.8 ha) and Project Area (area of maximum disturbance; 169.9 ha) compared to expected landscape disturbances from: a proposed underground uranium mining project in the Athabasca Basin (NexGen’s Rook I Project), an underground mining project which recently completed the Saskatchewan EA process (Foran’s McIlvenna Bay Project), and an open pit mining project which recently completed the federal EA process (Generation PGM’s Marathon Palladium Project). Attachment IR-137 contains Table IR-137-1 and Figure IR-137-1; we also refer the reviewer to Section 2.2.8 Project Area and Figure 2.2-28 in the revised draft EIS for an overview of the Project spatial areas. Denison suggests that the FIRT’s review of terrestrial environment IR responses be framed within the context of the Project’s spatial boundaries.</p> <p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p> <p>Saskatchewan Ministry of Environment (ENV). 2023. Woodland Caribou in the Boreal Shield (SK1): Background Information.</p>	

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					[1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011).				
IR-142 IR-159 IR-167	IR-142-159-167-R1	ECCC	Wildlife and Wildlife Habitat	<b>Reference to EIS:</b> Section 9.3.3.3, Baseline Studies Section 9.3.5 Mitigation Measures  IR 142, 159, and 167 Responses from Denison	<b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided.  <b>Rationale:</b> Knowing the survey methodology for pre-construction and pre-clearing surveys across multiple species is important because the Proponent is intending to collect data so that ECCC can determine whether the methodology used to collect the data is appropriate and if the methodology would contribute to understanding cumulative effects and adaptive management. Understanding how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods, such as nesting, breeding, foraging and migration, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the effectiveness of mitigation strategies and adaptive management being developed by the Proponent for each species mentioned in IR-142, IR-159 and IR-167.	Provide survey methodology and timing for all preconstruction and pre-clearing surveys, including avian and species at risk surveys (caribou, wolverine).		<p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se, but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snow pack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017)), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.</p> <p><b>References:</b></p> <p>B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119</p>	No

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								<p>Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.</p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	
IR-143	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"><li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>• Description of seasonal use of the LSA, RSA and caribou range.</li><li>• Description of Project areas used by caribou.</li><li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul> <p>Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).</p> <p>See also related: IR-152.</p>	<p>This response has not been accepted.</p> <p>The information provided by the Proponent is insufficient to understand potential Project impacts and appropriate mitigation that would be required.</p> <p>Information on important habitat features and how caribou are using the landscape is required to complete an accurate assessment of the Project impacts to caribou habitat and habitat use. In the absence of this information, ECCC will assume a conservative estimate that all habitat features are high value and are used for important life functions.</p> <p>Although the Proponent provided a map showing telemetry points (provided by the Province of Saskatchewan), this map doesn’t have sufficient detail to assess habitat use and important biophysical features of the Project area. These details are necessary to assess habitat use and important biophysical features of the Project area.</p> <p>See follow-up IR-143-144-R1 and IR-143-145-R1.</p>	<p>In the Proponent’s and its SME’s view, the information provided in the habitat-based environmental assessment is considered to adequately describe the baseline conditions of woodland caribou and allow the assessment of likely adverse effects of the Project on woodland caribou, using accepted environmental methods and approaches. To further address the reviewer’s comment, we have prepared additional figures (below) to consider the Project study areas and Project footprint + 500 m area; however, these are provided as supplemental information and will not change the assessment presented in the draft EIS.</p> <p>The baseline data and telemetry points (i.e., best data available at the time) were used to document the habitat use (by type and season) at an appropriate scale and detail to inform the assessment of the Caribou VC in terms of: alteration/loss of habitat; change in movement patterns; and change in mortality – the likely effects selected to inform and focus the assessment.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown in Figure 3). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>(forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>Knowledge holders confirmed that woodland caribou utilize the area and might be encountered in the Terrestrial RSA (19-LK-ERFNTrip-134.149; 19-LK-ERFNTrip-134.151), and that local trappers encounter caribou regularly at their traplines in winter and see them during summer (19-LK-ERFNTrip-134.151). They have not observed any changes in densities and suggest that the same number of caribou have been found in the area over the years (19 -LK-ERFNTrip-134.156). Caribou are reported to calve near the Wheeler River, which has lots of heavy muskeg in the area (16-EN-ERFN-100.15). Knowledge holders identified the area east of Highway 914 and northeast of Russell Lake, between Russell Lake and McDougall Lake (corresponding with Omnia winter tracking transects #5 and #9; see revised draft EIS Appendix 9-B, Omnia Terrestrial Environment Wildlife and Vegetation Baseline Inventory Figure 2.6-1) as an area where caribou are commonly observed in the winter. “There are tall trees here, some small hills with protected valley areas, and it seems sheltered. There is caribou moss in this area” (19-LK-ERFNTrip-134.154). Caribou are known to travel through areas of younger forest and burns to get to preferred habitat types (19-LK-ERFNTrip-134.152), such as more mature forests and areas with abundant lichen growth. “Caribou [...] eat low bush cranberries and lichen; lichen takes many years to grow and recover” (18-EN-ERFN-5.76). Caribou have been observed to use areas of younger forest stands with regenerating pine. In years with deep snow or when there is a hard crust on the snow, they may eat the tips of fresh growth off the younger pine trees (19-LK-ERFNTrip-134.155).</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project</p>	

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								permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.	
IR-144	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<p><b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i></p> <p><i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i></p>	<p>Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.</p>	<p>This response has not been accepted.</p> <p>The information provided by the Proponent is insufficient to understand potential Project impacts to this species and characterize the risk to determine impacts from the Project to caribou and appropriate level of offsetting mitigation that would be required. The revised map 9.3-8 shows seasonal use, however, it is challenging to see the overlapping features. The map does not allow the reader to get a good understanding of the seasonality of the data. Due to the fact that caribou use different habitat types in differing ways over the course of a year, seasonality of the data will allow for a deeper understanding of habitat use.</p> <p>The scale provided on the current map does not allow for a proper assessment of seasonal use, including differentiation of habitat use.</p> <p>Individual maps by season and survey type with larger scale insets that show areas with overlapping points would help to clarify the map and allow for a greater understanding of spatial and temporal features of caribou habitat.</p> <p>See follow-up IR-143-144-R1.</p>	<p>In the Proponent’s and its SME’s view, the baseline surveys in combination with information from other sources related to caribou were appropriate to adequately inform the habitat-based environmental assessment. The data collected and the analysis completed to inform the environmental assessment represent the best-available information on caribou relative to the Project, which has been updated to include up-to-date caribou habitat potential mapping for the SK1 range obtained in December 2023.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment, 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p>	
IR-143-144-R1	IR-143-144-R1		Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 144 Responses from Denison	<p><b>Context:</b> In the IR-143 response, the Proponent states: “As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from Indigenous Knowledge (IK) was included in the EIS, including potential calving areas in the Terrestrial RSA.” The Proponent provided a revised Map 9.3-8 to display these features.</p> <p><b>Rationale:</b> While the revised Map 9.3-8 shows seasonal use, it is challenging to see the overlapping spatial and temporal features. The map is not adequate for fully understanding the seasonality of the data. The scale provided does not allow for a proper assessment of seasonal use, including differentiation of habitat use such as calving, movement or wintering habitats.</p> <p>Some habitats, based on use, may be more used for more critical functions than others and this information cannot be adequately assessed based on the information provided.</p>	Provide individual maps by season and survey type or with larger scale insets that show areas with overlapping spatial and temporal features.		<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>The baseline surveys for caribou were appropriate to adequately inform the habitat-based environmental assessment, considering the low suitability of the habitat expected to be disturbed by the Project and the low caribou use indicated. The data collected and the analysis used to inform the environmental assessment represent the best-available information on caribou relative to the Project.</p> <p>Figure 9.3-8 in revised draft EIS shows the EA study areas and the caribou observed within the ecosite types, while Figure 2-2 in revised Draft EIS Appendix 9-F shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low, moderate, high). These figures include larger scale insets to provide greater detail in relation to the location of the woodland caribou observations in context to the habitat (ecosite) types and the habitat suitability (as classified by Saskatchewan Environment) within the Study Areas.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with</p>	Yes  Appendix 9-F incorporated (added) into the revised Draft EIS Appendices

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								<p>waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the draft EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the</p>	

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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								<p>Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p> <p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p>	
IR-145	-	ECCC	Wildlife and Wildlife habitat	<p>Section 9.3.3.3, Woodland Caribou</p>	<p><b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).</p> <p>The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.</p> <p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>	<p>1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada:</p> <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul> <p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p>	<p>This response has not been accepted.</p> <p>The map provided by the Proponent lacks spatial and temporal details needed to complete an assessment of habitat importance to caribou relative to the Project. The Proponent did not provide information or mapping on known important habitat features, habitat quality or biophysical attributes and mapping was not provided at the different scales as requested in the IR.</p> <p>ECCC recommends that the Proponent provide mapping of important caribou habitat features, such as those used for calving, wintering, and movement to assess how caribou utilize the landscape and assess potential impacts to caribou due to impacts to these areas. Knowing detailed data on caribou habitat use will contribute to identifying mitigation measures and potential offsetting.</p> <p>In the absence of telemetry data, mapping of habitat quality, based on a combination of known ecosites and known important biophysical features will provide a reasonable alternative, where known important caribou habitat features cannot be mapped.</p> <p>The provision of information on habitat use and biophysical features will facilitate the verification of the Proponent’s effects assessment.</p> <p>See follow-up IR-143-145-R1.</p>	<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>The baseline surveys for caribou were appropriate to adequately inform the habitat-based environmental assessment. The data collected and the analysis used to inform the environmental assessment represent the best-available information on caribou relative to the Project.</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations within these ecosite types are presented in Figure 9.3-8 in the revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown in Figure 3). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>

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						<b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.		<p>majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.</p>	
IR-143 IR-145	IR-143-145-R1	ECCC	Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 145 Responses from Denison	<b>Context:</b> Information presented on boreal caribou in the study areas in the Proponent’s response is insufficient to: <ul style="list-style-type: none"><li>characterize and determine the risk of Project impacts,</li><li>and</li><li>calculate the appropriate level of offsetting required.</li></ul> Information on important habitat features and how caribou are using the landscape is required to complete an assessment of the Project impacts.	<p>1. Provide maps at the Project Development Area (PDA)/Local Study Area (LSA)/Regional Study Area (RSA) scale showing caribou habitat quality.</p> <p>2. Provide maps at the PDA/LSA/RSA scale showing areas with the appropriate biophysical attributes for calving and other life stages, such as important wintering habitats and</p>		<p>Denison obtained and appropriately considered all publicly available data/information, including information on caribou and habitat in the SK1 range obtained from Saskatchewan Environment, which as updated caribou habitat potential in December 2023, as well as the Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (ECCC 2020) to adequately inform the environmental assessment to appropriately determine the residual effects and their significance on caribou, as per accepted environmental assessment methodology.</p> <p>Figure 9.3-8 in revised Draft EIS shows the study areas and the caribou observed within the ecosite types, while Figure 2-2 in revised Draft EIS Appendix 9-F shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low,</p>	Yes  Updates to Figure 9.3-8 and Appendix 9-F has been incorporated into the revised Draft EIS Appendices

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					<p>Although the Proponent provided a map showing telemetry points (provided by the Province of Saskatchewan), the map lacked sufficient detail to assess habitat use and important biophysical features of the Project area.</p> <p>The IR-145 response states: “Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.” As a part of the analysis, calving areas are particularly important to delineate if information is available as a key part of all life stages.</p> <p>In the draft EIS, the habitat types that are considered non-habitat for caribou are open bogs (BS20), leatherleaf shrubby fens (BS22), graminoid fens (BS24), open fens (BS25), rush sandy shorelines (BS26), sedge sandy shorelines (BS27) and waterbodies.</p> <p><b>Rationale:</b> Woodland caribou are known to use treed bog and open fen (Section 9.3.3.3.1 of the draft EIS), however open fens and bogs are excluded from the identified available Woodland Caribou habitat, based on not detecting presence or not detecting presence as frequently.</p> <p>Mapping of important caribou habitat features is required to assess important potential impacts to caribou. In the absence of telemetry data, mapping of habitat quality, based on a combination of known ecosites and known important biophysical features will provide a reasonable alternative where known important caribou habitat features cannot be mapped.</p>	<p>movement corridors.</p> <p>Indicate the source of telemetry data (i.e., University of Saskatchewan and/or the Province of Saskatchewan).</p>		<p>moderate, high).</p> <p>Based on the baseline field data from 2017 to 2021, of the 397 observations recorded, woodland caribou were primarily observed in Jackpine-blueberry/lichen (BS3) ecosite type (n=268 observations) or in association with black spruce treed bog (BS17) ecosite (n=83). In the remaining observations, woodland caribou were found associated with waterbodies/ rush sandy shore (BS26) ecosite (n=17), black spruce-blueberry/lichen (BS7) ecosite (n=10), black spruce-jack pine/feather moss (BS9) ecosite (n=6) , anthropogenic/disturbed (AN) sites (n=6) and Jackpine-blueberry/lichen (BS3) / Black spruce-blueberry/lichen (BS7) ecosite (n=5) followed by Jack pine – black spruce / feathermoss (BS4) ecosite (n=1) and Labrador tea shrubby bog (BS18) ecosite (n=1). These observations are presented in Figure 9.3-8 in revised Draft EIS.</p> <p>According to the habitat potential classifications of these ecosite types identified by the Saskatchewan Ministry of Environment, these ecosites are considered to have the potential (at some point in time) to develop into moderate/high suitability habitat for woodland caribou (as shown Figure 2-2 in revised Draft EIS Appendix 9-F). As defined in the Range Plan for Woodland Caribou in Saskatchewan; Boreal Plain Ecozone- SK2 Central Caribou Administration Unit, habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g., recently burned, harvested or industrial development), but its optimal state.” (Saskatchewan Ministry of Environment 2019). As is illustrated, the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised Draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.</p> <p>Figure 2-3, Figure 2-5, and Figure 2-7 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figure 2-4, Figure 2-6, and Figure 2-8 in revised Draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p> <p>We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. The habitat potential for life history use areas summarized here were incorporated in the draft EIS approach of delineating ‘available habitat’ based on ecosite classification for woodland caribou in the Project study areas. In combination with this, in the draft EIS we assumed caribou presence year-round which was assumed to include all life requisite attributes (forage, refuge, calving). The basis for the draft EIS’s assessment of potential project and cumulative effects on woodland caribou was adequate and the additional information provided to the reviewer here does not result in any changes to the conclusions of the EIS.</p> <p>In closing, we note that the Saskatchewan Environmental Assessment Review Panel and Environmental Assessment Branch have completed their review of the Wheeler River</p>	



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								Project draft EIS plus Denison’s response to technical review comments and there are no outstanding concerns with the caribou assessment. Denison has been working closely with the Province of Saskatchewan’s, Woodland Caribou Team Lead, Habitat Ecologist and Conservation Specialists and fully anticipates ongoing oversight and approvals from the Ministry of Environment related to caribou through the Caribou Management Framework, EA decision conditions related to offsetting, the broader provincial process for project permitting, and the ongoing regulatory role of the Ministry of Environment for mining projects in Saskatchewan. Denison is committed to continuing to work with the province in this regard.	
IR-148	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>an account (and GIS file if available) of existing habitat affected, using the following formula: (Project footprint + 500m buffer) – overlapping (permanent alteration(s) + 500m buffer)</li></ul></li><li>A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</li><li>Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and</li></ol>	<p>This response has not been accepted, due to outstanding information related to #2.</p> <p>ECCC’s role is to provide advice to the CNSC under the Species at Risk Act and/or the Migratory Birds Convention Act to support compliance with these pieces of legislation in their decision making. Having access to project study area shapefiles allows ECCC to do their due diligence in validating any overlapping Critical Habitat, important habitat features, species at risk ranges, migratory birds ranges and other potentially important local or landscape characteristics. Obtaining project shapefiles from proponents is standard practice for our analysis of environmental impacts of projects.</p> <p>ECCC requested for more detailed mapping at the level of the project footprint in order to be able to have higher confidence in our analysis relative to potential effects on caribou Critical Habitat. However, as the requested mapping was not provided by the Proponent, ECCC is required to make assumptions that could impact our determination of potential effects and possible offsetting requirements to mitigate impacts to caribou Critical Habitat (as per the Federal Recovery Strategy for Woodland Caribou). We are aware that the project footprint may change, which may result in changes to the final recommended offset amount. We are prepared to work with a draft file with the understanding that it is still being finalized. The fact that the landscape may change over time based on data available does not negate the fact that baseline analysis is still required to determine impacts on caribou, and we still require the study area shapefiles to continue with our general analysis of the study area, given</p>	<p>Firstly, Denison would like to clarify the chronology associated with this IR for the record.</p> <ul style="list-style-type: none"><li>The GIS files in question were not viewed as a requirement during the first round of comments. The reviewer asked Denison to provide GIS files for all existing habitat affected in SK1 (if available).</li><li>Denison notes that the direct request for the Project footprint shape files was received from the CSNC via email on November 21, 2023 (email from Way to Switzer); however, the files were requested following a meeting between the Saskatchewan Ministry of Environment and ECCC where Project offsetting was being discussed (i.e., not in relation to the original IR topic).</li><li>Denison acknowledges that there was some confusion regarding the reviewer’s request through the FIRT process versus the requests received to support offsetting and mitigation plans outside of the EA process.</li><li>Denison will provide the Project specific shapefiles to the CNSC separately from this response table.</li></ul> <p>For reference, the relevant data (including field observations in relation to ecosite types) have been collated into new maps. Figure 9.3-8 in the revised Draft EIS shows the EA study areas and the caribou observed within the ecosite types, while Figure 2-2 in Appendix 9-F of the revised Draft EIS shows the EA study areas and the caribou observed within the ecosite types as classified and delineated by the Ministry of Environment as per their protocol (in terms of the caribou habitat potential; low, moderate, high) in relation to the SK1 conservation unit.</p>	<p>Yes</p> <p>Updates to Figure 9.3-8 and Appendix 9-F have been incorporated into the revised Draft EIS Appendices</p>



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						provide a rationale for the conclusion.  See also related: IR-154.	the limited data that was provided by the proponent.  Please provide the requested shape files.		
IR-149	-	ECCC  CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife-specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the Project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the</li></ol>	<p>This response has not been accepted.</p> <p>The Conceptual Caribou Management Plan does not provide sufficient detail to understand if using the restoration trials as an offset will produce satisfactory habitat compensation to address the Project effects to caribou.</p> <p>Additional clarity on the Proponent’s role in the Developing Eco-restoration Together program is required, such as how the outcomes of these programs will result in mitigation measures and offsetting requirements. Additional clarity on the scope of the program should also be provided so that ECCC can understand the objectives and deliverables of the program.</p> <p>See follow-up IR-149-R1A, IR-149-R1B and AD-71 in the Advice to Proponent table.</p>	<p>For context, the responses that have been provided to caribou IR-related elsewhere in this response table (IRs 37, 143, 143-144-R1, 143-145-R1, 144, 145, 148, 151, 155, 156) have relevance to the this, and other IR responses, and it is recommended that all of this information be considered in its entirety. The afore-referenced IR responses include descriptions of additional data that have been obtained and collated and analyses and interpretation that have been completed in relation to the presence of caribou and suitable habitat in Project study areas. At time therefore, Denison and its SME believe there are no material data/information gaps the prevent or constrain the analysis of Project and cumulative effects, defining the appropriate mitigation measures, and establishing the required offset within the provincial offsetting framework.</p> <p>With respect to data gaps, the following is noted:</p> <ul style="list-style-type: none"><li>• As described herein, additional data have been obtained and presented in Appendix 9-F. These data help to link caribou data, habitat/ecosite data and habitat suitable into the analysis. It is noted based on the new perspectives the overall conclusions of the caribou assessment are unchanged. While it is acknowledged that data may be lacking on the range level, Denison as a Project proponent is not responsible for and need not a complete a range assessment for the purpose of a Project-specific cumulative effects assessment.</li></ul> <p>With respect to mitigation measures, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison and its SME have re-considered the mitigation measures presented in the EIS documentation to date in light of updated caribou-related information and does not see that further mitigation measures are needed at this time.</li></ul> <p>With respect to offset, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The updated document is provided with this second round IR submission.</li></ul> <p>With respect to monitoring, the following is noted:</p> <ul style="list-style-type: none"><li>• Denison has committed to monitor for the presence of woodland caribou primarily within the Project Footprint as well as other areas within the Terrestrial RSA based on accepted methods that will be developed as part of its wildlife monitoring follow-up program as part of the implementation of its Environmental Management System. As it is understood, aerial surveys to document presence and habitat use are not permitted by the Saskatchewan Ministry of Environment at this time, Denison conceptually proposes to document the presence of woodland caribou using remote cameras placed strategically within representative habitat types within the Terrestrial RSA and a wildlife observation tracking log (based on the Project-wide implementation of the current wildlife card system Denison has in place). As Denison works collaboratively with the Saskatchewan Ministry of</li></ul>	No

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

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						<p>avoidance and minimization measures.</p> <p>4. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</p> <p>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</p> <p>6. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-157.</p>		<p>Environment to finalize the Caribou Management Framework, further details on monitoring in conjunction with the offset commitment will be developed.</p> <p>In direct response to the questions raised in the review comment the following is noted:</p> <ul style="list-style-type: none"><li>Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</li><li>We also note that the Eco-restoration Together (ERT) program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The ERT program will focus primarily on site restoration techniques for decommissioning. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</li><li>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</li></ul>	
IR-149	IR-149-R1A	ECCC	Wildlife and Wildlife Habitat	Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149	<b>Context:</b> Much of the information presented in the Conceptual Caribou Management Plan is qualitative in nature and does not present specific details regarding a quantitative assessment of impacts following measures to avoid, minimize, and restore on-site and then assess residual effects and determine the offset required to counterbalance the remaining impacts. This is	1. Provide a quantitative assessment of impacts following measures to avoid, minimize and restore on-site and then assess residual effects and determine the offset required to		<p>Please see response to IR-149.</p> <p>In addition, in direct response to IR-149-R1A the following is noted.</p> <p>1. Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison</p>	No

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
				IR-149 Response by Denison	<p>required to understand if offsetting is sufficient to address impacts to caribou. The Proponent also does not provide details on methods that will be used for pre- disturbance wildlife clearance surveys. ECCC is aware that that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program.</p> <p><b>Rationale:</b> ECCC requires the quantitative details on the assessment of impacts to be included within the Conceptual Caribou Management Plan to adequately assess how the Proponent has applied the mitigation hierarchy. Details on the methods that will be used for pre- disturbance wildlife clearance surveys will also be required to verify that the Proponent has adequately considered how they have avoided, mitigated, or restored impacts to caribou.</p> <p>While ECCC understands that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program, however, more clarity on the Proponent’s role in the program and the scope of the program is required. Details such as how the outcomes of these programs will result in mitigation measures and offsetting requirements and additional clarity on the scope of the program should also be provided so that ECCC can understand the objectives and deliverables of the program.</p>	<p>counterbalance the remaining impacts.</p> <p>2. Provide details on methods to be used for pre- disturbance wildlife clearance surveys.</p> <p>3. Provide details on the Proponent’s role in the Developing Eco-restoration Together program and how that work may be used in offsetting requirements.</p> <p>4. Provide the scope (i.e., quantitative habitat amount) of the Eco-restoration Together program.</p>		<p>has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</p> <p>2. For clarification, the pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including woodland caribou) that may potentially be using habitats at certain times of the year. For example, in the event the sweeps are conducted during the winter period, methods would include snow tracking to identify woodland caribou presence based on tracks and feeding craters observed within the study areas, based on survey protocols provided by the Government of Saskatchewan (2014). This effort would also be combined with use of remote cameras that have been in place throughout the Terrestrial RSA for the past several years, and the photos captured from the cameras can be used to further verify caribou presence with the study areas. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.</p> <p>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</p> <p>3. The Eco-restoration Together program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</p> <p>4. The Eco-restoration Together program is no longer considered within the context of the Project-related Caribou Management Framework that outlines the offset plans that Denison has been working closely with Saskatchewan MOE to develop. The offset requirements that are being developed are those that will fulfill provincial requirements under their offsetting program scheme.</p> <p><b>References:</b></p>	

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								Government of Saskatchewan. 2014. Snow Track Survey Protocol. Fish and Wildlife Branch, Ministry of Environment. 8 pp.	
IR-149	IR-149-R1B	ECCC	Wildlife and Wildlife Habitat	Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149  IR-149 Response by Denison	<b>Context:</b> Section 4.2.2 of the Conceptual Caribou Mitigation plan states: “locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;”. However, no specific mitigation measures are mentioned for impacts to caribou due to noise generated from the Project air strip.  <b>Rationale:</b> Noise from the air traffic using the air strip will also generate excessive noise that can impact caribou. Additional information on the timing and frequency of air traffic, as well as specific mitigations related to impacts from air traffic, including mitigations related to frequency and timing of flights, will be necessary to evaluate impacts to caribou due to air strip noise.	1. Provide additional information on the timing and frequency of air traffic using the Project air strip.  2. Provide specific mitigations related to impacts from air traffic, including mitigations related to frequency and timing of flights.		Please see response to IR-149.  In addition, in direct response to IR-149-R1B the following is noted.  The flight schedules have not yet been determined at this relatively early stage of planning for the Project.  Mitigation measures likely to be incorporated into the operation of the airstrip, with respect to air traffic, would include, as safety allows, maintaining as direct approach and departure flight paths as possible, and obtaining appropriate altitudes, and leaving the LSA and RSA, as quickly as is safely reasonable.	No
IR-151	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.	1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.  2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.	This response has not been accepted.  There is insufficient information to support the Proponent’s conclusion that there are no impacts to landscape connectivity. Additional information on habitat quality, caribou use of the landscape for different life stages, and important habitat features within the study area is required to understand effects of the Project on habitat connectivity.  Provide maps of caribou habitat quality and an assessment of Project impacts to high quality habitat including habitat that may be associated with landscape connectivity.	The woodland caribou found in the SK1 range are non-migratory, in the sense that barren-ground caribou are. Rather based on information received from the Saskatchewan Ministry of Environment it is understood that they utilize a variety of habitat types across both the SK1 and SK2 ranges and are distributed and move broadly across the landscape. To date, western science has not identified any known “corridors” used specifically by woodland caribou in the SK1 range. As such, the Project will not hinder or exclude woodland caribou from moving across the landscape within the SK1 range; rather, they will be able to move around the Project Footprint unimpeded through the habitat types that are available.  Knowledge holders confirmed that woodland caribou occur in the Terrestrial RSA (19-LK-ERFNTrip-134.149; 19-LK-ERFNTrip-134.151), and that local trappers encounter caribou regularly at their traplines in winter and see them during summer (19-LK-ERFNTrip-134.151). They have not observed any changes in densities and suggest that the same number of caribou have been found in the RSA over the years (19 -LK-ERFNTrip-134.156). Caribou are reported to calve near the Wheeler River, which has lots of heavy muskeg in the area (16-EN-ERFN-100.15). Knowledge holders identified the area east of Highway 914 and northeast of Russell Lake, between Russell Lake and McDougall Lake (corresponding with Omnia winter tracking transects #5 and #9; see revised draft EIS Appendix 9-B, Omnia Terrestrial Environment Wildlife and Vegetation Baseline Inventory Figure 2.6-1) as an area where caribou are commonly observed in the winter. “There are tall trees here, some small hills with protected valley areas, and it seems sheltered. There is caribou moss in this area” (19-LK-ERFNTrip-134.154). Caribou are known to travel through areas of younger forest and burns to get to preferred habitat types (19-LK-ERFNTrip-134.152), such as more mature forests and areas with abundant lichen growth. “Caribou [...] eat low bush cranberries and lichen; lichen takes many years to grow and recover” (18-EN-ERFN-5.76). Caribou have been observed to use areas of younger forest stands with regenerating pine. In years with deep snow or when there is a hard crust on the snow, they may eat the tips of fresh growth off the younger pine trees (19-LK-ERFNTrip-134.155).	Yes  Appendix 9-F incorporated (added) into revised Draft EIS Appendices

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								<p>English River First Nation and SVS (2022) compiled an IK study documenting current and past land use, knowledge of the land, and participants’ perspectives on potential Project effects, as well as cumulative effects from past mining and other developments. The report identified a wildlife corridor used by several species, including woodland caribou. The corridor runs between Cree Lake (approximately 40km southwest of the Terrestrial RSA and Russell Lake (in the southern portion of the Terrestrial RSA (Feature 1001-09; ERFN and SVS 2022). The report identified a caribou calving area: Feature 1009-07 covering large portions of the Terrestrial RSA with the exception of the most western, northern, and eastern extents. This area is also described as offering good caribou habitat year-round (ERFN and SVS 2022).</p> <p>In September 2011, Environment Canada gathered Aboriginal Traditional Knowledge from Indigenous groups across Canada to support their recovery efforts for boreal woodland caribou (ERFN 2011). In the report, most interviewees stated that caribou lost their calving areas to fires and they moved elsewhere to have their calves. It is more difficult to find the caribou now (ERFN 2011).</p> <p>Figure 2-2 in revised Draft EIS Appendix 9-F shows the location of woodland caribou observed during the baseline field program in association with the ecosite types classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou. As shown in the figure, the majority of the caribou location data points are located beyond the Project Footprint and to the northern and eastern portions of the RSA.</p> <p>Based on the information presented in Figures 2-3 to Figure 2-8 provided in Appendix 9-F, related to the life requisite habitat potential for calving, forage and refuge habitat, as characterized by the SK MOE (2023), the majority of the ecosite types within the RSA are relatively uniform with no discernable differences in habitat quality across the region. As such, there are no definitive differences in habitat quality (i.e., these ecosite types provide the same quality of habitat for use by woodland caribou). Further, there are no barriers preventing woodland caribou from moving throughout the Terrestrial RSA through the habitat types that offer a similar level of quality for the various life requisites for this species. In this context, potential Project-related effects on connectivity are not expected.</p> <p><b>References:</b></p> <p>English River First Nation (ERFN). 2011. English River First Nation: English River First Nation, ATK (Aboriginal Traditional Knowledge) Summary Report. Compiled by Environment Canada.</p> <p>English River First Nation (ERFN) and Shared Value Solutions (SVS). 2022. Wheeler River Project – Summary of Traditional Knowledge Study Results – English River First Nation. Prepared for English River First Nation. March 2022.</p>	
IR-155	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou Habitat in	1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine available habitat based	This response has not been accepted.  The Proponent’s response to IR-155 states “Available woodland caribou habitat was identified	Denison has created a series of maps utilizing existing habitat (ecosite) data in combination with the habitat potential classifications from the Saskatchewan Ministry of Environment in response to this and related IRs, as outlined below (see Appendix 9-F).	Yes  Appendix 9-F incorporated



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					<p>the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>	<p>in the draft EIS to comprise the ecosites with observations of caribou and caribou sign during the baseline studies. This was done without seasonal differentiation because it was assumed that caribou may use these ecosites during all seasons and life stages.” The methodology used to determine available caribou habitat does not accurately represent use of the documented habitat.</p> <p>The trail camera and pellet survey methods used do not satisfy the IR as they may lead to an underestimation of available caribou habitat.</p> <p>Trail camera and pellet surveys are not normally used to determine available habitat, as they only show presence. Using observations within ecosites to determine what is available habitat for caribou may lead to an underestimation of available habitat. Some smaller or rare ecosites may not have been sampled, leading to their exclusion as available habitat.</p> <p>Additionally, trail cameras were only placed on linear features, which are not representative of the whole landscape. Survey locations and camera trap placement may not provide an accurate representation of the study area or the SK1 range.</p> <p>To adequately determine available caribou habitat, ECCC requires a new habitat-based analysis that captures important biophysical features outlined in Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020.</p>	<p>Figure 2-2 in Appendix 9-F of the revised draft EIS shows the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat (Saskatchewan Ministry of Environment 2019).</p> <p>Figures 2-3, Figure 2-5, and Figure 2-7 in the revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Area, LSA, and RSA scales.</p> <p>Figures 2-4, Figure 2-6, and Figure 2-8 in the revised draft EIS Appendix 9-F illustrate the location of caribou observations in relation to the indicates habitat life requisite attributes (forage, refuge, and calving) based on the information received from the SK MOE (2024) at the Project Footprint + 500 m scale.</p>	<p>(added) into the revised Draft EIS Appendices</p>
IR-156	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>	<p>This response has not been accepted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 2020, the SK1 range is currently at its disturbance threshold. All remaining habitat in this range is considered to be critical habitat.</p> <p>As the development of this Project will result in loss of critical habitat for boreal caribou, the Project will have an impact on boreal caribou.</p>	<p>It is Denison’s and its SME’s understanding that the SK1 range is not at its disturbance threshold (60% undisturbed) based on the most recent information that we are aware of from the province that was confirmed in November of 2023. As at that date, it was estimated that the disturbance, almost exclusively due to natural factors (fire), was at 53% (SK ENV 2023). This is material to the consideration of both potential Project-related and cumulative effects that are reviewed below.</p> <p>Denison used a conservative approach in that the EA assumed that all habitat types were suitable and available to caribou and were used by caribou during all seasons in support of caribou life requisites - which is highly conservative considering the indicated low caribou population levels within the LSA and RSA.</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>



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					<p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the Proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the Project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the Proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p> <p>The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.</p>		<p>The assessment does not contain adequate information on habitat quality or representativeness of the RSA to the SK1 range. The Proponent did not consider disturbance in the regional context, therefore their conclusions are not based on the best available information. Considerations of disturbance in a regional context is required to accurately represent residual and cumulative effects to caribou within the SK1 range.</p> <p>The Proponent has not provided sufficient information to support their conclusion of a “not significant” impact to boreal caribou as the Recovery Strategy wasn’t fully considered. Since all remaining habitat in this range is critical habitat, the Project will negatively affect critical habitat necessary for the survival and recovery of the species. The Proponent should provide a revised assessment of residual and cumulative effects, taking into consideration the Recovery Strategy and that the disturbance within the SK1 range is at the disturbance management threshold, and Projects impacts to critical habitat.</p>	<p>The EA for the Project considered that the habitat types in the Project Footprint and the RSA have largely been disturbed, primarily by past fire events. This has been acknowledged and documented by local knowledge keepers. In September 2011, Environment Canada gathered Aboriginal Traditional Knowledge from Indigenous groups across Canada to support their recovery efforts of boreal woodland caribou (ERFN 2011). Forest fires are considered the main threat to woodland caribou in the English River area, and most interviewees stated that caribou lost their calving areas to fires and they moved elsewhere to have their calves. It is more difficult to find the caribou now (ERFN 2011).</p> <p>Figure 2-1 in revised Draft EIS Appendix 9-F shows the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate or high quality habitat to support woodland caribou in relation to the SK1 range. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat for caribou (Saskatchewan Ministry of Environment 2019).</p> <p>The disturbance of the SK1 conservation unit has little relevance to the LSA and RSA, which were selected to inform and focus the EA for the Project, as per accepted EA methodology. As described in Section 9.3.7, existing habitat disturbances due to past and ongoing anthropogenic development have altered the Terrestrial RSA resulting currently in 1.5% of habitat loss in the Terrestrial RSA. The Project is likely to add another 0.4% of anthropogenic disturbance (considering the Project Area of 169.6 ha) to the disturbance resulting in up to 1.9% of total anthropogenic disturbance in the Terrestrial RSA. While the Terrestrial RSA currently provides 30,541.63 ha (76.1%) of habitat that are currently available for woodland caribou (Section 9.3.7), which is located within the SK1 Boreal Shield Woodland Caribou Management Unit. Environment and Climate Change Canada (2020) identified the caribou population in the SK1 conservation unit as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in the SK1 Boreal Shield range should not exceed 5% with the remainder (i.e., 55%) being attributed to natural disturbance (while maintaining a minimum of 40% undisturbed habitat in the range). Based on 2010-2015 mapping, Environment and Climate Change Canada (2020) calculated that approximately 58% of the SK1 Boreal Shield range is currently affected by past forest fires and 3% of the range is affected by anthropogenic disturbances. Based on the federal assessment and recent preliminary disturbance assessment from ENV, an estimated 53% of SK1 is considered disturbed, with 47% undisturbed (ENV 2023), indicating that the land use and overall disturbance in the conservation unit remains below the recovery strategy disturbance threshold.</p> <p>The size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020), resulting in an estimated additional Project-related disturbance of 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. The incremental increase of the disturbance at the SK1 Range is 0.001%, but for context that habitat is primarily disturbed and regenerating as a result of past fire disturbance, which is not anticipated to be suitable habitat for caribou in the next 40-50 years. As such, the contribution of the Project effects to the cumulative effects on woodland caribou within the SK1 conservation unit are deemed to be negligible.</p>	

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								<p><b>References:</b></p> <p>Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p> <p>Saskatchewan Ministry of Environment (ENV). 2023. Woodland Caribou in the Boreal Shield (SK1): Background Information.</p>	
IR-157	-	ECCC	Wildlife and Wildlife habitat	<p>Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary</p>	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets. ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of</p>	<p>This response has not been accepted.</p> <p>The Proponent provided a conceptual Woodland Caribou Monitoring Plan, however, this plan does not include an assessment of the Proponent’s determination of the required amount of habitat offset.</p> <p>ECCC currently recommends a minimum offset multiplier of 4:1 (offset outcome: residual adverse effect) for a project that has a low severity impact of adversely affecting a low vulnerability ecological component. This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum; for example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context.</p> <p>Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p> <p>The Proponent provided a conceptual Woodland Caribou Monitoring Plan, however, this plan does not include an assessment of the Proponent’s determination of the required amount of habitat offset.</p> <p>ECCC currently recommends a minimum offset multiplier of 4:1 (offset outcome: residual adverse effect) for a project that has a low severity impact of adversely affecting a low vulnerability ecological component. This is a benchmark ratio applied to a</p>	<p>Please see response to IR-149.</p> <p>In addition, in direct response to IR-157 the following is noted.</p> <p>Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</p> <p>Further, Denison has committed to monitoring the effects on wildlife, as per the Wildlife Management Plan. The findings of the monitoring programs are expected to inform Denison, through an adaptive management process, of the need, if any, for additional mitigation measures.</p>	No

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						<p>the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p>	<p>project that is in the lower end of the risk spectrum; for example, for a project with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context.</p> <p>Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets.</p> <p>In the absence of sufficient data or information required to validate the level of risk that this Project is likely to have on the species recovery, the implementation of the mitigation hierarchy and offsetting measures to address Project adverse effects, ECCC’s views are based on the precautionary approach.</p> <p>Thus, ECCC preliminary analysis regarding the likelihood of this Project having an adverse effect on boreal caribou recovery is identified as moderate to high, resulting in a precautionary offsetting requirement that should be in terms of amount, much greater than 4:1. The assumptions of ECCC’s risk assessment include:</p> <ul style="list-style-type: none"><li>• The biophysical attributes required for boreal caribou recovery (i.e. habitat for calving, post-calving, rutting, winter and travel) are present within the study area and will be directly or functionally lost,</li><li>• Sensory disturbance arising from project activities (e.g. air traffic) will cause functional habitat loss for boreal caribou within important habitat areas required for different life stages.</li></ul>		

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							<p>Additionally, lack of information supporting the Proponent’s offsetting plans creates uncertainty and thereby warrants a higher offset ratio.</p> <p>ECCC is available to provide information to the Proponent on how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>		
IR-158	-	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p><b>Updated Rationale:</b> The Proponent should identify additional focal species that can serve as indicator species by representing anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects, such as species at elevated risk of collision with vehicle traffic.</p> <p>By identifying focal species or guilds for each key indicator species within the Migratory Breeding Birds Valued Components (VCs), ECCC would be able to accurately review the Proponent’s assessment of impacts and mitigation measures in order to assess the accuracy of the Proponent’s conclusions and provide expert advice on the mitigation measures.</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	<p>This response has not been accepted.</p> <p>The Proponent did not identify focal species for each key indicator species within the Migratory Breeding Birds valued components. This information is needed to accurately review the Proponent’s assessment of impacts and mitigation measures in order to assess the accuracy of the Proponent’s conclusions and provide expert advice on the mitigation measures.</p>	<p>The information provided in the Draft EIS did include a discussion of bird guilds/focal species in the Existing Environment, see Section 9.4.3.2 Migratory Breeding Birds. Section 9.4.6.3.1 in the revised Draft EIS has been updated so that discussion regarding guilds/focal species was carried forward within the effects assessment and specifically within the context of the habitat-based assessment to link habitat related effects to bird species identified in the study areas.</p> <p>For reference it is noted that no focal species/guilds were initially included as part of the VC determination as the approach used in the EA was focused on the key habitat types (i.e., habitat-based assessment) that all migratory bird species, regardless of guild, would be expected to use on a seasonal or year-round basis depending on the species. For example, it is recognized that waterbirds and waterfowl use different habitat types as part of their individual life requisites, in that they all require open water for foraging but may nest in either upland or wet meadow or aquatic habitats. Upland game birds typically use a variety of upland forest ecosite types, whereas migratory songbirds will be found in all ecosite types throughout the RSA. As such, the EA considered the potential effects on all available habitat types used by these key indicator species and appropriate mitigation measures have been proposed and will be implemented which will address all migratory bird species regardless of focal species/guild. Nevertheless, as indicated above, discussion of focal species/guilds has been carried forward more directly into the effects assessment. It is noted that this discussion does not change the mitigation measures proposed, nor the conclusions of the assessment.</p>	Yes  Section 9.4.6.3.1
IR-159	-	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	<p>This response has not been accepted.</p> <p>The Proponent’s response indicated that their opinion is that the data presented in the draft EIS is sufficient and that no updates to the draft EIS are needed.</p> <p>However, a single year of baseline data from 2017 is insufficient to assess Project impacts during the follow-up and monitoring program. Although pre-construction surveys prior to clearing can give a very localized picture of the avian community, it does not provide a baseline within the Regional Study Area (RSA) of the bird community and will be</p>	<p>Denison and its SME continue to be of the opinion that the data on which the effects assessment is based are sufficient and fit for purpose as it concerns the EA process. The effects assessment was not based on the 2017 field survey data alone. The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including IK. The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory</p>	Yes  Appendix 9-F incorporated (added) into the revised Draft EIS Appendices



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					<p>avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p> <p><b>Updated Rationale:</b> ECCC recommends that for major projects, a minimum of two years of field surveys should be provided so that temporal variability can be considered when comparing post-construction against baseline records and other available data. More recent data is needed due to landscape changes that may have occurred since 2017 as well as cumulative effects that have occurred in that time. Additionally, if there was an unusually high population density of birds in 2017 due to extraneous circumstances, Project effects may be attributed to a non-existent decline in the population when the discrepancy can be due to natural variability.</p> <p>A more recent baseline will account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p>		<p>of limited use for comparing construction and operational monitoring data to baseline conditions. Use of more recent data or supplemental data can account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures.</p> <p>See follow-up IR-142-159-167-R1.</p>	<p>songbird species were documented. A summary of the total number of individuals observed for each species across all plots is provided in Appendix 9-F of the revised Draft EIS. While the supplemental data do provide further context for the RSA, they would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA.</p> <p>The above does not preclude the implementation of further breeding bird surveys prior to site development and operations. Denison accepts the comment that additional, more recent information, as well as supplemental data as available, and will provide the basis for a more effective review of mitigation and follow-up measures as the Project moves forward. The details of such follow-up monitoring will be defined as part of the further consideration of planning related to follow up programs.</p> <p>For clarification the pre-clearance wildlife sweeps are intended to identify sensitive wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects. The spatial scale of where these pre-construction sweeps would be completed could be expanded to include other areas beyond the Project Area but within the RSA.</p>	
IR-160	-	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p><b>Updated Rationale:</b> Results regarding the effects of the Project, including a discussion on habitat types that will be lost or indirectly impacted during the life of the Project, and a discussion on the overall impact on the avian community including results from baseline studies as well as other supplemental information as per IR-159 are required to assess the validity of the Proponent’s conclusions and should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>	<p>This response has not been accepted.</p> <p>The Proponent did not provide the information requested in IR-159. This information is required to assess the accuracy of the effects assessment.</p>	<p>Table 9.4-15: Summary of Available Habitat for Migratory Songbirds in the Project Study Areas provides an overview of the ecosite types that are present with the Project Area, Wildlife LSA, and Terrestrial RSA that are available for use by all migratory bird species.</p> <p>Direct effects, specifically habitat loss, are calculated as the area of available habitat for migratory songbirds expected to be lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during the Construction Phase. In the Project Area, 113.5 ha or 100% of available habitat is assumed to be removed and will not be available to the migratory songbird species for the duration of the Project. This represents the removal of 4.5% of available habitat within the Wildlife LSA and of 0.6% within the Terrestrial RSA (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds, Direct Habitat Loss, and Habitat Alteration in the Study Areas). Further, revisions included in Figure 9.4-11: Available Habitat for Migratory Songbirds provides further context as to the habitat (ecosite) types within the Project Area that will be affected by Project activities.</p> <p>An additional 28.5% (719.4 ha) of available habitat for migratory songbirds in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance. In the Terrestrial RSA, 3.5% of available habitat may experience habitat alteration (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds,</p>	<p>Yes</p> <p>Revised Draft EIS, Table 9.4-15, Table 9.4-16 and Figure 9.4-11 have been updated</p>

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								Direct Habitat Loss, and Habitat Alteration in the Study Areas). Mitigation measures outlined in Section 9.4.5 are anticipated to reduce the effects of alteration and/or loss of habitat on migratory songbirds, but not eliminate them.	
IR-162	-	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<p><b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.</p> <p>In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow (<i>Hirundo rustica</i>) and Horned Grebe (<i>Podiceps auratus</i>) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”</p> <p>Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.</p> <p><b>Updated Rationale:</b> The management plans for these three species demonstrate the variability in their habitat selection.</p> <p>The Management Plan for the Yellow Rail (<i>Coturnicops noveboracensis</i>) in Canada (Environment Canada, 2013) states “Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert 1999, COSEWIC 2009), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). “</p> <p>The Management Plan for the Rusty blackbird (<i>Euphagus carolinus</i>) in Canada (Environment Canada 2015), states: “Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka et al. 2010a, Matsuoka et al. 2010b, Greenberg et al. 2011).”</p>	<p>1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>3. Assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>See also related IRs: IR-160 and IR-161.</p>	<p>This response has not been accepted.</p> <p>Part 1. Of the IR was accepted, however the answer for part 2. And 3. Of the IR are insufficient in order to understand the Proponent’s rationale for using yellow rail and rusty blackbird to represent horned grebe. These species are all associated with wetlands, however, their specific habitat requirements and wetland types differ.</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures to allow for a more accurate review of the chosen mitigation measures.</p>	<p>As noted elsewhere in the IR responses, per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project’s effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA.</p> <p>Nesting habitat requirements of the horned grebe are similar at a landscape level to those represented by yellow rail and rusty blackbird in that they are typically found associated with northern waterbodies and watercourses with various forms of emergent vegetation. At a site-specific scale, there are subtle differences in nesting habitat requirements, as summarized previously by ECCC in the Context and Rationale response.</p> <p>Given the nesting habitat requirements of these species, the available habitat types within the Denison study areas (e.g., Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area) for use by these species include the following ecosite types: Labrador tea shrubby bog (BS18), graminoid bog (BS 19), graminoid bog/graminoid fen (BS19/BS24), open bog (BS 20), leatherleaf shrubby poor fen (BS22), willow shrubby rich fen (BS23), graminoid fen (BS24), open fen (BS25), and waterbodies and lakes. The habitat-based methodology of the environmental assessment adequately and appropriately addresses effects on these habitat types and the associated migratory bird species that could potentially use these habitat types. Further assessment of each species would not be expected to affect or alter the findings of the habitat-based environmental assessment.</p> <p>The characterization of the alteration and/or habitat loss residual effect considers the Project effects on available habitat used by these three migratory breeding birds within the Wildlife LSA and Terrestrial RSA. As outlined in Table 9.3 18, 0.05% of the Project Area, 11.5% of the Wildlife LSA, and 24.2% of the Terrestrial RSA provide habitat types that are potentially available to these three migratory breeding bird species.</p> <p>Direct habitat loss is calculated as the area of available habitat lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during Construction. In the Project Area, 0.09 ha or 100% of available habitat is assumed to be removed and will not be available to these species for the duration of the Project (Table 9.3 19). This considers that the Project Area has previously been disturbed (i.e., almost 15% of the Project Area is disturbed by anthropogenic activities) and includes only 0.02 ha (0.01%) of landscape covered by waterbodies. This relates to a removal of 0.02% of available habitat within the Wildlife LSA and 0.001% in the Terrestrial RSA.</p> <p>An additional 93.9 ha (17.0%) of available habitat in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance (Table 9.3 19). This area of indirect effect represents 1.0% of available habitat in the Terrestrial RSA that may experience habitat alteration.</p>	No



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					<p>The Management Plan for the Horned Grebe (<i>Podiceps auritus</i>), Western population, in Canada (ECCC, 2022) states: “The Horned Grebe breeds in small (generally 0.5 to 2 ha, but ranging from 0.24 to 18.2 ha), shallow (at least 20 cm deep, but on average 40 cm), and usually fishless, perennial wetlands, but they can also nest on larger lakes with shallow edges and sufficient emergent vegetation. Breeding sites usually contain at least 40% open water with beds of emergent vegetation, such as sedges (<i>Carex</i> spp.), rushes (<i>Juncus</i> spp.) and cattails (<i>Typha</i> spp.) (Faaborg 1976, Kuczynski et al. 2012, Routhier 2012, Stedman 2018).”</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures. This will allow for a more accurate review of the chosen mitigation measures.</p>				
IR-164	-	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<p><b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).</p> <p>As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.</p> <p><b>Updated Rationale:</b> A greater level of detail, including a discussion on impacts to different focal species and/or guilds within the Migratory Breeding Birds Valued Component, is required for a more fulsome assessment of effects and identification of mitigation measures. Additionally, mapping detailing important features or habitat types that will be lost due to the Project for different guilds of migratory birds will be required to assess Project effects. This information will be required in order for the Proponent to apply adaptive management, and for ECCC to review the adequacy of these management plans.</p>	<p>1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.</p> <p>2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.</p>	<p>This response has not been accepted.</p> <p>The Proponent did not provide the information requested in the previous Information Requirement. The discussion of impacts to different focal species/guilds within the Migratory Breeding Birds VC and mapping of important features or habitat types lost for these guilds of birds is required for the Proponent to apply adaptive management, and for ECCC to review the adequacy of these management plans.</p>	<p>As noted elsewhere in the IR responses, as per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project’s effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA. Further, the approach used in the EA was focused on the key habitat types that all migratory bird species, regardless of guild, would use. The EA considered the potential effects on all available habitat types used by these key indicator species and appropriate mitigation measures have been proposed and will be implemented which considered all migratory bird species regardless of focal species/guild.</p> <p>Direct habitat loss is based on the removal of habitat (ecosites) during site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during the Construction Phase. In the Project Area, 113.5 ha or 100% of available habitat is assumed to be removed and will not be available to the migratory songbird species for the duration of the Project. This represents the removal of 4.5% of available habitat within the Wildlife LSA and of 0.6% within the Terrestrial RSA (Table 9.4 16: Summary of Available Habitat for Migratory Songbirds, Direct Habitat Loss, and Habitat Alteration in the Study Areas). Further, revisions have been made to Figure 9.4-11 in the revised draft EIS provides further context as to the habitat (ecosite) types within the Project Area that will be affected by Project activities.</p> <p>No important wildlife features were identified within the Project Area during the baseline surveys, although several raptor nests were found within the Wildlife LSA and Terrestrial RSA (see Figure 9.4-6 in the revised draft EIS:). The pre-clearance wildlife sweeps will be completed to identify important wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects.</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Figure 9.4-6 and Figure 9.4-11</p>
IR-165	-	CNSC ECCC	Birds (all species)	Section 9.4.4.2.2	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p>	<p>Please perform an ecological risk assessment with avian receptors</p>	<p>This response has not been accepted.</p>	<p>The CCME livestock guidelines are intended to protect both birds and mammals. As per the CCME “Protocols for Deriving Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water)”, the livestock guidelines are</p>	<p>No</p>

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				Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment  Appendix 10-A (ERA)	<p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>located at the contaminated waste ponds, including:</p> <ol style="list-style-type: none"><li>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</li><li>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</li><li>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>	<p>Please provide an explanation for the appropriateness and conservatism of using the Canadian Council of Ministers of the Environment (CCME) water quality guidelines (WQG) for the protection of livestock for avian receptors, or update the tables provided in Attachment IR-165 using the CCME Water Quality Guidelines for the Protection of Aquatic Life.</p> <p>In order to protect migratory birds from the quality of water in the water management pond, it is recommended that the use of the CCME water quality guidelines for the protection of aquatic life to assess potential impacts to aquatic birds from water management facilities because they are more protective than the CCME water quality guidelines for livestock with lower acceptable levels for contaminants. The water quality guidelines for the protection of aquatic life should also be used to compare predicted contaminant concentrations in water management ponds. The FIRT is unable to verify predicted Project impacts to migratory birds using water management ponds as the selected CCME Water Quality Guidelines for livestock do not accurately reflect the exposure levels and pathways experienced by waterfowl and shorebirds.</p>	<p>based on toxicological datasets and follows toxicological dataset requirements for derivation of the guidelines. Livestock are defined in the Protocol as “any terrestrial animal kept for economic profit or personal use (e.g., cattle, pigs, poultry, waterfowl, etc.)”. The Protocol identifies that aquatic organisms such as fish should be addressed by the water quality guidelines for protection of aquatic life. The IR is asking about avian receptors located at the water management ponds . It is not appropriate to assess avian receptors (which are considered riparian and/or terrestrial) against guidelines for the protection of aquatic life (which are considered to be fish, aquatic plants, aquatic invertebrates, etc.). As identified in the Protocol, the livestock guidelines consider the potential for bioaccumulation in the animal. Additionally, for each species, the livestock guidelines are based on the data from the most sensitive livestock species, and the sensitivities of life stages are considered as well. As such, the livestock guidelines are considered sufficiently protective in the unlikely case that avian birds land on and drink from the process water pond or the effluent monitoring and release ponds. The previous response to IR-165 (Attachment IR-165) outlined the numerous mitigation measures Denison plans to implement to minimize the potential for avian exposure to pond water, as well as additional visual and auditory deterrent techniques. As such, no additional changes are needed to address this IR.</p> <p><b>References:</b></p> <p>CCME. 1999. Protocols for Deriving Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water).</p>	
IR-169	-	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds, Table 9.4-15 and Map 9.4-11	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density</p>	<ol style="list-style-type: none"><li>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</li><li>2. Explain why other habitat types were not considered as available habitat for migratory songbirds.</li></ol>	<p>This response has not been accepted.</p> <p>In their response to IR-169, the Proponent states, “As per accepted methodology, to appropriately focus the habitat- based effects assessment, as per accepted EA methodology, the most frequently used habitat types (i.e., the ecosites experiencing the highest species richness, highest mean number of breeding songbird pairs, and highest species diversity) within the Project study areas were included as “available habitat” as shown in draft EIS Table 9.4-15 Summary of Available Habitat for Migratory Songbirds in the Project Study Areas and Figure 9.4-11 Available Habitat for Migratory Songbirds.”</p> <p>The methodology used to determine available habitat is not appropriate. The methodology used</p>	<p>Updates to Table 9.4-15 and 9.4-16, as well as Figure 9.4-11 have been completed in the revised Draft EIS to include all habitat (ecosite) types. See separate response to IR-169: Available Habitat for Migratory Songbirds. Figure 9.4-11 will be replaced in the EIS with a revised figure that includes all ecosite types.</p> <p>Although of interest, these observations with the RSA would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA.</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Table 9.4-15 and Table 9.4-16, as well as updates to Figure 9.4-11.</p>

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					and diversity, it is expected that all ecosites provide migratory songbird habitat.		<p>by the Proponent would be appropriate for the identification of higher quality habitat, but not as a representation of all available habitat. The methods used to determine available habitat may underrepresent rare ecosite types that were not sampled or were sparsely sampled, including ecosite types that may be important for species at risk. Avian habitat mapping/analyses should be corrected to reflect all available habitat to understand the location of habitat and the presence/absence of species.</p> <p>Repeat the analysis of available habitat to include all habitats used by birds, or</p> <p>a. Change mapping and analyses to indicate that areas identified are ecosites with the highest frequency of use, or</p> <p>b. Change mapping and analyses to show relative habitat use.</p>		
IR-170	-	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p><b>Rationale:</b> Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>This response has not been accepted.</p> <p>Part 1 of the IR was addressed, however, part 2 has not been addressed. ECCC requires this information to properly assess potential the mitigations and adaptive management for Common Nighthawk.</p>	<p>Based on the baseline field survey observations (n=38) for common nighthawk, the majority of observations (n=20) were in association with anthropogenic (disturbed) ecosite types, while the remainder (n=10) were associated with the jack pine-blueberry/black spruce-blueberry/lich (BS3/BS7) ecosite.</p> <p>Updates to Figure 9.4-7, Figure 9.4-12 and Table 9.4-19 of the revised draft EIS have been completed to include all habitat (ecosite) types. See separate response to IR-170: Available Habitat for Common Nighthawk. Figure 9.4-12 in the revised draft EIS has been replaced in the EIS with a revised figure that includes all ecosite types.</p> <p>Mitigation measures that would pertain to common nighthawks are included in Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance, which state that site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, whenever practicable. The nesting season for the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs in Saskatchewan spans a period from March 15 to August 31.</p> <p>Further, in the event site clearing is necessary within this time frame, pre-clearance wildlife sweeps will be completed where common nighthawks are suspected of nesting; if an occupied nest is found, applicable activity restriction guidelines would be implemented (as per SK MOE 2017).</p> <p><b>References:</b></p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	<p>Yes</p> <p>Revised Draft EIS, updates to Figure 9.4-7, Figure 9.4-12, and Table 9.4-19</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-174	-	ECCC	SAR – Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p><b>Rationale:</b> Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<p>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</p> <p>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</p> <p>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</p> <p>4. Describe any pre-construction/pre-clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</p>	<p>This response has not been accepted.</p> <p>Items 1., 3. And 4. of IR-174 are accepted, however, item 2. Of IR-174, which asked for mapping of suitable myotis habitat, was not addressed.</p> <p>Mapping of suitable habitat or results from baseline studies is required to understand Project impacts to Species At Risk (SAR) bat species. This may include providing mapping of bat acoustic results, including locations along with frequency of detections.</p> <p>See also IR-134 and follow-up 134-R1.</p>	<p>Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure 2.9 of Appendix 9-F of the revised draft EIS.</p> <p>The EA used a habitat-based approach to predict the effects of the Project on bat species. Further, in the event that site clearing is necessary, pre-clearance wildlife sweeps will be completed and appropriate mitigation will be developed and implemented.</p> <p>The pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These sweeps are intended to identify sensitive wildlife features (including hibernacula or potential roosting sites for myotis species) that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these surveys, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.</p>	<p>Yes</p> <p>Appendix 9-F incorporated (added) into the revised Draft EIS Appendices</p>
IR-189	-	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<p><b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”</p> <p>In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”</p> <p><b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.</p>	<p>Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70% lichen in the diet.</p> <p>See also related: IR-138.</p>	<p>This response has not been accepted. Please:</p> <p>1. Provide a summary table of all hazard quotients for the second woodland caribou model assuming a diet of 70% lichen, 20% browse, and 10% macrophytes, for completeness.</p> <p>2. Clarify if the Appendix 10-A (ERA) will be updated to include the second woodland caribou model.</p>	<p>1. Summary tables of all hazard quotients (HQs) and the maximum radiological dose for the second woodland caribou model assuming a high lichen diet (HLD) of 70% lichen, 20% browse, and 10% macrophytes (woodland caribou HLD) and the woodland caribou assuming a low lichen diet (LLD) of 50% browse, 20% lichen and 30% macrophytes (woodland caribou LLD) are provided below.</p>	<p>Yes</p> <p>Appendix 10-A, New Section 6.2.1 added</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																																																																																									
								<table><tr><th rowspan="2">Biota</th><th rowspan="2">Location</th><th colspan="5">Maximum HQs during Project Phases</th></tr><tr><th>Arsenic</th><th>Cadmium</th><th>Cobalt</th><th>Chromium</th><th>Copper</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.70E-04</td><td>2.79E-04</td><td>1.62E-04</td><td>2.30E-04</td><td>2.74E-02</td></tr><tr><td>Whitefish Lake</td><td>3.85E-04</td><td>2.84E-04</td><td>1.66E-04</td><td>2.33E-04</td><td>2.83E-02</td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.90E-04</td><td>3.28E-04</td><td>2.00E-04</td><td>3.72E-04</td><td>2.15E-02</td></tr><tr><td>Whitefish Lake</td><td>4.06E-04</td><td>3.33E-04</td><td>2.04E-04</td><td>3.76E-04</td><td>2.29E-02</td></tr><tr><th>Biota</th><th>Location</th><th>Molybdenum</th><th>Selenium</th><th>Uranium</th><th>Vanadium</th><th>Zinc</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.30E-04</td><td>4.63E-03</td><td>3.10E-04</td><td>7.79E-03</td><td>2.80E-03</td></tr><tr><td>Whitefish Lake</td><td>2.54E-03</td><td>7.65E-03</td><td>9.19E-03</td><td>8.98E-03</td><td>2.82E-03</td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>4.50E-04</td><td>6.41E-03</td><td>4.20E-04</td><td>9.97E-03</td><td>3.53E-03</td></tr><tr><td>Whitefish Lake</td><td>2.43E-03</td><td>8.40E-03</td><td>1.66E-02</td><td>1.10E-02</td><td>3.54E-03</td></tr></table> <table><tr><th rowspan="2">Biota</th><th rowspan="2">Location</th><th colspan="7">Maximum Radiological Dose During Project Phases (mGy/d)</th></tr><tr><th>Uranium-238</th><th>Uranium-234</th><th>Thorium-230</th><th>Radium-226</th><th>Lead-210</th><th>Polonium-210</th><th>Total Dose</th></tr><tr><td rowspan="2">WoodLand Caribou LLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.34E-06</td><td>3.81E-06</td><td>6.25E-06</td><td>6.81E-04</td><td>1.20E-05</td><td>6.24E-03</td><td>6.95E-03</td></tr><tr><td>Whitefish Lake</td><td>8.19E-05</td><td>9.32E-05</td><td>7.30E-06</td><td>6.86E-04</td><td>1.20E-05</td><td>6.26E-03</td><td>7.14E-03</td></tr><tr><td rowspan="2">WoodLand Caribou HLD</td><td>Reference (Kratchkowsky Lake)</td><td>3.61E-06</td><td>4.12E-06</td><td>4.44E-06</td><td>6.05E-04</td><td>1.99E-05</td><td>1.09E-02</td><td>1.15E-02</td></tr><tr><td>Whitefish Lake</td><td>1.43E-04</td><td>1.62E-04</td><td>4.74E-06</td><td>6.09E-04</td><td>1.99E-05</td><td>1.09E-02</td><td>1.18E-02</td></tr></table> <p>Compared with the woodland caribou LLD, the predicted maximum HQs for the woodland caribou HLD generally increased by 5 to 81% with the exception of copper and molybdenum where the HQ decreased by 4 to 22% due to copper and molybdenum concentrations in lichen being lower than in browse. However, all HQs for woodland caribou HLD are below the benchmark of 1 for all non-radiological COPCs. The predicted maximum total radiological dose for the woodland caribou HLD increased by 65% compared to that for the woodland caribou LLD. However, the total dose for woodland caribou HLD is still far below the radiation dose benchmark of 2.4 mGy/d for terrestrial biota, as recommended in CSA N288.6-22.</p> <p>2. Appendix 10-A (ERA) was updated to include the second woodland caribou model as part of the sensitivity analysis presented in Section 6.2, “Section 6.2.1 Woodland Caribou Diet”. Additional text in this updated section is as follows: “The food source for the woodland caribou in the winter is terrestrial or arboreal lichens; terrestrial and aquatic vegetation are also food sources in the remainder of the year. For the ecological risk assessment, a low lichen diet (LLD) comprised of 50% browse, 20% lichen and 30% macrophytes was assumed to represent the year-round diet for woodland caribou (woodland caribou LLD). Research has noted that arboreal lichen could make up 70% of the caribou’s winter diet (MNRW, 2006). To make sure that woodland caribou who may have higher consumption rates of lichen remains protected, a high lichen diet (HLD) comprised of 70% lichen, 20% browse and 10% macrophytes was assumed as a sensitivity scenario for woodland caribou who may have higher consumption rates of lichen (woodland caribou HLD).”</p>	Biota	Location	Maximum HQs during Project Phases					Arsenic	Cadmium	Cobalt	Chromium	Copper	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.70E-04	2.79E-04	1.62E-04	2.30E-04	2.74E-02	Whitefish Lake	3.85E-04	2.84E-04	1.66E-04	2.33E-04	2.83E-02	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	3.90E-04	3.28E-04	2.00E-04	3.72E-04	2.15E-02	Whitefish Lake	4.06E-04	3.33E-04	2.04E-04	3.76E-04	2.29E-02	Biota	Location	Molybdenum	Selenium	Uranium	Vanadium	Zinc	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.30E-04	4.63E-03	3.10E-04	7.79E-03	2.80E-03	Whitefish Lake	2.54E-03	7.65E-03	9.19E-03	8.98E-03	2.82E-03	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	4.50E-04	6.41E-03	4.20E-04	9.97E-03	3.53E-03	Whitefish Lake	2.43E-03	8.40E-03	1.66E-02	1.10E-02	3.54E-03	Biota	Location	Maximum Radiological Dose During Project Phases (mGy/d)							Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-210	Polonium-210	Total Dose	WoodLand Caribou LLD	Reference (Kratchkowsky Lake)	3.34E-06	3.81E-06	6.25E-06	6.81E-04	1.20E-05	6.24E-03	6.95E-03	Whitefish Lake	8.19E-05	9.32E-05	7.30E-06	6.86E-04	1.20E-05	6.26E-03	7.14E-03	WoodLand Caribou HLD	Reference (Kratchkowsky Lake)	3.61E-06	4.12E-06	4.44E-06	6.05E-04	1.99E-05	1.09E-02	1.15E-02	Whitefish Lake	1.43E-04	1.62E-04	4.74E-06	6.09E-04	1.99E-05	1.09E-02	1.18E-02	
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								For reference, the modelled results (shown above) have been included as Table 6-1 and Table 6-2 in Section 6.2.1.  <b>References:</b> Ministry of Natural Resources and Wildlife (MNRW) Quebec Wildlife Sector, 2006. Gaspésie Woodland Caribou Recovery Plan (2002-2012). <a href="https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_gaspesie_woodland_caribou_final_1007_e.pdf">https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_gaspesie_woodland_caribou_final_1007_e.pdf</a>	
IR-190	-	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)  Appendix 6, Table 5 (p. 16)	NO2 criteria is not being consistently compared.  <b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.  Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.  <b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.	1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.	This response has not been accepted, as the rationale for not applying the CAAQS in the assessment is not accurate.  Health Canada acknowledges the commitment to use the 2025 CAAQS for NO <sub>2</sub> in future mitigation and follow-up plans. However, the response to IR-190 did not compare the predicted maximum concentrations to the most protective applicable air quality standards available (i.e., CAAQS), and included the following rationale:  <i>The CAAQS are applicable to measured ambient air concentrations over a three-year period and are not applicable to modelled results from a single facility; and, Use of the CAAQCs would require a three-year site specific data set.</i>  The statement is incorrect. The CAAQS are national air quality standards, but they are not restricted to applications within the context of the Air Quality Management System (AQMS). The comparison with CAAQS may be considered in determining the nature and severity of the Project’s impact on air quality levels and the resulting mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS.  The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, Health Canada suggests using model results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The modelling results should be able to indicate the frequency of CAAQS exceedances, which can	Table 3-9 and Table 3-10 in the ERA (Appendix 10-A) have been updated to use the available Federal CAAQS for NO <sub>2</sub> and SO <sub>2</sub> as the screening criteria instead of the Provincial SAAQS. Accompanying text was also updated to acknowledge exceedances of the NO <sub>2</sub> 1-hour CAAQS during all project phases instead of just during decommissioning. Additional text was added to Section 3.2.1.3.1 to acknowledge the number of hours in a year where exceedances of the CAAQS may occur.  For reference purposes the following further information is noted. While Denison is committed to applying the CAAQS in future monitoring and mitigation programs, it is important to note that the CAAQS are not legally binding or enforceable standards under federal law. The AQMS (Air Quality Management System) that underpins CAAQS is not a regulation, but merely a cooperative arrangement between the federal and provincial governments that informs decision-making at the provincial level. As such, the current provincial air quality criteria remain the only legally enforceable standards that are applicable to the Project, until such time that the province chooses to fully adopt the CAAQS.	Yes  Appendix 10-A Table 3-9, Table 3-10, Section 3.2.1.3.1 "Nitrogen Dioxide"



IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>be used in the discussion as to whether any anticipated human health impacts are anticipated.</p> <p>Please see the Advice to the Proponent table for further discussion on the use of CAAQS (AD-69), which also notes that, while being more conservative than the NAAQO, Saskatchewan &amp; Alberta’s screening value do not reflect the most recent science, which indicates that there is no apparent threshold for NO<sub>2</sub>, meaning that health effects may occur at any level of exposure.</p> <p>See also follow-up IR 190-R1.</p>		
IR-190	IR-190-R1	HC	Change to an environmental component due to hazardous contaminants	<p>Section 6.1.3.2.2 (p. 6-21) Table 6.1-8 (p. 6-22); and, Table 6.1-9 (p. 6-22)</p> <p>Section 6.1.8 (p.6-44)</p> <p>IR-190 Response from Denison</p>	<p>Limitations with the proposed use of passive NO<sub>2</sub> monitoring would not allow comparison of measurement results to the 2025 CAAQS for 1-hour NO<sub>2</sub>.</p> <p><b>Context:</b> In response to IR-190, there was agreement to using the 2025 CAAQS for NO<sub>2</sub> in future mitigation and follow-up plans, which Health Canada supports. However, the proposed air quality monitoring and follow-up plans (Chapter 6.1.8) anticipate continued use passive NO<sub>2</sub> samplers, which do not measure hourly (1-hour) concentrations.</p> <p>Section 6.1.3.2.2 indicates that the assessment makes use of passive samplers to measure NO<sub>2</sub> at two sampling locations. The results from those samplers are presented in tables 6.1-8 and 6.1-9, for a ~30-day sampling period (i.e., a total concentrations for NO<sub>2</sub> in ambient air over ~30 days).</p> <p>While passive samplers provide measurement data for comparison to the annual 2025 CAAQS for NO<sub>2</sub>, measurement data for the 1-hour NO<sub>2</sub> standard commonly requires use of an active sampler.</p> <p><b>Rationale:</b> Health Canada encourages the monitoring of air contaminants when exceedances or near-exceedances of air quality criteria, standards and/or guidance values are predicted or reported, to:</p> <ul style="list-style-type: none"><li>• determine the accuracy of predictions;</li><li>• help verify whether standards are being met; and,</li><li>• assist with implementing or modifying mitigation measures.</li></ul>	<p>1.Provide additional details on proposed air quality monitoring for NO<sub>2</sub> that will allow for comparisons to both the 1-hour and annual 2025 CAAQS and how that will be used to support mitigation and follow-up plans. Distinguish between comparisons with measured and modelled monitoring data, as well as use of passive and active samplers.</p> <p>2. If multiple approaches will be used to monitor NO<sub>2</sub> (e.g., use of passive and/or active samplers, modifications due to differences between project phases, etc.), describe their intended contribution to the monitoring objectives and outcomes (e.g., determine the accuracy of predictions; assist with implementing or modifying mitigation measures).</p>		<p>1. Air quality monitoring for NO<sub>2</sub> is proposed as monthly collection using passive samplers, during all Project phases. The objective of the program is to demonstrate compliance with provincial and federal ambient air quality standards including the CAAQSs. Monitoring data will also be compared against the modelled data provided in the EIS. Passive samplers will allow for direct comparison against the annual 2025 CAAQSs. To compare against the 1-hour CAAQSs Denison will use a commonly utilized averaging equation (such as the Ontario MECP averaging equation <a href="#">Air Dispersion Modelling Guideline for Ontario</a>) to allow for conversion from the monitoring period to a 1-hour averaging period. Denison acknowledges that short-term peaks may not be captured through the passive sampling approach; however, Denison plans to first utilize passive sampling during site preparation and will consider based on an adaptive management process whether there is a need to switch to continuous monitoring.</p> <p>2. See response to #1. Denison intends to use passive samplers for NO<sub>2</sub> monitoring.</p> <p><b>References:</b></p> <p>Ontario MECP. 2017. AIR DISPERSION MODELLING GUIDELINE FOR ONTARIO [GUIDELINE A-11] Version 3.0. <a href="#">Air Dispersion Modelling Guideline for Ontario</a>.</p>	No
IR-193	-	ECCC	Change to an environmental component due	Appendix 10-A (ERA), Section 3.1.1.2	<b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all	1. Provide acute and chronic water quality thresholds for all required	This response has not been accepted, as the Proponent has not included un-ionized ammonia, mercury and phosphorous in Table 3-1 in Appendix	1.) The ERA in Appendix 10-A is focused on chronic long-term exposure due to routine effluent release during the Project Phases. As such the screening criteria used were chronic criteria. It is acknowledged that effluent quality will not be allowed to exceed	Yes

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			to hazardous contaminants	Section 8.2.4.2.3	<p>COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>10-A or provided acute and chronic water quality thresholds for all COPCs, including those with monitoring required under the MDMER, in Table 3-1 in Appendix 10-A (ERA). Water quality thresholds derived from receiving environment baseline parameters have not been consistently applied throughout the draft EIS. It is unclear from the current information provided if predicted effluent concentrations exceed acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end of pipe.</p> <p>The Proponent should:</p> <p>1. Update Table 3-1 in Appendix 10-A to include un-ionized ammonia, mercury and phosphorous. Update the risk assessment to incorporate these parameters as needed.</p> <p>2. Update Table 3-1 in Appendix 10-A and Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS to include both acute and chronic water quality thresholds derived from receiving environment baseline parameters and in accordance with IR-114.</p>	<p>acute guidelines. Acute guidelines are now provided in the updated Table 8.2-10 as presented in Attachment IR-114 and in the Final Draft EIS. This table (Table 8.2-10) also includes guidelines for unionized ammonia, phosphorous and mercury. Phosphorus will be present in the effluent at low levels and the near-field water quality model indicates that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment. Mercury is not identified as present in the effluent (see response to IR-100). No updates to Table 3-1 in Appendix 10-A are needed.</p> <p>2.) Tables 8.2-8 and 8.2-10 have been updated as requested. Please refer to Attachment IR-114 and Attachment IR-115 and Section 8.2.4.2.3 of the updated EIS. No updates to Table 3-1 in Appendix 10-A are needed. The guidelines were derived using baseline environmental conditions such as baseline hardness, DOC, pH, etc.</p>	Revised Draft EIS, Section 8, Tables 8.2-8 and 8.2-10
IR-194	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li><li>Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</li></ol> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from</p>	<p>1. As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</p> <p>2. Provide the information on predicted maximum receiving environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</p> <p>3. Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</p> <p>4. Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment</p>	<p>This response has not been accepted, as the Proponent has not updated the ERA to assess elevated baseline concentrations to delineate potential Project effects from background conditions.</p> <p>The Proponent’s response states: “The ERA followed the guidance in CSA N288.6-22 which does not require COPCs with elevated baseline concentrations to be considered COPCs for further quantitative assessment in the ERA. Clause 6.2.5.9 indicates that constituents with naturally elevated concentrations should be excluded from further consideration as a COPC.”</p> <p>Section 6.2.5.9 of N288.6-22 is specific to the Human Health Risk Assessment, and this statement does not apply to the Ecological Risk Assessment (EcoRA). Section 7 of N288.6-22 is specific to the development of the EcoRA methodology, and in Section 7.2.5.2.6 of N288.6-22 it states: “In addition to screening of effluent</p>	<p>1. See response to IR-114. Additional information has been provided for COPCs with requirement for monitoring under Schedule 5 of MDMER. Note that predicted effluent quality for all Schedule 5 parameters, with the exception of mercury, nitrate, and phosphorous were provided in Table 3-1 of the ERA in Appendix 10-A (these constituents were not identified as COPCs in the ERA).</p> <p>2. Information on predicted maximum receiving environment surface water concentrations for COPCs with required monitoring under the MDMER is in the updated EIS (Tables 8.2-10 and 8.2-13 and Appendix 8E. Please refer to Attachment IR-115.</p> <p>3. This is not applicable. No additional COPCs need to be carried forward in the ERA as the concentrations of COPCs in effluent do not exceed water quality guidelines (see Table 3-1 in the ERA in Appendix 10-A). All constituents identified in Schedule 4 and Schedule 5 were considered in the ERA screening with the exception of cyanide and mercury which are not identified as present in the effluent (see IR-100 regarding mercury). Phosphorus and nitrate will be present in the effluent at low levels and estimates of these constituents via the near-field water quality model indicate that levels will remain well below criteria protective of aquatic life in the Whitefish Lake environment (see Tables 8.2-10 and 8.2-13 of Section 8).</p> <p>4. The CSA guidance referenced by the reviewer in this IR (Section 7.2.5.2.6 of N288.6-22) is for exposure situations and not for baseline. The text in Section 7.2.5.2.6 of N288.6-22</p>	Yes  Appendix 8E, Table 8.2-9, Table 8.2-10

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					effluent to the receiving environment and aquatic receptors based on the current information provided.	quality concentrations in the receiving environment.	<p>and emissions data, concentrations measured in environmental media should be considered, as determined in the EMPs. Maximum concentrations measured in soil, receiving water, or sediment should be compared to screening criteria.” Therefore, COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment should be assessed in the ERA.</p> <p>Additionally, in Section 7.2.5.4.2 of N288.6-22 it is stated: “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit.” Therefore, if baseline exceedances occur in one media types, they should be carried forward for all media types in the ERA.</p> <p>It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided. Negative effects to biota from naturally elevated background concentrations of COPCs can be exacerbated by additional input of COPCs from Project effluent into the receiving environment. It is important to characterize and assess those potential effects and delineate potential Project effects from background conditions.</p> <p>Please:</p> <ol style="list-style-type: none"><li>1. Update Table 3-1 in Appendix 10-A to include un-ionized ammonia, mercury and phosphorous. Update the risk assessment to incorporate these parameters as needed.</li><li>2. Update the ERA to assess the risk of COPCs that had elevated baseline water quality concentrations in the receiving environment: aluminum, iron, and lead.</li></ol>	<p>is saying that measured concentrations in environmental media should be screened in addition to effluent and emissions data. This is referring to measured concentrations in the environment since they will reflect the impact from releases from the facility. This is not referring to baseline concentrations without influence from effluent. Section 7.2.5.3.1 and 7.2.5.3.2 of N288.6-22 recommend that the most restrictive of applicable federal or provincial guidelines be used as the screening criteria, and screening criteria should not be below a reasonable upper end of background.</p> <p>Additionally, the reviewer points to Section 7.2.5.4.2 to indicate that if a COPC exceeds screening criterion in one medium it should be assessed for all media that are likely to contribute to exposure. This guidance was followed in the ERA – all COPCs identified in water were also assessed in sediment and vice versa, as well as additional food chain pathways. Again, the intent of this clause is for exposure situations and not specific to baseline conditions.</p> <p>The ERA did consider in the screening assessment constituents that had elevated baseline that were also present in the effluent. Aluminum, cadmium, iron, and lead exceeded water quality guidelines in baseline and were considered in the ERA screening; however, only cadmium was identified for further assessment since its concentration in the effluent exceeded its water quality guideline.</p> <p>Table 8.2-4 in the EIS provides a summary of baseline water quality exceedances. Note that the only iron exceedance was in SA-1 which is downstream of McGowan Lake (see Figure 8.2-4) and outside of the direct influence on the Project. Section 8.4.3.2.3 of the EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines.</p> <p>The screening followed the process identified in Figure 3-1 of the ERA (Appendix 10-A) as well as N288.6-22 guidance. No changes to the ERA or EIS are warranted to address Part 4 of this IR.</p>	

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IR-195	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>	<p>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</p> <p>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</p> <p>3. Update ERA figures and conclusions as needed.</p>	<p>This response has not been accepted. Although the Proponent addressed items 2 and 3, further information on maximum predicted concentrations of COPCs in water quality during various Project stages and how hydrological processes affect COPC concentrations from Project effluent is required based on the information provided in the Proponent’s response to validate the Proponent’s predictions.</p> <p>The Proponent has provided updated tables with modelled maximum COPC concentrations in water and sediment by individual Project phase but did not include the environmental quality guidelines for COPCs which were included in the original tables. The Proponent’s response confirmed the predicted effluent quality during the decommissioning phase. In their response the Proponent states: “Therefore, the modelled maximum COPC concentrations in water are the same for operations and decommissioning phases (which is considered conservative), the same peak concentrations appear annually due to the variation of the monthly local inflow. Since COPCs are accumulated in sediment, the modelled maximum COPC concentrations in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning in Figure 3-3.”</p> <p>The figures provided in the response support this statement, however, maximum predicted concentrations of COPCs in receiving water quality occur within a year of operations commencing. COPC concentrations in water also return to baseline within one year after decommissioning is complete. However, maximum predicted concentrations of COPCs in sediment quality do not occur until the end of the Project lifecycle due to accumulation over time, which is expected.</p> <p><b>Rationale:</b> It is unclear how maximum predicted concentrations of COPCs in water quality occur so quickly and decrease so quickly after Project operations commencement and decommissioning respectively. Further information on the</p>	<p>The maximum predicted concentrations of COPCs in water are seen over a relatively short period on the scale shown in the relevant figures as noted by the reviewer due to the short water retention time of the modelled lakes. As shown in the table below, the modelled lakes (excluding the reference lake) are small in size, with lake areas ranging from 0.10 to 1.49 km² and with average depths ranging from 1.0 to 5.5 m. Based on the area, depth and outflow of the modelled exposure lakes, the calculated retention times of the lakes ranged from 0.88 to 51.61 days. These short retention times explain the relatively rapid increase and subsequent decrease in concentrations of COPCs in the lakes during periods of effluent discharge and periods where there is no effluent discharge, respectively.</p> <table><caption>Waterbody Morphometry for Modelled Lakes</caption><thead><tr><th>Waterbody</th><th>Average Depth (m)</th><th>Area (km²)</th><th>Average Outflow (L/s)</th><th>Retention Time (day)</th><th>Retention Time (month)</th></tr></thead><tbody><tr><td>Reference Kratchkowsky Lake</td><td>2.9</td><td>0.80</td><td>331.2</td><td>80.66</td><td>2.69</td></tr><tr><td>Whitefish Lake North</td><td>1.6</td><td>0.26</td><td>1379.3</td><td>3.53</td><td>0.12</td></tr><tr><td>Whitefish Lake Middle</td><td>1.1</td><td>0.10</td><td>1398.5</td><td>0.88</td><td>0.03</td></tr><tr><td>Whitefish Lake South</td><td>1.0</td><td>0.32</td><td>1414.3</td><td>2.65</td><td>0.09</td></tr><tr><td>McGowan Lake</td><td>5.5</td><td>1.49</td><td>1832.3</td><td>51.61</td><td>1.72</td></tr><tr><td>Russell Lake Inlet</td><td>3.0</td><td>0.75</td><td>2390.3</td><td>10.92</td><td>0.36</td></tr></tbody></table> <p>Updated information has been added to Appendix 10-A, including Table 3-3, Table 3-5, Figure 3-2 and Figure 3-3, as well as Table 3-1 of Appendix A of Appendix 10-A.</p> <p>The revised text in Section 3.1.2.1 (Appendix 10-A) is as follows: “The modelled maximum COPC concentrations in water during decommissioning phase were the same as that during operations (Table 3 3). The peak concentrations of arsenic and polonium-210 appear annually in June, and the peak concentrations of all other COPCs appear annually in March due to the variation of the monthly local inflow during the effluent discharge period (Figure 3 2). It is noted that the maximum predicted concentrations of COPCs in water occurred over short periods of effluent discharge and subsequently decrease relatively quickly during periods when there is no effluent discharge. This is related to the short retention time of the modelled lakes. As shown in Table 3-1 in Appendix A, the modelled lakes (excluding the reference lake) are small, with lake areas ranging from 0.10 to 1.49 km² and with average depths ranging from 1.0 to 5.5 m. Based on the area, depth and outflow, the calculated retention times ranged from 0.88 to 51.61 days. As noted, the short retention times result in rapid increases and decreases of concentrations of COPCs in response to effluent discharge and then its cessation. Since COPCs accumulate in sediment, the peak concentrations of all COPCs in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning phase, as shown in Figure 3 3.”</p>	Waterbody	Average Depth (m)	Area (km²)	Average Outflow (L/s)	Retention Time (day)	Retention Time (month)	Reference Kratchkowsky Lake	2.9	0.80	331.2	80.66	2.69	Whitefish Lake North	1.6	0.26	1379.3	3.53	0.12	Whitefish Lake Middle	1.1	0.10	1398.5	0.88	0.03	Whitefish Lake South	1.0	0.32	1414.3	2.65	0.09	McGowan Lake	5.5	1.49	1832.3	51.61	1.72	Russell Lake Inlet	3.0	0.75	2390.3	10.92	0.36	<p>Yes</p> <p>Appendix 10-A, Section 3.1.2.1, Table 3-3, Figure 3-2, Figure 3-3</p> <p>Appendix 10-A, Section 3.1.2.2, Table 3-5</p> <p>Appendix 10-A, Section 3.1.2.3</p> <p>Appendix 10-A, Appendix A, Table 3-1</p>
Waterbody	Average Depth (m)	Area (km²)	Average Outflow (L/s)	Retention Time (day)	Retention Time (month)																																														
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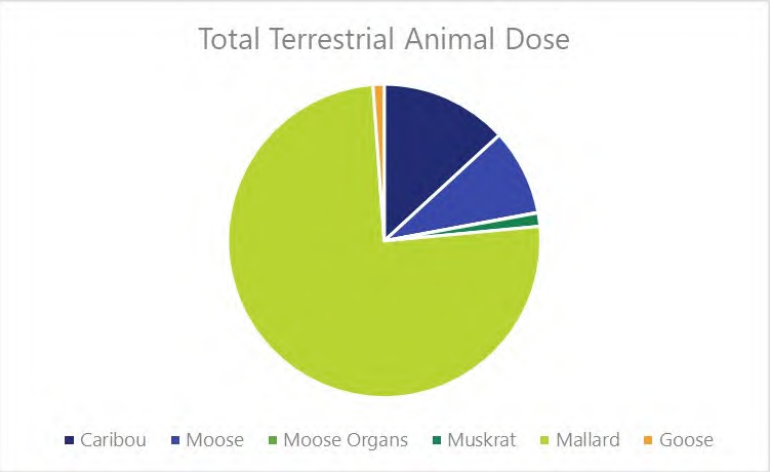


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							hydrological processes that facilitate this is necessary to validate predictions.  Provide further information regarding maximum predicted concentrations of COPCs in water quality during various Project stages and how hydrological processes (i.e. flows, retention time, etc.) facilitate the fast increase and decrease of COPC concentrations from Project effluent. This information should be included in Appendix 10-A, Section 3.1.2.1.	The revised text in Section 3.1.2.3 (Appendix 10-A) is as follows: “The maximum vanadium concentration in sediment is 37.2 mg/kg dw in Whitefish Lake (LA-5), which exceeds its sediment quality guideline of 35.1 mg/kg dw by approximately 6% (REF value from Burnett-Seidel and Liber, 2013). Therefore, vanadium was identified as a COPC in sediment.”	
IR-197	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.  <b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	This response has not been accepted, as the Proponent has not provided a valid explanation for not incorporating atmospheric deposition from Project-related air emissions into water quality modelling and assessing Project-related effects to aquatic receptors from this pathway.  In the Proponent’s response it is stated: “Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019).” However, both of these documents explicitly apply to human dose rate calculations and models for human end-points from radiation effects of radionuclides; they do not cover non- human biota nor non-radionuclide COPCs or chemical toxicity of radionuclides. Atmospheric deposition rates to large water bodies may be negligible for dose rates to human biota as they are not likely to be directly impacted or in the near-field vicinity. However, this may not be the case for aquatic receptors directly within the receiving environment.  A sufficient explanation for exclusion of atmospheric deposition of COPCs to surface water from Project activities has not been provided from an ecological perspective. This Project effect pathway may have effects on the aquatic receiving environment through accumulation of COPCs over	Atmospheric deposition to large waterbodies is explicitly excluded in the CSA N288.1 model. This assumption is valid for both human and ecological assessments. The N288.1 standard indicates in Section 1.5 of the Scope that the models can be used to support dose calculations for non-human biota.  The N288.1 rationale is that atmospheric input to water is very small relative to direct input to water. This conclusion applies to assessment for both human and ecological assessments, as well as radionuclides and non-radionuclides. The rationale in the IR response applies. However, calculations have been done for the Project to confirm the expectation that atmospheric input to water will be negligible.  The following calculation shows for the Project that the atmospheric input of uranium to Whitefish Lake (LA-5) is very small relative to the direct input to water via effluent.	Yes  Appendix 10-A, Appendix A, Section 2.2

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							<p>time or deposition of contaminants that are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions. ECCC requires atmospheric deposition from Project-related emissions to be incorporated into water quality modelling and that the Proponent assess any Project-related effects to aquatic receptors from this pathway in order to assess potential effects on the aquatic receiving environment.</p> <p>Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project-related effects to aquatic receptors from this pathway. Review CSA N288.6, otherwise, provide valid rationale from an ecological perspective for the elimination of this potential Project effects pathway.</p>	<table><tr><td colspan="4">P01=X1/X0(a)</td></tr><tr><td>X1</td><td>Air Concentration (LA-5) U</td><td>3.45E-05 mg/m<sup>3</sup></td><td>EIS Appendix 6</td></tr><tr><td>X0(a)</td><td>Atmospheric Release Rate</td><td>6.83E+01 mg/s</td><td>EIS Appendix 6</td></tr><tr><td>P01</td><td>Transfer source to air</td><td>5.05E-07 s/m<sup>3</sup></td><td></td></tr><tr><td colspan="4">P02=X2/X0(w)</td></tr><tr><td>X2</td><td>Water Concentration (LA-5) U</td><td>5.74E-04 mg/L</td><td>From IMPACT Model</td></tr><tr><td>X0(w)</td><td>Effluent Release Rate (U)</td><td>5.78E-01 mg/s</td><td>U Effluent Concentration x Effluent Flowrate</td></tr><tr><td>P02</td><td>Transfer source to water</td><td>9.93E-04 s/L</td><td></td></tr><tr><td colspan="4">P12 = Vg (A/V)10<sup>-3</sup>/(λs+λw)</td></tr><tr><td>Vg</td><td>Atmospheric deposition velocity</td><td>0.003 m/s</td><td>N288.1</td></tr><tr><td>Area</td><td>LA-5</td><td>96940 m<sup>2</sup></td><td>site-specific (Appendix A)</td></tr><tr><td>Volume</td><td>LA-5</td><td>106634 m</td><td>site-specific (Appendix A) (Area*Depth)</td></tr><tr><td colspan="4">λs = DR • ρ • Kd • (A/V)</td></tr><tr><td>DR</td><td>Sediment deposition rate</td><td>6.34E-08 mm/s</td><td>Assumption (2mm/yr)</td></tr><tr><td>ρ</td><td>sediment dry bulk density</td><td>0.11 kg/L</td><td>N288.1</td></tr><tr><td>Kd</td><td>partition coefficient</td><td>20000 L/kg</td><td>N288.1</td></tr><tr><td>λs</td><td>sedimentation loss rate constant</td><td>1.27E-07 s<sup>-1</sup></td><td></td></tr><tr><td colspan="4">λw = U • CA/V = Q/V</td></tr><tr><td>Q</td><td>Inflow into LA-5</td><td>1.379 m<sup>3</sup>/s</td><td>site-specific (Appendix A)</td></tr><tr><td>V</td><td>Volume of LA-5</td><td>106634 m<sup>3</sup></td><td>Area*Depth</td></tr><tr><td>λw</td><td>loss via water flow rate constant</td><td>1.29E-05 s<sup>-1</sup></td><td></td></tr><tr><td colspan="4">P12 = Vg (A/V)10<sup>-3</sup>/(λs+λw)</td></tr><tr><td colspan="2">Water conc'n from air = X0(a)*P01*P12</td><td>7.20E-06 mg/L</td><td></td></tr><tr><td colspan="2">Water conc'n from effluent = X0(w)*P02</td><td>5.74E-04 mg/L</td><td></td></tr><tr><td colspan="2">% Contribution to Water from Air</td><td>1%</td><td></td></tr></table> <p>The following statement has been added to Section 2.2 in Appendix A to Appendix 10-A</p> <p>"Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."</p> <p>The calculation has also been added to Section 2.2 of Appendix A for reference.</p> <p><b>References:</b></p> <p>Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I</p>	P01=X1/X0(a)				X1	Air Concentration (LA-5) U	3.45E-05 mg/m <sup>3</sup>	EIS Appendix 6	X0(a)	Atmospheric Release Rate	6.83E+01 mg/s	EIS Appendix 6	P01	Transfer source to air	5.05E-07 s/m <sup>3</sup>		P02=X2/X0(w)				X2	Water Concentration (LA-5) U	5.74E-04 mg/L	From IMPACT Model	X0(w)	Effluent Release Rate (U)	5.78E-01 mg/s	U Effluent Concentration x Effluent Flowrate	P02	Transfer source to water	9.93E-04 s/L		P12 = Vg (A/V)10 <sup>-3</sup> /(λs+λw)				Vg	Atmospheric deposition velocity	0.003 m/s	N288.1	Area	LA-5	96940 m <sup>2</sup>	site-specific (Appendix A)	Volume	LA-5	106634 m	site-specific (Appendix A) (Area*Depth)	λs = DR • ρ • Kd • (A/V)				DR	Sediment deposition rate	6.34E-08 mm/s	Assumption (2mm/yr)	ρ	sediment dry bulk density	0.11 kg/L	N288.1	Kd	partition coefficient	20000 L/kg	N288.1	λs	sedimentation loss rate constant	1.27E-07 s <sup>-1</sup>		λw = U • CA/V = Q/V				Q	Inflow into LA-5	1.379 m <sup>3</sup> /s	site-specific (Appendix A)	V	Volume of LA-5	106634 m <sup>3</sup>	Area*Depth	λw	loss via water flow rate constant	1.29E-05 s <sup>-1</sup>		P12 = Vg (A/V)10 <sup>-3</sup> /(λs+λw)				Water conc'n from air = X0(a)*P01*P12		7.20E-06 mg/L		Water conc'n from effluent = X0(w)*P02		5.74E-04 mg/L		% Contribution to Water from Air		1%		
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IR-198	-	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.  Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the Project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of	<p>This response has not been accepted, as the assessment should consider organ meats from different animals if these are consumed by local population, and estimated consumption rates should be confirmed.</p> <p>The response to IR-198 presents the estimated radionuclide concentrations in moose and caribou organ meats (as mass concentrations), where the</p>	Consistent with the requirements in CSA N288.6:22, the ERA undergoes a periodic review process every 5 years to ensure the assumptions are still valid and to improve modelling and reduce uncertainty. Based on current understanding of the ERFN diet, there is no need to include caribou organs as a separate organ. As indicated in the original IR Response in Attachment IR-198 (See Annex 1), approximately 80% of the organs consumed by ERFN is moose organs, and 20% is caribou organs. Note, that there was a units error in IR-198 Table 3: Estimated Tissue Concentrations of Moose Organs and	No																																																																																																				



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					<p>as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.</p> <p><b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.</p>	<p>animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.</p>	<p>concentrations of certain radionuclides (U-238, U-234, Pb-210 and Po-210) in caribou organ meat are indeed estimated to be higher than in moose organ meat. However, the response also indicates that moose organ meat consumption represents the large majority of organ meat consumption (~80%), roughly offsetting the higher concentrations in caribou organs. When calculating tissue concentrations of radionuclides, the higher consumption rate of moose organ meat in comparison to caribou organ meat appears insufficient to compensate for the higher estimated concentrations of U-238, U-234, Pb-210 and Po-210 in caribou meat and as a result, exposures to these radionuclides from organ meat consumption may be underestimated. Health Canada recommends assessing moose and caribou organ meat separately (rather than using moose as a proxy) to confirm that COPCs including radionuclides from organ meat consumption have not been underestimated.</p> <p>IR-198 also includes additional information on organ meat consumption rates for the La Plonge and Patuanak communities to estimate dietary exposure via organ consumption, but it is unclear how these relate to the values used in the Draft EIS and ERA (Appendix 10-A). Specifically, Page 4.16 of Appendix 10-A: <i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) states:</p> <p><i>“As a conservative approach for this assessment, the Patuanak diet was selected to represent the average traditional foods consumer in the HHRA”</i></p> <p>However, Table 4-4 (p. 4.19) reports an annual organ meat consumption rate of 4.49 kg for the adult average traditional food consumer while the reported daily Patuanak consumption rate for organ meat is 16.2 g (Table 4-3; p.4.17), which equates to an annual rate of 5.91 kg. Health Canada recommends a rationale be provided for this discrepancy, and if necessary, the correct estimated rate and associated assessment calculations.</p> <p>See also follow-up IR-198-R1.</p>	<p>Woodland Caribou Organs at McGowan Lake. The unit is Bq/kg fw, not mg/kg fw as shown in the table. The numbers in IR-198 Table 3 are correct for Bq/kg fw.</p> <p>The reviewer is asking for clarification on the discrepancy between the annual organ meat consumption rate of 4.49 kg for the adult average traditional food consumer (Table 4-4) versus the reported Patuanak consumption rate for organ meat of 5.91 kg/yr (16.2 g/d) (Table 4-3; p.4.17). The ingestion rates that represent the Patuanak consumption rates from the ERFN study were modified as follows:</p> <ul style="list-style-type: none"><li>- Based on the ERFN study, the total Patuanak organ meat consumption rate was 5.91 kg/year which includes <u>all</u> organs. The ingestion rate was modified to remove organs that were not moose resulting in a moose organ ingestion rate of 4.49 kg/year.</li><li>- The total large mammal meat consumption rate was 12.95 kg/year (35.5 g/d). The ingestion rate for large mammals was increased to 14.38 kg/year to account for caribou organs in the caribou meat ingestion rate (caribou meat = 1.2 kg/year, caribou organ = 1.4 kg/year).</li><li>- The total ingestion rate for all country foods is 72.5 kg/year (199 g/d as per Table 4-3 in Appendix 10-A) which is consistent with the total Patuanak ingestion rate from the ERFN study.</li><li>- Based on the rationale in the above bullets no changes are needed to the diet.</li></ul> <p>As illustrated in the bullets above, caribou organ ingestion was not ignored, but was assessed as part of caribou meat ingestion.</p> <p>To illustrate that the current assumptions used in the HHRA of ingestion of moose organs and caribou as meat only, a comparison is provided in the table below of human dose from moose organs, caribou assessed as meat, and caribou assessed as organs. The total dose to a person eating moose organs is the same order of magnitude as the total dose to a person eating caribou organs (note that this represents total dose, not incremental dose as shown in the ERA and is used for illustrative purposes only). Additionally, there is limited difference in the results whether caribou organ intake is assessed as meat or as organs. For some radionuclides (Ra-226, Po-210) the dose for caribou assessed as meat is higher and for other radionuclides (U-238, U-234, Th-230, Pb-210) the dose for caribou assessed as organs is higher.</p> <table><tr><th>Parameter</th><th>Unit</th><th>U-238</th><th>U-234</th><th>Th-230</th><th>Ra-226</th><th>Pb-210</th><th>Po-210</th></tr><tr><td>Moose organs Concentration</td><td>Bq/kg</td><td>6.13E-02</td><td>6.13E-02</td><td>3.04E+00</td><td>8.77E-02</td><td>7.15E+00</td><td>1.30E-02</td></tr><tr><td>Caribou meat Concentration</td><td>Bq/kg</td><td>1.41E-01</td><td>1.41E-01</td><td>1.11E-02</td><td>1.13E-01</td><td>1.80E+00</td><td>8.58E+00</td></tr><tr><td>Caribou organs Concentration (scaled from meat based on TF)</td><td>Bq/kg</td><td>2.49E-01</td><td>2.49E-01</td><td>3.04E+00</td><td>6.31E-02</td><td>5.66E+01</td><td>8.58E-02</td></tr><tr><td>Dose Coefficient (DCF)</td><td>Sv/Bq</td><td>4.90E-08</td><td>4.90E-08</td><td>2.10E-07</td><td>2.80E-07</td><td>6.70E-07</td><td>1.20E-06</td></tr><tr><td>Human Dose - Moose Organs (a)</td><td>mSv/a</td><td>1.35E-05</td><td>1.35E-05</td><td>2.87E-03</td><td>1.10E-04</td><td>2.16E-02</td><td>7.04E-05</td></tr><tr><td>Human Dose - Caribou Organs as Meat (b)</td><td>mSv/a</td><td>9.84E-06</td><td>9.84E-06</td><td>3.32E-06</td><td>4.50E-05</td><td>1.72E-03</td><td>1.47E-02</td></tr><tr><td>Human Dose - Caribou Organs (b)</td><td>mSv/a</td><td>1.74E-05</td><td>1.74E-05</td><td>9.10E-04</td><td>2.51E-05</td><td>5.40E-02</td><td>1.47E-04</td></tr><tr><td colspan="2">a) based on moose organ ingestion rate of 4.5 kg/a</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td colspan="2">b) based on caribou organ ingestion rate of 1.4 kg/a</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Parameter	Unit	U-238	U-234	Th-230	Ra-226	Pb-210	Po-210	Moose organs Concentration	Bq/kg	6.13E-02	6.13E-02	3.04E+00	8.77E-02	7.15E+00	1.30E-02	Caribou meat Concentration	Bq/kg	1.41E-01	1.41E-01	1.11E-02	1.13E-01	1.80E+00	8.58E+00	Caribou organs Concentration (scaled from meat based on TF)	Bq/kg	2.49E-01	2.49E-01	3.04E+00	6.31E-02	5.66E+01	8.58E-02	Dose Coefficient (DCF)	Sv/Bq	4.90E-08	4.90E-08	2.10E-07	2.80E-07	6.70E-07	1.20E-06	Human Dose - Moose Organs (a)	mSv/a	1.35E-05	1.35E-05	2.87E-03	1.10E-04	2.16E-02	7.04E-05	Human Dose - Caribou Organs as Meat (b)	mSv/a	9.84E-06	9.84E-06	3.32E-06	4.50E-05	1.72E-03	1.47E-02	Human Dose - Caribou Organs (b)	mSv/a	1.74E-05	1.74E-05	9.10E-04	2.51E-05	5.40E-02	1.47E-04	a) based on moose organ ingestion rate of 4.5 kg/a								b) based on caribou organ ingestion rate of 1.4 kg/a								
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								<p>Overall, caribou ingestion is not ignored in the HHRA, and whether or not they are assessed as meat or as organs makes little difference to the total dose from terrestrial animal ingestion, as the dose is dominated by ingestion of mallard as shown in the pie chart below. The caribou contribution to total dose is minimal since the total dose is well below the dose limit of 1 mSv/year; therefore, no changes are made to the ERA at this time.</p> 	
IR-198	IR-198-R1	HC	Change to an environmental component due to radiological contaminants	<p><a href="#">Annex 1 Response to Information Requests (Denison Mining) – August 18, 2023</a></p> <p>IR-198 Response from Denison – COPC Concentrations in Organs (<i>Pages 74, and 354-357 of 419</i>)</p> <p>Appendix 10-A (ERA)</p>	<p><i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of radionuclides based on their mass concentrations in country foods (the assessment is only based on radionuclide concentrations).</p> <p><b>Context:</b> As part of the response to IR-198 estimated Pb-210 concentrations in moose organ and caribou organ of 7.15 and 49.4 mg/kg (ww) are reported, respectively. However, Appendix 10-A: <i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of lead among the non-radionuclide COPCs.</p> <p>Using the organ meat consumption figure from the Patuanak community (16.2 g/day), exposure to Pb-210 from caribou organ meat is estimated at over 11 ug/kg bw per day (based on the response to IR-198) which would be close to 10 times greater than the 95<sup>th</sup> percentile dietary lead exposure estimates for the general Canadian population consuming retail foods.</p> <p><b>Rationale:</b> While the abundance of radionuclides may pose a health risk with respect to radioactivity, their presence as chemical contaminants may also have an impact on health. This is demonstrated by the case of Pb-210 described above.</p>	<p>1. Provide a rationale on why radionuclide mass concentrations were not assessed for their impact to human health.</p> <p>2. Provide an assessment of Lead (Pb) as a chemical contaminant (non-radionuclide) COPC to better understand potential health risks and inform management, mitigation, monitoring and/or follow-up planning.</p>		<p>1. Uranium was assessed as both a chemical constituent and a radionuclide constituent. The other radionuclides in the U-238 decay chain were assessed for their radiotoxicity and not their chemical toxicity. This is consistent with the PSL2 Assessment Report which indicates that because of uranium’s relatively low specific activity, uranium is the only radionuclide (in the uranium and thorium decay chains) with greater potential to be more chemotoxic than radiotoxic; therefore, it is important to assess its chemical toxicity (GC &amp; EC, 2006). To illustrate, the effluent quality of Pb-210 (as per Table 3-1 in Appendix 10-A) is 4.19E-01 mg/L. Using a specific activity of 2.86E+12 Bq/g for Pb-210 (<a href="http://www.wise-uranium.org/nucv.html">www.wise-uranium.org/nucv.html</a>), the mass concentration is 1.48E-10 mg/L. This is significantly lower than the lead concentration in the effluent of 3.00E-04 mg/L (as per Table 3-1 in Appendix 10-A) which is based on pilot tests with a safety factor added. As such, consideration of the mass concentration of Pb-210 is not needed.</p> <p>2. The response to IR-198 (Attachment IR-198) erroneously provided the concentrations of Pb-210 in moose organ and caribou organ in units of mg/kg (ww). The corrected units that should have been provided for Pb-210 in moose organ and caribou organ tissues are in Becquerel per kilogram wet weight (<b>Bq/kg ww</b>); that is, the concentrations of Pb-210 in moose and caribou organs are 7.15 Bq/kg ww and 49.4 Bq/kg ww, respectively.</p> <p>The following illustrates that chemical lead (from Pb-210) in organs is not a health concern. The concentrations of Pb-210 in moose organs is 7.15 Bq/kg ww. Using a specific activity of 2.86E+12 Bq/g for Pb-210 (<a href="http://www.wise-uranium.org/nucv.html">www.wise-uranium.org/nucv.html</a>), the lead concentration in moose organs would be 2.5E-09 mg/kg ww. The daily dose for moose organ consumption would be 4.4E-10 µg/kg bw/day.</p>	No

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					Due to their potential toxicological significance to human health, Health Canada recommends assessing arsenic, cadmium, lead and mercury as part of country food assessment, regardless of the method employed to determine COPCs.			<p>Dose = 4.5kg/yr*yr/365d*2.5E-09mg/kg/70.7kg*1000ug/mg. The estimated lead exposure dose from Pb-210 in moose organs is far below the 95<sup>th</sup> percentile dietary lead exposure estimate for the general Canadian population consuming retail foods, and also well below the provisional lead TRV recommended by Health Canada of 0.5 µg/kg bw/day.</p> <p>Therefore, Pb-210 is expected to contribute a negligible amount of lead metal to total lead exposure. Lead as a non-radiological contaminant was considered in Table 3-1 in the ERA (Appendix 10-A) did not screen into the assessment and therefore it is concluded that the potential risks to consumers of country foods due to lead (and Pb-210) are negligible. The project includes an environmental monitoring program which will include analysis of country foods for trace metals, including lead.</p> <p><b>References:</b></p> <p>Government of Canada, Environment Canada. 2006. Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (Impact on Non-human Biota). September.</p>	
IR-199	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<p><b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.</p> <p><b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.</p>	<p>1. Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.</p> <p>2. Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).</p>	<p>This response has not been accepted, as the explanation and rationale provided by the Proponent is not sufficient to validate the model performance.</p> <p>Beyond the figures demonstrating modelled versus measured concentrations of COPCs in water and sediment provided in Appendix A, no quantitative statistical metrics validating model performance have been provided by the Proponent. It is also unclear if the geometric mean for each COPC at each monitoring station was calculated as individual inputs per station or if a single geometric mean for each COPC was calculated using all sampling data. Using a single geometric mean of all samples would result in not capturing the variation in concentrations of COPCs between sampling stations such as variation between different lakes. The Proponent’s response provided no additional information that was not already in the EIS to the information request for specific details on how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality.</p> <p>Without statistical metrics validating model performance, there is no quantitative evidence to</p>	<p>To clarify, the geomean shown for each COPC in Figure 3-2 (water) of the IMPACT Model report is for all the data in a series of lakes downstream of the future mine discharge. The measured data do not suggest any pattern of difference among lakes, nor would any such pattern be expected under baseline conditions. We want a baseline model that predicts a value for the downstream lakes in the range of measured data, as long as the measured data are reliable and not dominated by detection limit values. As discussed in Section 3.2.1 of the IMPACT Model report, the model meets this test. The geomean was considered appropriate as it is more representative of the central value of the data distribution. However, considering the data represents baseline conditions with many values below the detection limit, there is limited difference between the geomean and the arithmetic mean for the majority of constituents (see table below for summary statistics for baseline water concentration). Section 3.2.1 of the IMPACT Model Report (Appendix A to Appendix 10-A) was modified to provide more discussion on the selection of the geomean.</p>	<p>Yes</p> <p>Appendix 10-A, Appendix A, Section 3.2.1</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)																																																																																																																																																																																																											
							<p>support conclusions of model performance regarding the use of model calibrated concentration inputs of COPCs and conclusions on under- and over-predicted COPC concentration inputs influence on risk assessment conclusions. It is also unclear if the methodology for using the geometric mean of all samples for each COPC has eliminated variation between sample sites for modelling, and how this affects the conclusions of risk.</p> <p>ECCC requires further information on how using geometric mean values of the measured baseline data influences variation between sites and model outputs, as well as quantitative statistical metrics validating model performance to verify the Proponent’s conclusions.</p> <p>Please provide:</p> <p>1. Further information on how using geometric mean values of the measured baseline data influences variation between sites and model outputs.</p> <p>2. Quantitative statistical metrics validating model performance to support conclusions on model calibrated concentration inputs of COPCs and risk assessment conclusions, with particular focus on influence of over- and under-predicted COPC concentration inputs. Include model performance benchmarks for comparison.</p>	<table><tr><th rowspan="3">Category</th><th rowspan="3">Parameter</th><th rowspan="3">Units</th><th>Total</th><th>Count</th><th rowspan="2">Minimum</th><th rowspan="2">Percentile_95th</th><th rowspan="2">Maximum</th><th rowspan="2">Arithmetic_Mean(a)</th><th rowspan="2">Geo</th></tr><tr><th>Count</th><th>(&lt;RDL)</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="2">Major Ions</td><td>Chloride</td><td>mg/L</td><td>142</td><td>7</td><td>&lt;0.1</td><td>0.7</td><td>0.9</td><td>3.69E-01</td><td></td></tr><tr><td>Sulphate</td><td>mg/L</td><td>142</td><td>1</td><td>&lt;0.2</td><td>1.1</td><td>8.3</td><td>8.46E-01</td><td></td></tr><tr><td rowspan="12">Metals</td><td>Arsenic</td><td>mg/L</td><td>142</td><td>53</td><td>&lt;0.0001</td><td>0.0001</td><td>0.0003</td><td>1.05E-04</td><td></td></tr><tr><td>Cadmium</td><td>mg/L</td><td>142</td><td>90</td><td>&lt;1.00E-08</td><td>0.00003</td><td>0.00007</td><td>1.34E-05</td><td></td></tr><tr><td>Chromium</td><td>mg/L</td><td>142</td><td>142</td><td>&lt;0.0005</td><td>&lt;0.0005</td><td>&lt;0.0005</td><td>5.00E-04</td><td></td></tr><tr><td>Cobalt</td><td>mg/L</td><td>142</td><td>138</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Copper</td><td>mg/L</td><td>142</td><td>139</td><td>&lt;0.0002</td><td>&lt;0.0002</td><td>0.0008</td><td>2.07E-04</td><td></td></tr><tr><td>Lead</td><td>mg/L</td><td>142</td><td>135</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0012</td><td>1.16E-04</td><td></td></tr><tr><td>Molybdenum</td><td>mg/L</td><td>142</td><td>138</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0013</td><td>1.23E-04</td><td></td></tr><tr><td>Nickel</td><td>mg/L</td><td>142</td><td>101</td><td>&lt;0.0001</td><td>0.0003</td><td>0.0006</td><td>1.24E-04</td><td></td></tr><tr><td>Selenium</td><td>mg/L</td><td>142</td><td>140</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Uranium</td><td>mg/L</td><td>142</td><td>141</td><td>&lt;0.0001</td><td>&lt;0.0001</td><td>0.0002</td><td>1.01E-04</td><td></td></tr><tr><td>Vanadium</td><td>mg/L</td><td>142</td><td>110</td><td>&lt;0.0001</td><td>0.0002</td><td>0.0005</td><td>1.12E-04</td><td></td></tr><tr><td>Zinc</td><td>mg/L</td><td>142</td><td>95</td><td>&lt;0.0005</td><td>0.00278</td><td>0.02</td><td>9.62E-04</td><td></td></tr><tr><td rowspan="2">Nutrients</td><td>Ammonia as N</td><td>mg/L</td><td>142</td><td>104</td><td>&lt;0.01</td><td>0.0596</td><td>1.2</td><td>3.26E-02</td><td></td></tr><tr><td>Nitrate</td><td>mg/L</td><td>103</td><td>70</td><td>&lt;0.04</td><td>0.438</td><td>0.66</td><td>1.15E-01</td><td></td></tr><tr><td rowspan="4">Radionuclides</td><td>Lead-210</td><td>Bq/L</td><td>142</td><td>136</td><td>&lt;0.02</td><td>&lt;0.02</td><td>0.05</td><td>2.06E-02</td><td></td></tr><tr><td>Polonium-210</td><td>Bq/L</td><td>142</td><td>112</td><td>&lt;0.005</td><td>0.008</td><td>0.02</td><td>5.50E-03</td><td></td></tr><tr><td>Radium-226</td><td>Bq/L</td><td>142</td><td>98</td><td>&lt;0.005</td><td>0.00995</td><td>0.01</td><td>5.70E-03</td><td></td></tr><tr><td>Thorium-230</td><td>Bq/L</td><td>142</td><td>138</td><td>&lt;0.01</td><td>&lt;0.01</td><td>0.02</td><td>1.01E-02</td><td></td></tr></table> <p>(a) The majority of the results are less than the detection limit</p> <p>Statistical measures of how individual baseline measurements deviate from the baseline prediction would not be indicative of model performance, since the model is not trying to predict this noise. What matters is how well the model predicts the downstream condition as reflected in the geomean of the data. This can be seen in Figure 3-2.</p> <p>The “underpredictions” seen in Figure 3-2 (Se, U, Pb-210) are to be expected when the measured data are dominated by non-detects. The predicted value is consistent with measured data. There is no implication of any model error that would influence model predictions for the operational phase of the mine. The overpredictions seen in Figure 3-2 (Cd, Cu, V) would imply a conservatism of similar magnitude in the baseline + project predictions for water in the operational phase. As an example, the root mean square error (RMSE) for cadmium of the measured water quality data against the modelled prediction shown in Figure 3-2 is +/-1.31E-05 mg/L which indicates that the modelled concentration is within the range of the geomean of the measured data.</p> <p>Similarly, the geomean shown for each COPC in Figure 3-3 (sediment) of the IMPACT Model report is for all the data in a series of lakes downstream of the future mine discharge. The overpredictions seen in Figure 3-3 (for As and Ra-226) would imply a conservatism of similar magnitude in the baseline + project predictions for sediment in the operational phase.</p> <p>The relationship in the Wheeler River IMPACT model between water and sediment is based on existing operating uranium mines in northern Saskatchewan as described in the IMPACT Model Report (Appendix A to Appendix 10-A). Baseline conditions do not represent impacted conditions; therefore, it is not appropriate to calibrate the model to baseline conditions as we are most interested in impacted conditions. The test of model performance will be as the facility moves into operation and operational data is compared against modelled data.</p>	Category	Parameter	Units	Total	Count	Minimum	Percentile_95th	Maximum	Arithmetic_Mean(a)	Geo	Count	(<RDL)								Major Ions	Chloride	mg/L	142	7	<0.1	0.7	0.9	3.69E-01		Sulphate	mg/L	142	1	<0.2	1.1	8.3	8.46E-01		Metals	Arsenic	mg/L	142	53	<0.0001	0.0001	0.0003	1.05E-04		Cadmium	mg/L	142	90	<1.00E-08	0.00003	0.00007	1.34E-05		Chromium	mg/L	142	142	<0.0005	<0.0005	<0.0005	5.00E-04		Cobalt	mg/L	142	138	<0.0001	<0.0001	0.0002	1.01E-04		Copper	mg/L	142	139	<0.0002	<0.0002	0.0008	2.07E-04		Lead	mg/L	142	135	<0.0001	<0.0001	0.0012	1.16E-04		Molybdenum	mg/L	142	138	<0.0001	<0.0001	0.0013	1.23E-04		Nickel	mg/L	142	101	<0.0001	0.0003	0.0006	1.24E-04		Selenium	mg/L	142	140	<0.0001	<0.0001	0.0002	1.01E-04		Uranium	mg/L	142	141	<0.0001	<0.0001	0.0002	1.01E-04		Vanadium	mg/L	142	110	<0.0001	0.0002	0.0005	1.12E-04		Zinc	mg/L	142	95	<0.0005	0.00278	0.02	9.62E-04		Nutrients	Ammonia as N	mg/L	142	104	<0.01	0.0596	1.2	3.26E-02		Nitrate	mg/L	103	70	<0.04	0.438	0.66	1.15E-01		Radionuclides	Lead-210	Bq/L	142	136	<0.02	<0.02	0.05	2.06E-02		Polonium-210	Bq/L	142	112	<0.005	0.008	0.02	5.50E-03		Radium-226	Bq/L	142	98	<0.005	0.00995	0.01	5.70E-03		Thorium-230	Bq/L	142	138	<0.01	<0.01	0.02	1.01E-02		
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IR-200	-	HC	Indigenous Peoples' health /	Section 10 (p. 4.10)	Indigenous consultation should be included in the Country Foods analysis.	1. Evaluate the suitability of using the 2017 EFRN survey results and	This response has not been accepted, as it did not provide the requested information to support the	IR-01 was provided by the EFRN as a member of the FIRT. Denison subsequently met with EFRN to better understand the specific concern raised. The comment was centered	No																																																																																																																																																																																																											



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			Socio- economic conditions	Appendix 10-A (ERA), Table 4-4 (p. 4.19)	<p><b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following:</i> “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p>consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.</p> <p>2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>	<p>assumption used in the traditional foods risk assessment.</p> <p>The response did state:</p> <p><i>The 2017 report was authored by ERFN and as such there is no need for Denison to ask ERFN to validate their own report.</i></p> <p>The dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017 was an important resource that contributed to the risk assessment; however, the ERFN’s Information Request (IR-1) raised similar questions about the EIS’s assumptions on Indigenous land use and diet, and the perception that feedback from the local ERFN trapper was not representative of the community’s current and future land use. The response to IR-1 referenced meetings/discussions that were held with the ERFN to better understand how their community uses the area and their diet.</p> <p>The following contradictory clarification was provided in the response to IR-1: [The] <i>ERFN considers the ERFN Trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use.</i></p> <p>See follow up IR-200-R1.</p>	<p>around the fact that the local land and resource harvester, referred to throughout the EIS as the ERFN Trapper, passed away before the draft EIS filing. The nation was concerned that the land use and occupancy of the ERFN Trapper may be lost or somehow downplayed since he has passed away and no longer resides near the Project site. In response to this, Denison updated text in the revised draft EIS to better reflect the totality of ERFN TK and land use information. The ERFN Trapper’s land and resource use patterns and activities are considered by ERFN as representative of future ERFN uses in the area.</p> <p>We note that in IR-01 ERFN was not suggesting that the ERFN Trapper’s diet was <b>representative</b> of all ERFN land users. The HC reviewer has erroneously connected parts of the response to IR-01 and IR-200 to suggest there is a gap in the EIS; Denison notes there is no contradictory information provided and outline clarifications here and in response to IR-200-R1.</p> <p>ERFN wrote and provided the 2017 dietary study (CanNorth 2017) and requested Denison use this information in the EIS. The CanNorth report is considered as a source of Indigenous Knowledge by the community. Denison has included both an ERFN diet as described in the 2017 report, and the ERFN Trapper’s diet throughout the HHRA. There were five receptors in the human health risk assessment (HHRA): camp worker, seasonal resident, recreational fisher/hunter, fisher/trapper, and future permanent resident. The ERFN 2017 diet was included for a portion of the camp worker, seasonal resident, recreational fisher/hunter, and future permanent resident diets. The fisher/trapper diet was unique and provided by the ERFN Trapper whose trap lines and commercial fishing operations are located in the Project area. Importantly, the ERFN Trapper’s diet was not a scaling up of the ERFN 2017 ingestion rates; rather, it was based on different dietary assumptions. For example, the ERFN Trapper rarely eats any country plants but eats a considerably larger amount of caribou and fish, whereas the ERFN 2017 diet has a wider representation of all food pathways.</p> <p>Other sensitive or vulnerable human health groups are addressed through the use of toxicity reference values (TRVs) that incorporate uncertainty factors to account for sensitive individuals. This is standard practice in development of TRVs for human health risk assessment. As such, differences in health status or subgroups were not considered separately.</p> <p>Denison will work with regulators and Indigenous nations and communities to refine future permanent resident characteristics through regular updates to the ERA as the Project advances as per the review cycle in N288.6.</p> <p>Denison encourages the CNSC to reach out to the ERFN FIRT representative to confirm Denison’s understanding on the scope of IR-01 (Annex 1, IR-01 on page 1/419) and ERFN’s acceptance of Denison’s response to IR-01 and related discussions.</p> <p><b>References:</b></p> <p>CanNorth. 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p>	

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IR-200	IR-200-R1	HC	Indigenous People’’ health / Socio- economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)  IR-200 Response from Denison	<p>The traditional foods risk assessment should be updated to include an “Intense Land User” scenario and consider all relevant sub-groups. <b>Context:</b> See ‘Rationale for Status’ in IR-200 <b>Rationale:</b> Health Canada notes that the response to IR-1 confirms that the use, diet and consumption rates used to assess the “Trapper” receptor are representative of “intensive land users” from the ERFN and possibly others. This change in the assumption is significant and should be integrated into the traditional foods risk assessment. Suggestions and follow-up measures have been provided to assist in responding to this information request, which benefits from the clarity provided in response to IR-1.</p> <p>Health Canada also notes that the response to IR-200 did not consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p>	<p>1. Update assumptions used in the risk assessment to reflect the new information provided in response to IR-1. (e.g., the <i>ERFN Trapper’s use of the area as <b>representative</b> of current and future land users</i>).</p> <p>2. Update the risk assessment in the EIS and ERA for the “Trapper” receptor (i.e., Intensive Land Users) to account for the <b>representative</b> nature of their described diet (i.e., consumption rates and composition).</p> <p>3. Update the rationale and decisions related to management, mitigation, monitoring and follow-up. Include a specific discussion for those COPCs that contribute to elevated health risks among “intensive land users” and those raised by Indigenous communities (i.e., selenium, mercury &amp; cadmium).</p> <p>4. Revise receptor’s descriptor/title from “Trapper” to “Intensive land users” throughout the EIS and ERA to be consistent with proposed revisions made in response to IR-1.</p> <p>Consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately. Alternatively, provide a fulsome rationale to justify their exclusion.</p>		<p>1. Denison would like to clarify to the reviewer that the response to IR-01 does not in fact introduce new information to the EIS. As noted in the above response to IR-200, the intent of IR-01 was to provide updates to the EIS to better reflect the totality of ERFN TK and land use information. Both the ERFN 2017 (CanNorth 2017) and the ERFN Trapper’s traditional food intakes have been included in the HHRA.</p> <p>2. Denison has clearly outlined in the EIS, Section 10 and Appendix 10-A how each HHRA’s receptor diet was derived, including that for the fisher/trapper. We reiterate that the ERFN provided the 2017 dietary study to Denison and requested Denison include this in the EIS.</p> <p>3. The details of the Project’s environmental management system are being developed to support Project permitting and licensing. This will include monitoring for various metals and radionuclides in a variety of media (e.g., fish, water, etc.). No updates to management, mitigation, monitoring and follow-up outlined in the revised draft EIS are required. Based on the criteria set out in Section 4 Table 4.3-1, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e., moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring program.</p> <p>4. Denison has clearly outlined in the EIS, Section 10 and Appendix 10-A how each HHRA’s receptor diet was derived, including that for the fisher/trapper.</p> <p>As indicated in the response to IR-200 above, other sensitive or vulnerable human health groups are addressed through the use of toxicity reference values (TRVs) that incorporate uncertainty factors to account for sensitive individuals. This is standard practice in development of TRVs for human health risk assessment. As such, differences in health status or subgroups were not considered separately.</p> <p><b>References:</b></p> <p>CanNorth. 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p>	No
IR-203	-	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<b>Context:</b> This section of the ERA states “If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the	This response has not been accepted.  Although these potential sediment quality exceedances if treated effluent were to be released	After running the model to include the effluent released during the decommissioning period, the additional constituents that exceed sediment quality guidelines include vanadium for the expected case and cadmium for the upper bound case. Table 3-6 of the ERA (Appendix 10-A) has been updated to include the updated sediment quality	Yes



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					<p>Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p> <p><b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.</p>	maximum upper bound discharge rate scenario.	at the maximum upper bound discharge rate are to be documented in the ERA, the response does not address the potential risk to receptors nor propose any mitigation measures. Please provide additional assessment/justification/mitigation measures for these predicted sediment quality exceedances.	<p>predictions and the comparison against sediment quality guidelines. Vanadium was added as a COPC for the ERA since it exceeds a sediment quality guideline in LA-5 (Whitefish Lake). Section 6.2.2 of the ERA, figures and text were updated as well.</p> <p>For cadmium, the sediment quality exceeds the REF value but is below the NE2 value which is also a no-effect value. The predicted concentration of vanadium in sediment in LA-5 at the end of decommissioning is 37.2 mg/kg dw for the expected case and 68.5 mg/kg dw for the upper effluent. This is a conservative prediction as it assumes effluent is released during decommissioning at the same flow and quality as during operations. The predicted sediment concentration for vanadium is higher than the REF value from Burnett-Seidel and Liber (2013) of 35.1 mg/kg dw and the LEL from Thompson et al (2005) of 35.2 mg/kg dw. Exceedances of a REF or LEL value are not indicative of adverse effects to aquatic organisms but do suggest that further investigation may be warranted. Exceedance of a REF value indicates that sediment downstream of the proposed discharge is elevated compared to natural background. The LEL represents a concentration in sediment that the majority of benthic organism can tolerate, whereas the SEL represents a concentration in sediment that the majority of benthic organisms cannot tolerate (Persaud et al., 1993). The predicted sediment concentration for vanadium in LA-5 is well below the SEL of 160 mg/kg dw; therefore, adverse effects to benthic organisms are not anticipated. Nevertheless, vanadium was carried forward as a COPC in the ERA and hazard quotients are provided in the updated Draft ERA (Appendix 10-A) for the expected case. No hazard quotients above 1 were identified.</p> <p><b>References:</b></p> <p>Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.Persaud, D., Jaagumagi, R., Hayton, A., 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality of Ontario. Ministry of Environment and Energy. Ontario.</p> <p>Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.</p>	Appendix 10-A, Table 3-6, Section 6.2.2.
IR-206	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Section 11 Section 12 Section 15 Section 16	<p><b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.</p> <p><b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the Project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEAA 2012.</p>	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find solutions or continue discussions with the potentially impacted Indigenous Nations and communities.	<p>This response has not been accepted.</p> <p>The IR response directs the FIRT to refer to the response for IR-28. However, this IR response does not directly respond to this IR in question. In IR-28, Denison does discuss how they plan to address the concerns raised by Indigenous Nations and communities, but Denison does not demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects.</p>	<p>In engagement activities in May of 2022 and October of 2023, the conclusions of the EIS inclusive of residual effects, cumulative effects, and significance determination were shared and engaged upon with Indigenous Nations and communities. This includes ERFN and KML.</p> <p>The Indigenous COIs ERFN and KML did not identify any outstanding concerns with these conclusions, or the potential of the Project to adversely affect Indigenous and/or treaty rights that could not be mitigated or accommodated by the Project.</p> <p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the EIS process since filing its draft EIS. This has included engagement specific to the conclusions of the draft EIS</p>	Yes  Revised Draft EIS, Section 4

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							CNSC requires Denison to provide this information before the response can be accepted.	<p>in May of 2022 and October of 2023. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward.</p> <p>A list of commitments and/ or mitigation measures arising from these processes, with specific details to each Indigenous Nation (or representative thereof), will be included in the revised EIS. For clarity, this will not include any private, confidential accommodations made under contractual agreements. Where not contained in confidential contractual agreements, any new mitigation or enhancement measures will be updated in the revised EIS. Further to this, Section 4 of the EIS will be updated to include a summary of engagement and associated outcomes, with additional details offered in the Indigenous Engagement Report. Denison has engaged with various Nations (or representatives thereof) in response to the public comment review process and will continue to do so throughout the assessment process.</p>	
IR-209	-	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<p><b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).</p> <p><b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)</p>	Please provide detailed proposed mitigation measure for KML’s concerns related to loss of cultural knowledge and language should they work for Denison.	<p>This response has not been accepted.</p> <p>Please provide validation that this proposed mitigation measure is considered suitable and has been accepted by KML.</p>	<p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the Project process since filing its draft EIS. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward. Denison and KML are in agreement that all items identified in the FIRT and public comment process are considered as resolved. During the public comments process, KML raised concern for the loss of language, culture, and knowledge related to working at an industrial operation (KML and NVP Public Comment #94).</p> <p>KML has validated the process in which Denison and KML will communicate concerns and agree on appropriate mitigation measures. Specifically, the following response was provided to KML on November 22, 2023, and validated by KML on December 5, 2023. Also see comment No 37 in the Issues and Concerns Table in Appendix 4b.</p> <p>Denison respects the concern raised by KML regarding language and culture related to working at an industrial operation. Denison and KML will be working on specific items of interest to mitigate these types of concerns through private contractual arrangements, which may include specific mitigation and accommodation measures in this respect. Mitigation measures associated with potential effects to cultural continuity (including knowledge transfer and language) are described in Section 12.1.5 of the revised draft EIS and include:</p> <ul style="list-style-type: none"><li>• Working with Indigenous COIs to understand culturally important periods relative to harvest times and cultural camps to facilitate Indigenous employees taking time off to participate in such activities;</li><li>• Implementation of Denison's Indigenous Peoples Policy and advancement of reconciliation</li><li>• Using a commuter rotation system has also shown to be effective in allowing Indigenous employees continued opportunities to spend time on the land, and important factor in</li></ul>	Yes  Revised Draft EIS, Section 12.1.5

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								<p>the transmission of knowledge and language (see Section 11 of the Draft for a description of potential effects to land use).</p> <p>In discussions with Indigenous Communities of Interest since the filing of the draft EIS, it has become apparent that Denison should add additional commitment / mitigation measure in relation to this area of interest, as follows:</p> <ul style="list-style-type: none"><li>• Encouragement to speak languages of choice while at site, except during safety sensitive situations.</li></ul> <p>Section 12.1.5 of the revised draft EIS was updated to include the additional commitment / mitigation measure in relation to culture and language, as follows:</p> <ul style="list-style-type: none"><li>• Encouragement to speak languages of choice while at site, except during safety sensitive situations.</li></ul>	
IR-212	-	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	<p>The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.</p> <p><b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).</p> <p>The commitment regarding monitoring and follow-up activities appears limited to “<i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i>” (p. 14).</p> <p><b>Rationale:</b> Country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the prediction</p>	<p>1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.</p> <p>2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the Proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and the direct involvement of communities in monitoring, surveillance, and risk communication activities.</p>	<p>This response has not been accepted as it does not provide sufficient detail on engagement and adaptive management.</p> <p>The response to IR-212 expresses interest and intent to working with local and Indigenous communities to develop follow-up and monitoring programs, supported by an overview of the intended approach. It also articulates that the detail of follow-up and monitoring plans will be developed as part of the licensing and regulatory phases of the Project’s approval process.</p> <p>As previously indicated, country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. As such, it is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program for country foods.</p> <p>Additionally, the preliminary monitoring plan should include decision criteria/thresholds/benchmarks for initiating action and what those actions might entail (e.g., inspection of treatment processes, additional sampling, communication with local land users &amp; residents, engagement with interested communities, etc.).</p> <p>HC reiterates its previous IR, with added clarification:</p>	<p>Given the stage of the Project, Denison believes the information provided in response to the original IR comment provided an appropriate level of feedback with respect to modes of engagement with local, provincial and federal authorities, and Indigenous Nations and communities around the sampling / monitoring (including important country foods harvested for food and cultural purposes). Based on the criteria set out in revised Draft EIS Section 4, Table 4.3-1, Denison has committed to collaborating with the Indigenous Communities of Interest English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. Within the context of the IR Denison does not feel it is entirely appropriate to provide definitive information with respect to how engagement activities will occur given that a commitment to engage in a manner that best suits the individual communities has been made and that process continues to unfold. Nevertheless, additional information is provided below that Denison believes provides further clarity regarding ongoing and planned engagement. Additionally, concepts concerning decision making related to criteria/thresholds/benchmarks that may be used to trigger follow up actions are also discussed.</p> <p>1. Denison understands the importance of engaging Indigenous Nations and communities with respect to items that matter to them. As recent as October 2023, Denison has engaged with Indigenous Communities of Interest about how the outcomes of the environmental assessment process become key areas of focus by the licensing and approvals regime – including in relation to environmental monitoring. All discussion and materials related to these engagement sessions can be found in Section 4. Further to this, Denison has planned a comprehensive and technical workshop with ERFN in March 2024, and expects to undertake the same for KML soon thereafter, focused very specifically on the aspects of items licensed or approved post-environmental assessment. This will include environmental monitoring and the relationship to country foods, including potential country foods to be monitored as part of monitoring programs. As the lifecycle regulator for the Project, Denison is required to provide information related to the outcome of these discussions into forthcoming updates in the IER to the CNSC.</p> <p>2. Re decision criteria/thresholds/benchmarks – As with any aspect of routine monitoring that would be implemented at the Project site that provides information on operational performance, feedback mechanisms will be developed as part of the monitoring process so that appropriate actions can be taken in response to data as it becomes available (i.e.,</p>	No

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							<p>1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, for substances in country foods that may represent a potential health risk and/or are of concern to community members and land users (e.g., Mercury/Methylmercury, Selenium, Cadmium and Lead).</p> <p>2. Describe the decision criteria/thresholds/benchmarks for these substances in country foods and steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.</p>	<p>routine monitoring will be developed in consideration of the adaptive management concept). Details regarding such feedback mechanisms, the basis of how subsequent actions would be triggered, and those actions would be defined as part of the development of monitoring programs as part of the Environmental Management Program during licensing, and in conjunction with engagement activities. With that in mind, a conceptual trigger-response mechanism framework related to sampling / monitoring of country foods is described for consideration that would be the basis of detailed plans developed in the next phase of Project approvals.</p> <ul style="list-style-type: none"><li>Conceptually, screening criteria would be defined in consideration of increasing trends measured in environmental media relative to background.</li><li>Where a screening criteria/threshold/benchmark was triggered, an investigation would be initiated to verify the result and to determine if the change in concentration is significant relative to background. This could include lab re-analysis, review of QA/QC data and field notes, reconnaissance, re-sampling or additional sampling and/or additional analyses. Potential causes of the increasing trend would be investigated to establish whether the trend was Project related, and the investigation may be informed by mine operations data (e.g., water treatment performance), climatic data, local and Indigenous knowledge, and background data from reference locations in the region.</li><li>If the investigation confirms that the criteria/threshold/benchmark criteria was triggered by the Project, additional analyses such as modelling, toxicity testing, increased sampling may be initiated (as appropriate) or assessment of human health risks may be warranted.</li><li>If, based on the additional investigation, modified or additional mitigation measure(s) are identified, such measures may need to be developed, implemented and monitored to address the specific issue identified as being of concern. Monitoring would be adapted to ensure it was capable of monitoring the performance of any mitigations implemented and to demonstrate the risk identified had been mitigated.</li></ul> <p>It is envisioned that Denison would engage its Indigenous Communities of Interest in all aspects of the process. Members of the public and the provincial and federal governments would be engaged through with the formalized public information program, required by the CNSC.</p>	
IR-216	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the proponent specify in the EIS that worker health, as it relates to accidents and malfunctions, will be addressed independently and part of the licensing process as required. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As indicated in the initial response to IR-216 it is Denison's intent to assess radiological dose to workers as part of the licensing process (see also Section 14.2 of the revised Draft EIS). As such Denison confirms that this will include the assessment of radiological dose to workers that may be associated with Bounding Scenarios 1 (Vehicle Accident and Aquatic Release of Radioactivity) and 7 (Vehicle Accident and Terrestrial Release of Radioactivity) of the Accident and Malfunctions Assessment (Section 14 of the revised Draft EIS). For clarity, the last paragraph of Section 14.2 of the revised Draft EIS has been revised as follows, noting that the bolded text is the addition that states the specific commitment requested in the IR.</p>	Yes  EIS Section 14.2

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					the expected doses meet the dose limits set out in the Radiation Protection Regulations.			<p>"It is noted that some hazards related to worker safety were identified; however, worker safety (i.e., risks and consequences) is beyond the scope of this assessment. Consistent with Canadian Standards Association (CSA) N288.6-12 (CSA Group 2012), potential risks to nuclear energy workers will be addressed as part of the license application and will include the results of occupational hazard and exposure assessments and the Radiation Protection Program and Health and Safety Program. <b>Specifically, as it pertains to the consideration of accidents and malfunctions as presented herein, Denison will assess radiological dose to workers that may result from Bounding Scenarios (see definition in Section 14.5.6) involving vehicular accidents resulting in releases of radioactivity to the aquatic (see Section 14.6.1) and terrestrial (see Section 14.6.7) environments."</b></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment in the revised draft EIS and as indicated the additional work to characterize radiological dose to workers will be completed during licensing.</p>	
IR-217	-	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.	<p>This response has not been accepted.</p> <p>The Proponent has provided information on all water crossings along the transportation corridor. However, it is insufficient for the justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.</p>	<p>The review comment is acknowledged, but there seems to be some confusion as to the context for the “bounding scenario” terminology used in the accident malfunction analysis. It is the release of the radioactivity (Scenario 1) and chemicals (Scenario 2) that form the basis of these bounding scenarios, and not the specific locations of their occurrence.</p> <p>It would not be possible (nor appropriate) to select a scenario that would necessarily bound all other scenarios in this regard, given the variability of conditions on the transportation route along Hwy 914 south from the project site to its junction with Hwy 165 and then Hwy 165 both east to Hwy 2 and west to Hwy 155. The alternative, that is selecting a host of locations in an attempt to capture such variability in conditions, would not be practical, nor is it necessary in Denison’s and their SME’s view. As noted in the original response, the location selected for the material releases evaluated in accident malfunction Scenarios 1 and 2 was chosen because it represents an important location to Indigenous, local resource users. The analyses of these scenarios provide examples of such releases to local receptors at the crossing identified in the report and contribute to the characterization of overall risk, the key endpoint in the accident and malfunction assessment. From that perspective the analyses would be expected to be generally representative of crossings along the transport route. As noted in the original response to IR 217, the approach in the accident and malfunction assessment is consistent with past practice for comparable assessments for uranium projects in the province.</p> <p>For clarity, the text in the attached revised Draft EIS has been revised as follows:</p> <p><b>For Appendix 14-A:</b></p> <p><b>Section 5.1</b> – to be added to the end of the 4<sup>th</sup> paragraph, “<i>This location was the focus the evaluation as it represents an important location to resource users in the study area. The scenario provides an example of the consequences of such releases to local receptors – that is, the results of the assessment of the releases at this location would be expected to be generally representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability</i></p>	<p>Yes</p> <p>Draft EIS Sections 14.6.1.1 and 14.6.4.2.1</p> <p>Appendix 14-A Sections 5.1 and 5.2</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p><i>multiplied by consequence. Appendix C to this report describes water crossings along the Project-related transportation route on Highway 914 south from the Project site to its junction with Highway 165 and Highway 165 east to Hwy 2 and west to Hwy 155. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.”</i></p> <p><b>Section 5.2</b> – to be added to the end of first paragraph, “<i>As with Scenario 1, this location was also the focus the evaluation as it represents an important location to resource users in the study area but the results of the analysis presented can generally be applied more broadly to water crossings along the transport route from an overall risk perspective.”</i></p> <p><b>Section 14:</b></p> <p><b>Section 14.6.1.1</b> – to be added to the end of the 4<sup>th</sup> paragraph, “<i>This location was the focus the evaluation as it represents an important location to resource users in the study area. The scenario provides an example of the consequences of such releases to local receptors – that is, the results of the assessment of the releases at this location would be expected to be generally representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. Appendix C to this report describes water crossings along the Project-related transportation route on Highway 914 south from the Project site to its junction with Highway 165 and Highway 165 east to Hwy 2 and west to Hwy 155. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.”</i></p> <p><b>Section 14.6.2.1</b> – to be added to the end of the 1<sup>st</sup> paragraph, “<i>As with Scenario 1, this location was also the focus the evaluation as it represents an important location to resource users in the study area but the results of the analysis presented can generally be applied more broadly to water crossings along the transport route from an overall risk perspective.”</i></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity to the reporting.</p>	



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-218	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m3/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m3/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.	<p>This IR has not been accepted as there are two typos in Denison’s response.</p> <p>In the column: Final EIS Update, the wording “Section 14.6.4.1” appears to be “Section 14.6.1.4”; for the <u>Revisions to Appendix 14-A</u>, the wording “average annual low of 24.3m<sup>3</sup>/s (average flow)” should be “average annual low of 17.3m<sup>3</sup>/s (average flow)”. Please update this text.</p>	<p>Acknowledged. Based on the further comment, confirmation of the editorial revisions for Section 14 of the Draft EIS and Appendix 14-A are highlighted below.</p> <p><b>Revisions to Section 14 of the EIS:</b></p> <p>- The last two rows of Table 14.6-3 will be removed.</p> <p>- From Section 14.6.1.4 (not Section 14.6.4.1 as previously indicated), the second to last sentence in first paragraph to be revised as follows, “<i>The flow rates considered for this assessment were 5th percentile annual flows of 10.9 m3/s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m3/s (average flow), and the 95th percentile annual flow of 24.67 m3/s (maximum flow).</i>”</p> <p>- Table 14.6-5 to be revised as shown in Attachment IR-218 (Annex 1, Attachment IR-218, pages 392/419).</p> <p><b>Revisions to Appendix 14-A:</b></p> <p>- From Section 8.1, second to last sentence in first paragraph to be revised as follows, “<i>The river flows considered for this assessment are the 5th percentile annual flow of 10.9 m3/s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m3/s (average flow), and the 95th percentile annual flow of 24.67 m3/s (maximum flow).</i>”</p> <p>- Table 8-5 to be revised shown in Attachment IR-218 (Annex 1, Attachment IR-218, pages 392/419).</p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is for editorial purposes.</p>	Yes  Draft EIS Section 14.6.1.4  Appendix 14-A, Section 8.1  Appendix 14-A, Table 8-5
IR-219	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the Proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.	<p>This response has not been accepted as the Proponent’s response does not include rationale for using different water column depths for uranium concentrate release characterization.</p>	<p>Acknowledged.</p> <p>With respect to water column depth, Denison confirms that only one water column depth was considered with respect to uranium concentrate recovery. The assumption of a 10 cm water column depth (Draft EIS Section 14.6.1.1.1, Appendix 14-A Section 5.1) is in reference to the bottom 10 cm of the water column where uranium concentrate that would be deposited on the river bottom is assumed to interact with the receiving environment (i.e., where uranium concentrate, dissolution is assumed to occur in the Wheeler River). The average depth of 1.2 m (Draft EIS Section 14.6.1.1.1, Appendix 14-A Section 5.1) is in reference to the assumed average depth of the river where the release is postulated to occur. Denison notes that the final sentence of Draft EIS Section 14.6.1.1.1 and Appendix 14-A Section 5.1 state “. . . <i>and a water column depth of 5 cm.</i>”; this statement is erroneous and has been amended in both locations in the revised Draft EIS to state “. . . <i>and a water column depth of 10 cm.</i>”</p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is for editorial purposes.</p>	Yes  Draft EIS Section 14.6.1.1.1  Appendix 14-A, Section 5.1

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
IR-222	-	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<p><b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.</p> <p><b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.</p>	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.	<p>This response has not been accepted as the Proponent states that: <i>“Through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as “moderate” and “ALARP” and as such consistent with the A&amp;M assessment methodology was not carried forward further evaluation.”</i></p> <p>This is not the case. In Appendix A, Table 3, item 3.3 identifies that aquatic release of fuel, hazardous chemicals and reagents as having a high risk and further assessment is needed. If the Proponent believes the above statement is true, Appendix A in Appendix 14-A should be revised to reflect such a case.</p>	<p>Acknowledged.</p> <p>Table 3, Item 3.3 in Appendix A of Appendix 14-A has been revised to reflect the content of the original response (Annex 1, IR-222, page 82/419) whereby the release of acids and bases (chemicals and reagents) has a lower overall risk screening ranking than the release of diesel fuel. Complementary text has been added to Section 14 of the revised Draft EIS for consistency and clarity.</p> <p>The following revisions have been made in the revised Draft EIS:</p> <p><b>Revisions to Appendix A of Appendix 14-A</b></p> <ul style="list-style-type: none"><li>- Table 3, Item 3.3, the consequence and overall risk ratings for this scenario have been modified to reflect the distinction between the release of acids and bases (chemicals and reagents) and the release of diesel fuel and the following note has been added to the “Screening Decision / Rationale” column in Table, “ As seen in the “S” column two consequence screening rankings were provided and consequently, two overall risk screening ranking are also provided. Acids and bases (chemicals and reagents) released to the aquatic environment are likely to dissolve relatively quickly and effects to local biota can be expected to be experienced on a local basis and over a shorter timeframe resulting in the screening consequence score of “major” (4) and an overall risk screening ranking of “moderate”. There is little likely that mitigation can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP (thus the overall ranking of “ALAPRP, moderate”). The release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in liquid phase distinct from that of the water and in this sense, this release produces a greater challenge of potential contamination over a relatively large spatial extent and timespan. For this reason, a screening consequence score of “catastrophic” (5) and an overall risk ranking of “high” was given. Per the rationale provided above, the “high” overall risk release of diesel fuel case was chosen as the representative case for Scenario 3.3 and carried forward for further assessment.”</li></ul> <p><b>Revisions to Section 14.6.2.4:</b></p> <p>The following has been added as the first paragraph of Section 14.6.4.2 of the draft EIS for clarity, <i>“For the purpose of assessing the potential effects on the aquatic environment from a release of fuels and hazardous chemicals the release of diesel fuel was chosen as a representative scenario, rather than other chemicals, such as acids and bases. The release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in liquid phase distinct from that of the water in the receiving environment with potential contamination occurring over a relatively large spatial extent and timespan. In contrast, the release of acids and bases would dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe.”</i></p> <p>For reference, similar text has been added to Section 8.2 of Appendix 14-A.</p>	<p>Yes</p> <p>Appendix 14A, Appendix A, Section 3.0, Table 3, Item 3.3</p> <p>EIS Section 14.6.4.2</p> <p>Appendix 14-A, Section 8.2</p>

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								It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity to the reporting.	
IR-225	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the Proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the proponent specify in the EIS that any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As noted in the original response to IR-225 (Annex 1, IR-225, page 83/419), any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Per this additional FIRT request, this commitment has been included in the text of Section 14.6.5.2 of the revised Draft EIS. It is also noted that additional mitigations have been added to those listed in Section 14.6.5.2 so that the list is consistent with those measures highlighted in Appendix 14-A - that is, these are not new measures; rather the list has been modified for consistency. Section 14.6.5.2 of the Draft EIS is presented below in its entirety for reference, with revised text highlighted in bolded font.</p> <p>"The following principal mitigating measures would be in place to reduce the probability of a release from the process piping and vessels:</p> <ul style="list-style-type: none"><li>• visual inspections;</li><li>• regular and preventive inspection, testing, and maintenance programs;</li><li>• <b>personnel training and orientation;</b></li><li>• <b>development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE;</b></li><li>• emergency response planning;</li><li>• <b>building ventilation;</b> and</li><li>• full containment of the processing plant; and</li><li>• <b>ambient monitoring.</b></li></ul> <p><b>For reference, the engineering design controls identified as mitigating measures above will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing."</b></p>	Yes  EIS Section 14.6.5.2
IR-229	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the Proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.	<p>This response has not been accepted.</p> <p>In order to accept this response, CNSC staff request that the Proponent must specify in the EIS that any engineering design control measures identified in Bounding Scenario 6 such as ventilation will be included in the detailed design and will be provided to the CNSC during Project licensing. Please provide proposed text for the revised EIS, for SME review and acceptance.</p>	<p>As noted in the original response to IR-229 (Annex 1, IR-229, page 85/419), any engineering design control measures identified in Bounding Scenario 6 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing. Per this additional FIRT request, this commitment has been included in the text of Section 14.6.6.2 of the revised Draft EIS. It is also noted that additional mitigations have been added to those described in Section 14.6.6.2 so that there is consistency between the Draft EIS and Appendix 14-A - that is, these are not new measures; rather the text has been modified for consistency. Section 14.6.6.2 of the Draft EIS is presented below in its entirety for reference, with revised text highlighted in bolded font.</p> <p>"Denison would make sure that the design of the plant includes control measures to reduce exposure levels to workers and members of the public to levels that are as low as achievable. The control measures would work to make sure that the processing plant is adequately ventilated. Emergency response and spill response plans would include procedures for worker protection, details about personnel protection equipment (particularly respiratory equipment), and procedures to evaluate exposures during a release of uranium powder. <b>In addition, the following is noted with respect to mitigation:</b></p>	Yes  EIS Section 14.6.6.2

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								<ul style="list-style-type: none"><li>• implementation of regular and preventive inspection, testing, and maintenance programs;</li><li>• ventilation design considerations for upset conditions; implementation of personnel training and orientation;</li><li>• development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE;</li><li>• implementation of fire safety plan and firefighting systems; and</li><li>• ambient monitoring.</li></ul> <p><b>For reference, the engineering design controls identified as mitigating measures above will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing."</b></p> <p>It is noted that this IR response does not change the outcome of the accidents and malfunctions assessment. Information that will be added to the EIS documentation as noted above is to add clarity and consistency to the reporting.</p>	
IR-235	-	ECCC ERAD	Fish and fish habitat Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”</p> <p>RCP4.5 represents predicted climate conditions of a moderate carbon future.</p> <p>RCP8.5 represents predicted climate conditions under a high carbon future.</p> <p>The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.</p> <p><b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.</p> <p>ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a></p> <p>ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a></p>	<p>1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.</p> <p>2. Provide detailed calculations for the following average values:</p> <ul style="list-style-type: none"><li>• 25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li><li>• 25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li></ul> <p>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</p> <p>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</p> <p>5. Compare model derived data against:</p>	<p>Although responses 1 to 4 have been accepted, this response has not been accepted for the following reasons:</p> <p>5. although PMP is used for design purposes as indicated in Section 8, presenting the variability of observed versus climate model predicted historical precipitation values would provide understanding on the uncertainties associated with climate model projected or historical precipitation (Max 1-day, seasonal or annual) values. Thus, the proponent is recommended to include more clarification in the revised EIS.</p>	<p>The PMP is similar to annual precipitation and ~6 to 10x higher than measured and predicted future maximum 24-hour precipitation and 1:100 24 hour return events.</p> <p>In terms of Project effects on water quantity, the conservative estimate of water withdrawal would result in a reduction of flow of about 3% at times of low flow and the water level in Whitefish Lake could change by 1cm; this minor change is beyond the ability of monitoring techniques to practically measure and the assessment concluded that the Project would not result in a significant effect on surface water quantity (hydrology). Monitoring, including of water withdrawal rates and of potential effects (e.g., change in water flow, change in lake levels) will be implemented as the Project moves forward.</p> <p>The reviewer has requested information would not change the EA conclusions. However, for the purposes of demonstrating the uncertainties of climate model predicted values vs. observed data, the Max 1-day precipitation annual average historical data for Tomblin Lake, high carbon (RCP8.5) was compared to the predictive model results from the period of 1950 to 2013 (i.e., ensemble high carbon dataset). The predicted model data were hindcast for periods prior to 2006 and these value are then based on the historical data set with the ensemble values derived from 24 CMIP5 global climate models (the complete list of models can be found at <a href="https://climateatlas.ca/data-sources-and-methods">https://climateatlas.ca/data-sources-and-methods</a>) (Climate Atlas of Canada, 2023).</p> <p>A correlation coefficient (R2) value was calculated for these two datasets and the result was a coefficient of 0.36 which indicates the level of uncertainty that can be expected in the forward casting of precipitation data into the future. This information is further included in the EIS to indicate that current climate models are variable in nature and their uncertainty requires continued monitoring.</p>	<p>Yes</p> <p>Revised Draft EIS, Section 15.5.2 (text added to discuss uncertainty in the climate predictions)</p>

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.</p> <p>These values do not match the averages shown in Tables 15.5-1 and 15.5-2.</p>	<p>1. Natural variability of the observed data.</p> <p>2. Variability in the statistics generated via observation based time series.</p> <p><b>Technical Discussion Required:</b> Yes</p>			
IR 236	-	ECCC ERAD	Fish and fish habitat Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p><b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>This response has not been accepted.</p> <p>The Proponent made a correlation between precipitation and the Probable Maximum Precipitation (PMP). However, annual maximum and PMP cannot be correlated as they are two separate concepts that require different statistical methods to verify.</p> <p>The Proponent provided two tables which displayed precipitation data under current, existing, and future climate scenarios for two nearby lakes. These were provided to support the Proponent’s response, however, the calculations used to achieve the table figures within the response or Attachment: IR-236 were not provided. As one value cannot be used to infer the other, reviewing the calculations is required to support the Proponent’s conclusions.</p> <p>Please see the following requests: 1. In Table 3 of Attachment: IR-236, the historical mean value (1976 to 2005) for the Maximum 1-Day Precipitation is 24.1 mm and is indicated as measured. However, this estimate appears to be derived from ensembles of climate modeled historical precipitation. Thus, proponent to insert a footnote at Table 3 that indicate the total annual as well as maximum 1-day are estimates based on ensembles of climate modeled historical precipitation. The Proponent needs to provide the calculations that were used to reach the conclusions found within Tables 2 and 3 of Attachment: IR-236. Reviewing the calculation will allow for verification of the Proponent’s conclusions. If the currently used data sources do not allow for accurate representation of their conclusions, the Proponent should use complete</p>	<p>Please see Attachment IR-236.</p>	<p>Yes</p> <p>IR-236 added as Appendix D of Appendix 6-C</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
							<p>regional observational data sources to support the conclusions in Tables 2 and 3.</p> <p>2. The analysis of mean maximum one day and mean annual total precipitation [1976-2005] based on weather station (Climate ID 4063755) at Key Lake is roughly 32mm and 470mm respectively. Thus, include both modeled and observed historical precipitation statistics in the EIS for context.</p> <p>Measured data should take precedence over modeled data. The Proponent is taking an ensemble of modeled data to "predict" historical data when measured data is available and can validate the models. Without strong justification, it is not appropriate to replace measured data with "predicted" modeled data.</p>		
IR-237		CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the Proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>	<p>This response has not been accepted.</p> <p>Denison has indicated they will update the follow-up program in Appendix 16-C, but this information has not been provided. CNSC reminds Denison that there should be no new information in the final EIS, and that we must review this information before accepting the response to this IR.</p> <p>Please provide an updated version of Table 1-5.1 with detailed information proposed by Denison in the IR response for the next iteration of the FIRT technical review, for SME review and acceptance.</p>	<p>See Attachment IR-237. Also see an updated version of Appendix 16-C that has been included in an updated version of Appendix 16-C that is provided with this IR response submission package.</p>	<p>Yes</p> <p>Appendix 16-C (updated)</p>



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
					<p>The follow-up program plan should be sufficiently described in <u>the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.</u>” (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>				
IR-238	-	CNSC	Current use of lands and resources for traditional purposes Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the Proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	<p>This response has not been accepted.</p> <p>Please provide additional information and updates on engagement activities to the EIS and IER (to date) that demonstrate whether Indigenous Nations and communities have been engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights. See also AD-62 in the Advice to Proponent table.</p>	<p>Denison has continued to engage with Indigenous Communities of Interest (COIs) along with other Indigenous communities who have expressed interest in the Project since filing its Draft EIS. This has included engagement specific to the conclusions of the draft EIS in May of 2022 and October of 2023. Through the provincial technical review process, the Federal Indigenous Review Team, and the public comments process, Denison has considered and responded to the issues and interests raised. This has included gaining a better understanding of the core issues and concerns of Indigenous communities and their desired involvement in the EIS review process going forward.</p> <p>A list of commitments and/ or mitigation measures arising from these processes, with specific details to each Indigenous Nation (or representative thereof), will be included in the final EIS. For clarity, this will not include any private, confidential accommodations made under contractual agreements. Where not contained in confidential contractual agreements, any new mitigation or enhancement measures will be updated in the final EIS. Further to this, Chapter 4 of the revised Draft EIS has been updated to include a summary of engagement and associated outcomes, with additional details offered in the Indigenous Engagement Report. Denison has engaged with various Nations (or representatives thereof) in response to the public comment review process and will continue to do so throughout the assessment process.</p> <p>More specifically to the Indigenous COIs, Denison has worked with ERFN and KML to determine their desired involvement in mitigation and monitoring processes. This has included identifying and agreeing to measures that need to be in place as part of the EIS,</p>	<p>Yes</p> <p>Revised Draft EIS, Section 4 (including appendices)</p>

IR Response Table  
Denison’s Response to December 2023 FIRT Comments  
February 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Information Requirement (IR)	Rationale for Status	Denison’s Response	EIS Updates (Yes/No; if Yes, provide EIS Section number)
								<p>which topics needs to be carried through the licensing process, and each community's desired role in the process as the Project progresses. Denison and ERFN, and similarly Denison and KML, are in agreement that all items identified in the FIRT and public comment process are considered as resolved. For details, please see the Issues and Concerns table in Appendix 4B in the revised draft EIS</p> <p>Denison is committed to keeping the Indigenous communities who have expressed interest in the Project informed of monitoring and mitigation plans. Any commitments stemming from these processes, so long as they are not contained in confidential contractual arrangements, have been included in the revised Draft EIS.</p>	

## ATTACHMENT IR-12

Original IR Number	IR-12
Follow Up IR Number	-
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.2.3, Project Description
Context and Rationale (original IR)	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m<sup>3</sup> for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p> <p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>

<p>Information Requirement (original IR)</p>	<ol style="list-style-type: none"> <li>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li> <li>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li> <li>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</li> <li>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</li> </ol>
<p>Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)</p>	<p>This response has not been accepted, for the following reasons (numbers correspond with original IR):</p> <p>1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed.</p> <p>3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999 study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value.</p> <p>CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.</p> <p>Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment.</p> <p>Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR.</p>

	<p>Reference:</p> <p>[A.1] Atmospheric &amp; Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie &amp; Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>
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Response:

Supporting figures to the response provided in IR table are provided on the following pages.



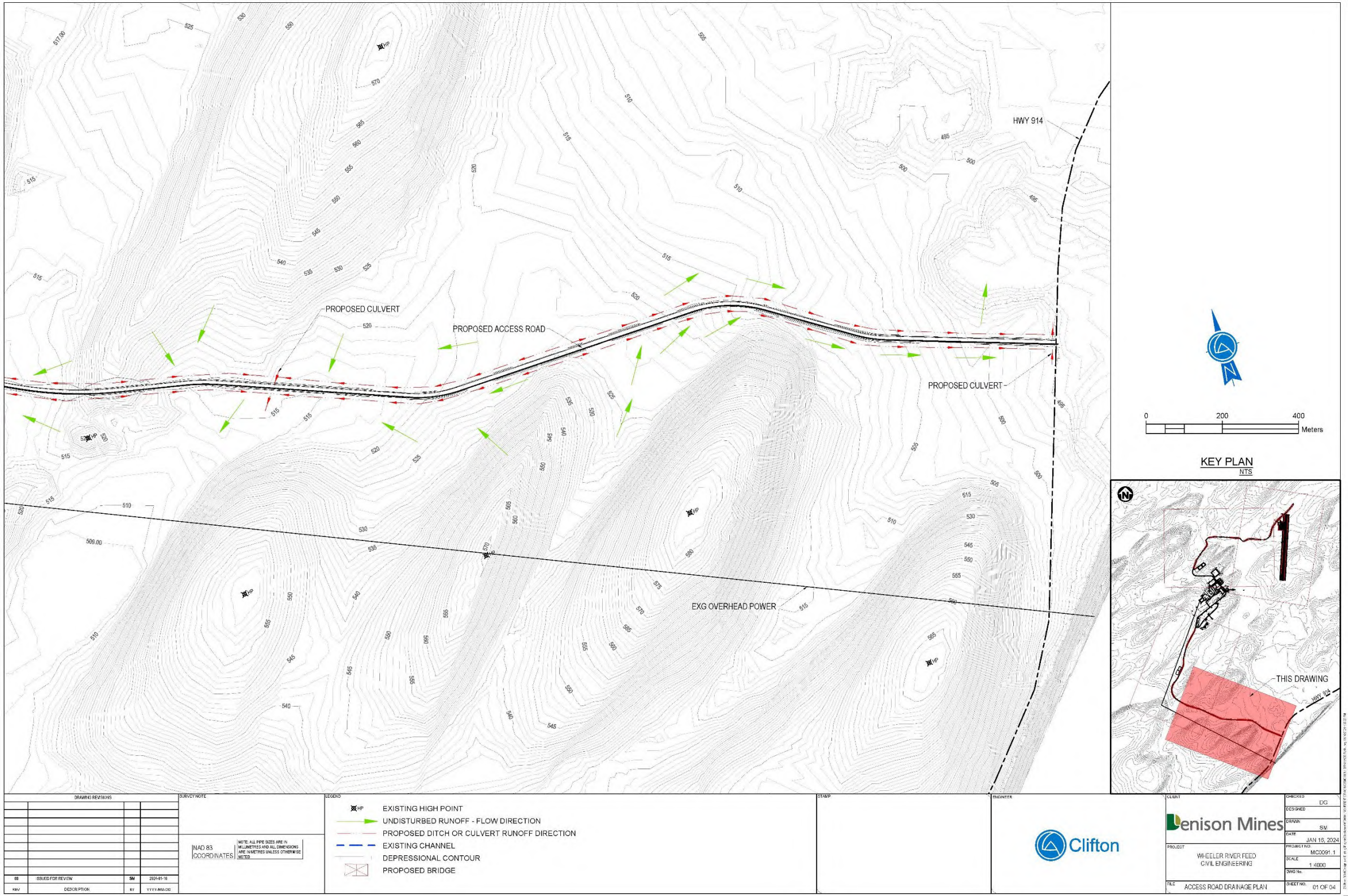


Figure IR-12- 1: Conceptual Site Drainage – Access Road (segment 1 of 2)



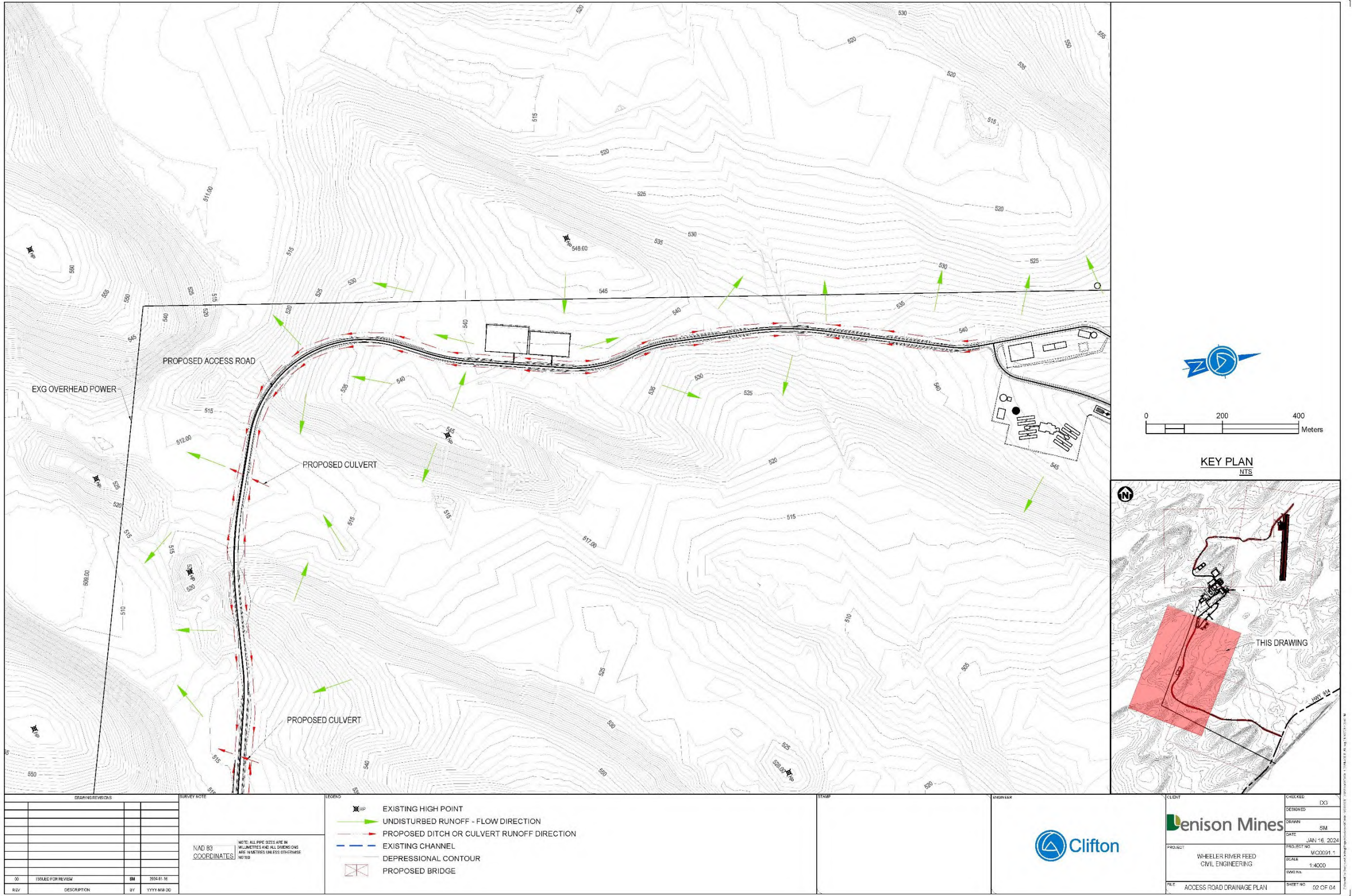


Figure IR-12- 2: Conceptual Site Drainage – Access Road (segment 2 of 2)



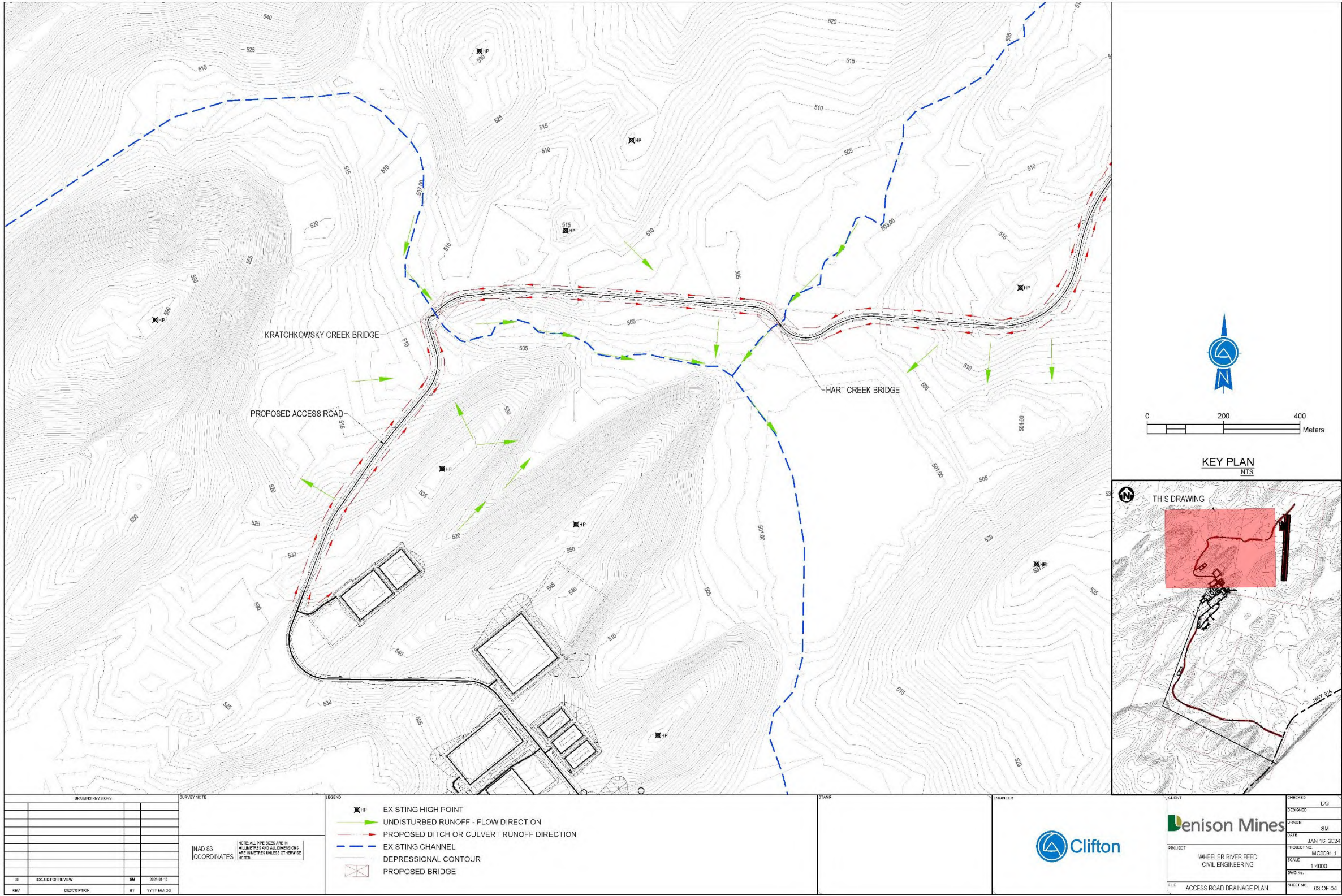


Figure IR-12- 3: Conceptual Site Drainage – Road to Airstrip



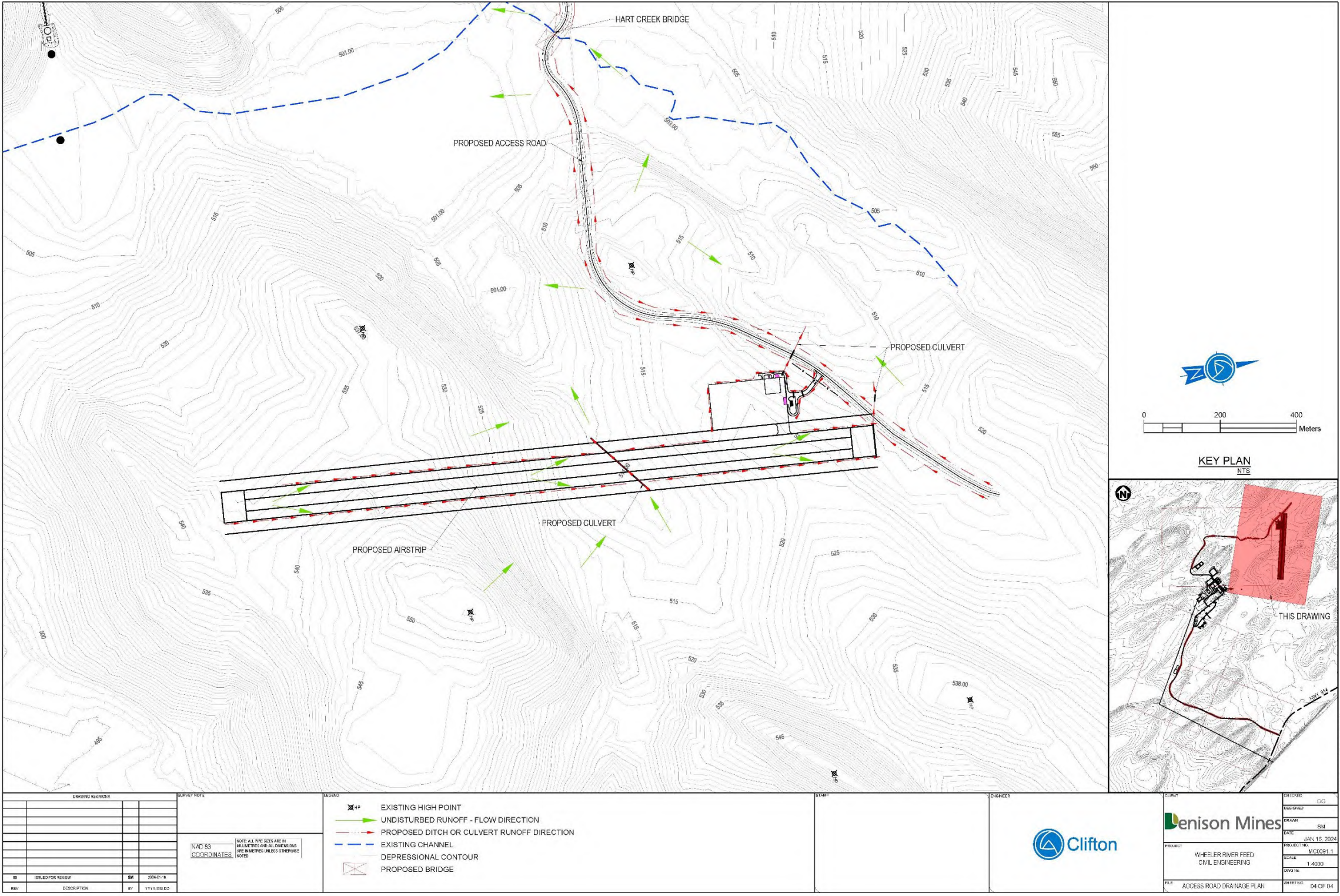


Figure IR-12- 4: Conceptual Site Drainage – Near Airstrip



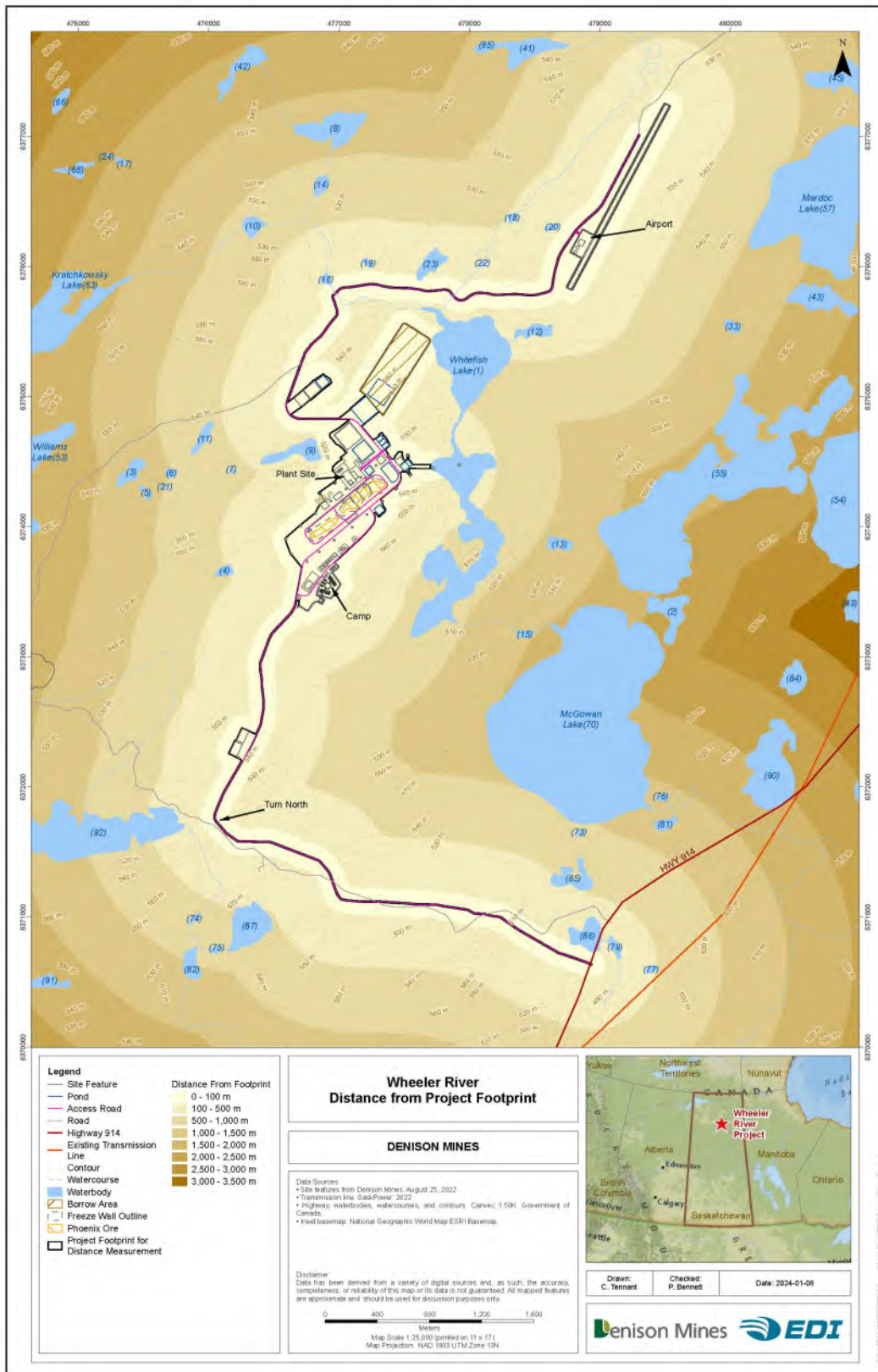


Figure IR-12-5: Distance from Project Footprint to Waterbodies

## ATTACHMENT IR-13

Original IR Number	IR-13
Follow Up IR Number	-
Dept.	ECCC CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	<p>Section 2.2.4, Waste Management</p> <p>Section 2.2.7.7, Borrow Area</p> <p>Section 2.3.1.3 Site Preparation and Earthworks</p>
Context and Rationale (original IR)	<p>Context: The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).</p> <p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p>Rationale: ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>
Information Requirement (original IR)	<p>Please provide:</p> <ol style="list-style-type: none"> <li>1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching; <ol style="list-style-type: none"> <li>a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML.</li> <li>b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.</li> </ol> </li> </ol>

	<p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>
Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)	<p>This response has not been accepted.</p> <p>In the response, Denison expected that portion of basement rock will be potentially acid generating and stated that all basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. However, criteria for segregating the potential acid generating waste rock from the clean waste rock are not provided.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings by either recovering uranium or placing the materials underground into the mining area at the end of a well's production. However, it is not clear how the potentially acid generating waste rock will be disposed of in the long term.</p>



Supporting figure and table to the response provided in the IR table:

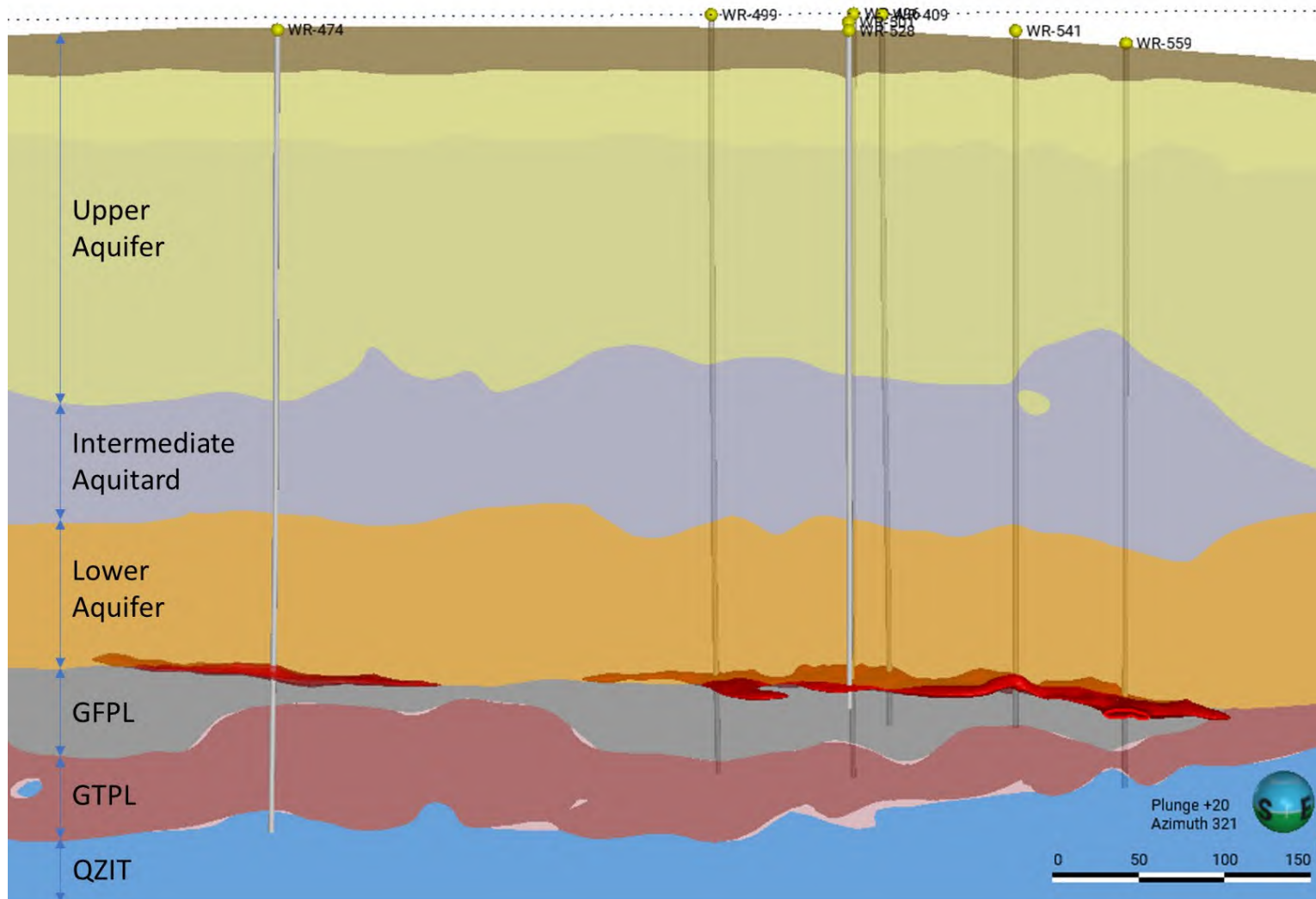


Figure IR-13-1: Major horizons of the sandstone (Upper Aquifer, Intermediate Aquitard, Lower Aquifer) and the different basement lithologies (Graphitic Pelite [GFPL], Garnetiferous Pelite [GTPL], Quartzite [QZIT]) associated with December 2023 ABA testing

Table IR-13-1: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other proposed mines

	Denison's Wheeler River Project (proposed uranium mine in Saskatchewan)	NexGen's Rook I Project (proposed underground uranium mine in Saskatchewan)	Foran's McIlvenna Bay Project (proposed underground copper-zinc mine in Saskatchewan)	Generation PGM's Marathon Palladium Project (proposed open pit platinum group metals and copper mine in Ontario)
Clean waste rock/NPAG	7,800 m <sup>3</sup>	8,000,000 m <sup>3</sup>	787,392 m <sup>3</sup>	183,146,067 m <sup>3</sup>
Mineralized or special waste (for U mines only)	150 m <sup>3</sup>	60,000 m <sup>3</sup>	n/a	n/a
PAG	1,850 m <sup>3</sup>	5,800,000 m <sup>3</sup>	1,823,164 m <sup>3</sup>	20,786,517 m <sup>3</sup>

Note: Volumes are a combination of pad storage capacities and life of mine volumes from publicly available documents including feasibility studies and EIS documentation. Any waste rock volumes presented as tonnes were converted to m3 by dividing by 1.78

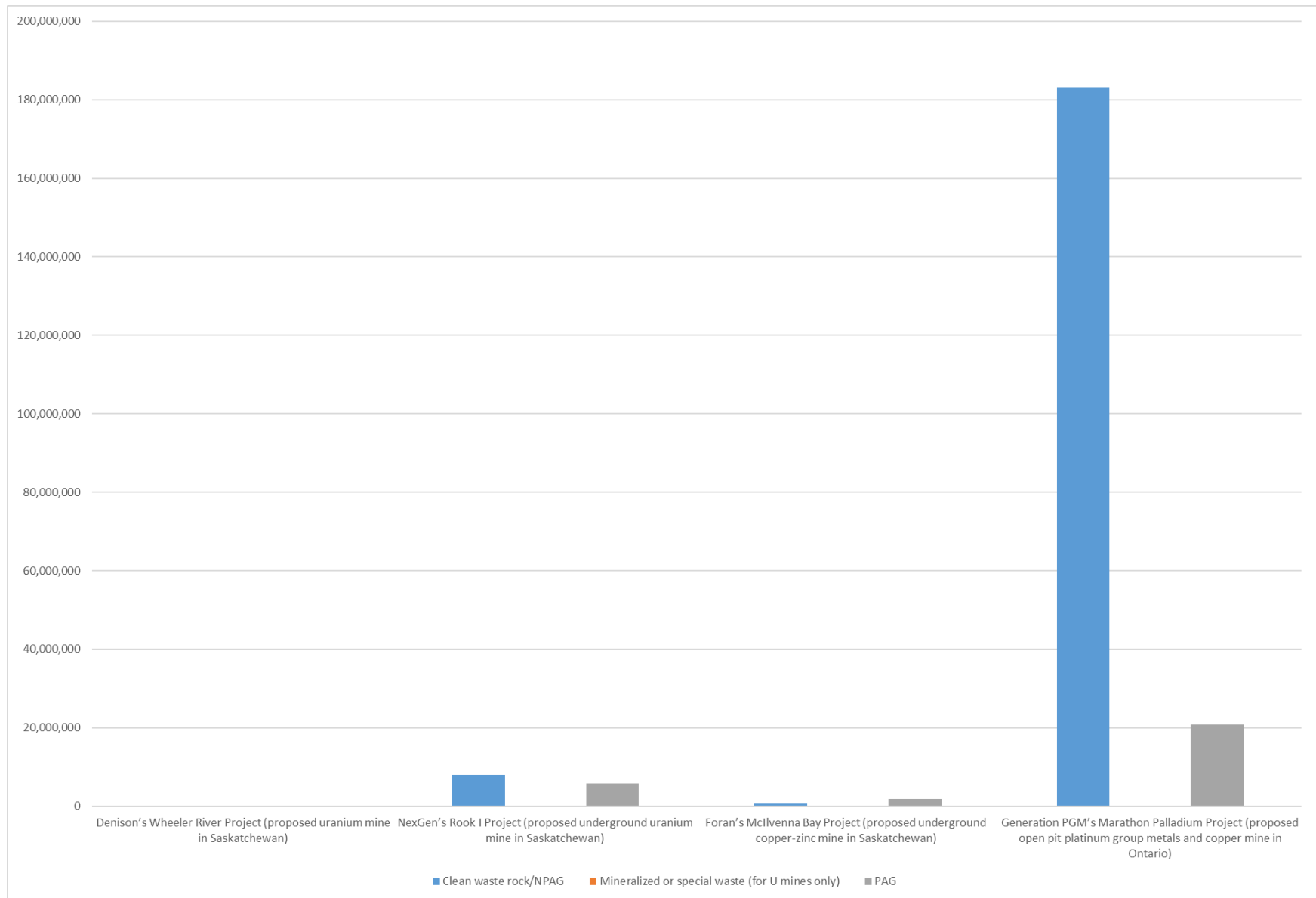
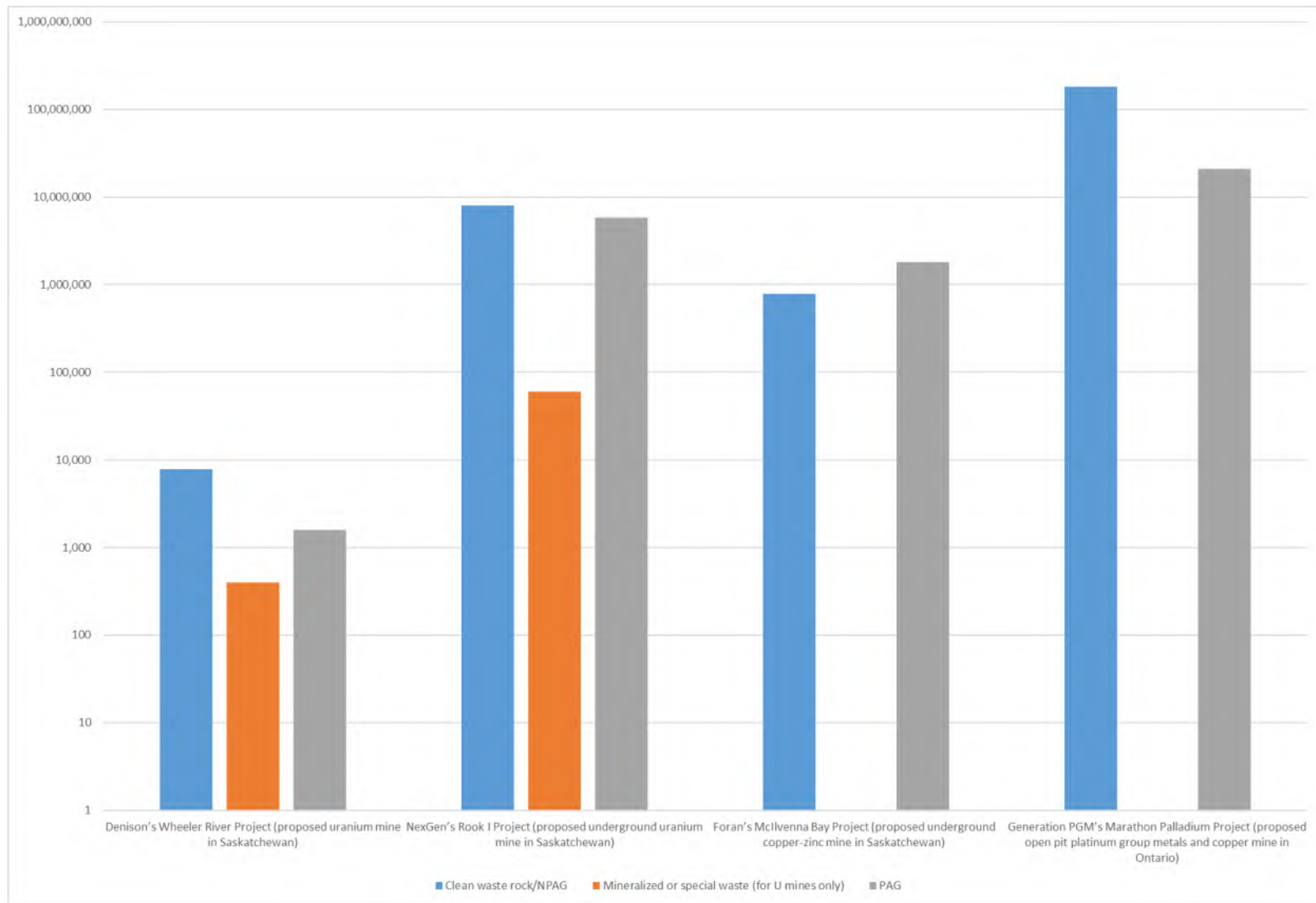


Figure IR-13-2: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other mines



Note: this is the data from Table IR-13-1 and shown in Figure IR-13-1, but this figure has a logarithmic scale on the y-axis.

Figure IR-13-3: Comparison of Wheeler River Project waste rock volumes to volumes anticipated at other mines (note: logarithmic scale on y-axis)

## ATTACHMENT IR-55

Original IR Number	IR-55
Follow Up IR Number	IR-55
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.3.3.1; Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2; Appendix 7-C, section 2.8
Context and Rationale (Original IR)	<p><b>Context:</b> According to the Proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is <math>8.4 \text{ E-}09 \text{ m/s}</math> based on field measurements. The Proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is <math>8.4 \text{ E-}10 \text{ m/s}</math>. Based on this information, structural geology and groundwater quality data, the Proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the Proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately <math>1.5 \text{ E-}07 \text{ m/s}</math>, or two orders of magnitude higher; b) The Proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The Proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the Proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p>

	<b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated in the Proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).
Information Requirement (Original IR)	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the Proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.
Rational for Status (unaccepted IR)	<p>This response has not been accepted.</p> <p>In response to IR-55, the Proponent states "The viewpoint from the third party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed."</p> <p>If the alternative model requested in IR-55 has been developed by the Proponent, NRCan requests that full details of this model be provided in an attachment.</p>

### **Denison's Response:**

#### **1.0 Introduction**

At request of the third-party reviewers, an alternative calibrated groundwater flow model was developed with a target hydraulic conductivity of  $1 \times 10^{-7}$  m/s within the competent portions of the Intermediate Sandstone Aquitard (ISA). This value was higher than the base case model value of  $1 \times 10^{-8}$  m/s, presented in Appendix 7-C of the revised Draft EIS.

The numerical groundwater flow model presented in Appendix 7-C was developed using the FEFLOW modelling software, and for this exercise, PEST was applied to find an alternative set of hydrogeologic parameters that would satisfy the calibration criteria (i.e., calibration constrained) with this higher hydraulic conductivity within the intermediate sandstone aquitard. The model structure (i.e., domain, mesh, layering, boundary conditions and hydrogeologic zonation) was left unchanged in this re-calibration; only the hydraulic conductivity values were changed. Vertical hydraulic conductivity values were tied to horizontal hydraulic conductivity values, resulting in consistent anisotropy ratios as those within the base case model.

The calibrated hydraulic conductivity values applied in the model, under both the base case and the alternative conceptualization, are presented in Table IR-55-1 alongside the range of field-based hydraulic conductivity values.



The hydraulic conductivity values simulated within the alternative calibrated scenario are considered to be on the high end of potential values for zones along the flow path toward Whitefish Lake, and thus provide a conservative estimate of potential hydrogeologic conditions. However, the model calibration was able to be maintained by combining these higher hydraulic conductivity values with offsetting lower hydraulic conductivity values in other areas.

**Table IR-55-1: Calibrated Hydraulic Conductivity**

Hydrostratigraphic Unit	Field Based Range of Hydraulic Conductivity (m/s)	Base Case Calibrated Horizontal Hydraulic Conductivity Value (m/s)	Alternative Calibrated Horizontal Hydraulic Conductivity Value (m/s)
Overburden Aquifer/Aquitard	$3 \times 10^{-6}$ to $2 \times 10^{-4}$	$5 \times 10^{-7}$ (till) to $8 \times 10^{-5}$ (sand)	$8.2 \times 10^{-8}$ (till) to $1.6 \times 10^{-5}$ (sand)
Upper Sandstone Aquifer	$4 \times 10^{-7}$ to $1 \times 10^{-4}$ (Geomean: $3.7 \times 10^{-6}$ )	$5 \times 10^{-6}$ (competent rock) to $5 \times 10^{-5}$ (desilicified rock)	$1 \times 10^{-5}$ (competent rock) to $1.6 \times 10^{-5}$ (desilicified rock)
Intermediate Sandstone Aquitard	$1 \times 10^{-10}$ to $3.8 \times 10^{-6}$ (Geomean: $8.4 \times 10^{-9}$ )	$1 \times 10^{-8}$ (competent rock) to $5 \times 10^{-6}$ (desilicified rock)	$1.0 \times 10^{-7}$ (competent rock) to $1.4 \times 10^{-4}$ (desilicified rock)
Lower Sandstone Aquifer	$7.8 \times 10^{-8}$ to $3 \times 10^{-5}$ (Geomean: $2.2 \times 10^{-6}$ )	$2 \times 10^{-7}$ to $1 \times 10^{-5}$	$8.5 \times 10^{-9}$ to $4.1 \times 10^{-5}$
Desilicified Zone Aquifer	$1 \times 10^{-6}$ to $2 \times 10^{-5}$ (Geomean: $4.8 \times 10^{-6}$ )	$5 \times 10^{-6}$	$1.4 \times 10^{-4}$
Ore Zone	$7.4 \times 10^{-10}$ to $2.7 \times 10^{-6}$ (5-spot Pumping Test Geomean: $1.0 \times 10^{-7}$ ) (Petrotek, January 2022)	$7 \times 10^{-10}$ to $2 \times 10^{-5}$	$6.2 \times 10^{-7}$
Lower Barrier Zone (underlying Ore Zone)		$1 \times 10^{-9}$	$5.3 \times 10^{-9}$
Basement Aquitards	$1 \times 10^{-11}$ to $1 \times 10^{-5}$ (Geomean : $4.8 \times 10^{-9}$ )	$1 \times 10^{-9}$ to $5 \times 10^{-9}$	$1.6 \times 10^{-9}$ to $4.9 \times 10^{-7}$

Key differences in the hydraulic conductivity values between the base case and alternative calibrated models include:

- 1) The Intermediate Sandstone Aquitard unit is simulated to have a higher hydraulic conductivity value of  $1 \times 10^{-7}$  m/s in the alternative model. It is noted that only 2 of 16 packer tests conducted within this unit produced values above  $1 \times 10^{-7}$  m/s, with the highest potential hydraulic conductivity values recorded near the MFb/MFc interface. As such, this alternative calibrated hydraulic conductivity value is considered conservatively high.
- 2) The Desilicified Zone Aquifer hydraulic conductivity was also simulated to be higher than the base case calibration, and higher than the range of measured hydraulic conductivities. The value of  $1.4 \times 10^{-4}$  m/s is almost 1 order of magnitude higher than the highest packer test value ( $2 \times 10^{-5}$  m/s), and 2 orders of magnitude higher than the most reliable estimates, which were obtained through pumping tests ( $2.7 \times 10^{-6}$  m/s). It is noted that the hydraulic conductivity of both the Desilicified Zone Aquifer and Intermediate Sandstone Aquitard units were increased to maintain calibrated conditions (i.e., the relative difference in hydraulic conductivities is important, which maintains the aquitard / aquifer relation between the two units).

- 3) The high hydraulic conductivity portions of the Lower Sandstone Aquifer were also increased to maintain a preferential flow path within this deeper unit.
- 4) The hydraulic conductivity values of materials surrounding the ore zone (i.e., the Upper and Lower Barrier zones, as well as the underlying paleo-weathered bedrock) were also increased in this simulation.
- 5) To compensate for the increased hydraulic conductivity values of the deeper units along the flow path between the Ore Zone and Whitefish Lake, the hydraulic conductivity values representing shallower units (i.e., the altered portion of the Upper Sandstone Aquifer and the Overburden sand Aquifer) were lowered by a factor of approximately 5. This adjustment was necessary to maintain calibration to observed water levels.

In summary, the hydraulic conductivity of the deeper units along the flow path between the Ore Zone and Whitefish Lake experienced an increase in hydraulic conductivity to maintain the relative ratio of conductivity values between them and the overlying Intermediate Sandstone Aquitard unit. In contrast, the shallow materials along this flow path experienced a lower hydraulic conductivity to maintain a calibrated condition.

## 2.0 Groundwater Model Calibration

### 2.1 Statistical Measures of Calibration to Water Levels

Calibration statistics were calculated as a measure of the statistical goodness of fit between the model-simulated and observed water level elevations for both the base case and alternative calibrated models (Table IR-55-2).

**Table IR-55-2: Water Level Calibration Statistics**

Calibration Statistic	Base Case Calibration	Alternative Calibration
Number of Calibration Targets	191	191
Mean Error (m)	0.23	0.33
Mean Absolute Error (m)	0.61	0.68
Root Mean Squared Error (RMS)	0.81	0.90
Normalized RMS (%)	4.1%	4.5%
Range of Observed Water Levels (m)	20.0	20.0
Baseflow: Observed: 29.3 to 50.6 L/s	40.6	44.5

As is evident from Table IR-55-2, the model calibration under the alternative calibrated conditions with higher hydraulic conductivity values representing the Intermediate Sandstone Aquitard, and Desilicified Zone is not as good as the base case calibration, and as such the model predictions should be viewed as less likely to occur than the base case model predictions. However, the alternative calibrated conditions are within the range of plausible values, given the available calibration data.

## **2.2 3D Groundwater Flow Patterns**

Groundwater elevation contours remained very similar between the calibrated models, as the calibration data constrains the simulated conditions. Under both calibrated conditions, groundwater from the vicinity of the Ore Zone is simulated to flow upward through the Desilicified Zone and discharge to Whitefish Lake.

The advective travel time to Whitefish Lake under the alternative calibration is approximately 250 years, which is similar to the predictions obtained with the base case model.

The alternative calibrated groundwater flow model, results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth through the ore zone/mining area.

## **3.0 Summary of Alternative Calibrated Model with Higher Conductivity within the Intermediate Sandstone Aquitard**

An alternative, calibrated groundwater flow model was developed with a hydraulic conductivity value representing the Intermediate Sandstone Aquitard of  $1 \times 10^{-7}$  m/s. While this hydraulic conductivity within the Intermediate Sandstone Aquitard is higher than expected given the geochemistry data and normative clay content observed in monitoring wells and mineralogical analysis of core logs, it is within the range of hydraulic conductivity values reported from packer tests completed within this unit. The alternative calibrated model was developed using PEST, wherein the hydraulic conductivity within other parameter zones were adjusted so that the alternative model was also consistent with the groundwater level and baseflow discharge field observations (i.e., calibration constrained).

The alternative model contains higher hydraulic conductivity values within the deeper portions of the groundwater flow system, including the Intermediate Sandstone Aquitard, the Lower Sandstone Aquifer and the Desilicified Zone. To compensate and maintain calibrated conditions, hydraulic conductivity values within the Upper Sandstone Aquifer and overlying sand (i.e., overburden) were reduced. The alternative model does not fit the field observations as well as the base case calibrated model presented within the EIS, however it is within the acceptable range for calibration metrics.

The resulting hydraulic conductivity distribution produces similar groundwater flow patterns, although with higher groundwater flow rates through the Lower and Intermediate Sandstone units, which are expected to produce greater dilution of COPCs along the flow paths toward Whitefish Lake. Advective groundwater transport timing to Whitefish Lake from the Ore Zone remained relatively consistent with the base case model.

In general, the alternative calibrated model does not fit the observation data as well as the simulations presented within the EIS. As such, it is considered a less-conservative modelled scenario than those already presented within the EIS. The alternative calibrated groundwater flow model results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth through the ore zone/mining area.

Analysis of transport of COPCs under this alternative calibrated scenario are presented as part of the response to IR-89.

## References

Petrotek. 2022. *Hydrologic Report, Summary of Findings, 2019-2021, Wheeler River Project*. Unpublished report prepared for Denison Mines. January 2022.

## ATTACHMENT IR-89-R1

Original IR Number	IR-89
Follow Up IR Number	IR-89-R1
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Numerical Modelling: Post- Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone  IR-89 Response from Denison
Context and Rationale (Original IR)	<p><b>Context:</b> The Proponent states that the range of hydraulic conductivities considered in sensitivity analysis was limited to values that fit within a calibration constrained uncertainty analysis of the model.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on the aquatic environment.</p> <p>The Proponent clarified the details of the calibration-constrained uncertainty analysis that was used for parameter bounding within the model, with hydraulic conductivity sensitivity bounds determined based on model calibration values that were supported by the available physical data.</p> <p><b>Rationale:</b> ECCC agrees that calibration constrained uncertainty analysis using hydraulic head field data is useful to determine probable upper limits of K values. However, there is always some degree of uncertainty in groundwater data and models. Sources of such uncertainty may include errors, lack of complete and representative field data to determine key parameters, or any number of heterogeneities associated with groundwater systems over large scales. Such uncertainties will always exist and can be accounted for by conducting a sensitivity analysis that accounts for the lack of physical data in the Desilicified Zone by running modelling scenarios using parameters that are outside of the calibration constrained values.</p>
Information Requirement (Original IR)	Expand the sensitivity analysis of hydraulic conductivity outside of calibration constrained parameters to account for the lack of physical data in the Desilicified Zone

## **Denison's Response:**

### **1.0 Introduction**

Simulations of conditions that extend beyond the range of conditions supported by the monitoring data (i.e., calibration-constrained conditions) is inappropriate for an EIS as it suggests that unrepresentative, potentially misleading scenarios should be tested, documented, and presented as potential outcomes. In the SME's view this would confuse the groundwater transport and associated risk discussions.

While we do not support development of un-calibrated scenarios for inclusion within the EIS, additional scenarios that did not violate field observation data were evaluated as part of this response. These scenarios further demonstrate the robust nature of the hydrogeologic setting, which has been shown to have a high assimilative capacity.

Additional groundwater flow and geochemical reactive transport modelling scenarios were performed in response to:

1. IR-55, wherein the hydraulic conductivity of the Intermediate Sandstone Aquitard was increased to a maximum value of  $1.0\text{E-}7$  m/s, and other parameter values, including the hydraulic conductivity of the Desilicified Zone, were increased to maintain a calibrated condition.
2. IR-70, wherein a higher hydraulic conductivity within the Ore Zone post-decommissioning was tested. This is an uncertain parameter which is unconstrained by calibration data.
3. IR-71, wherein uncertainty in future groundwater recharge rates were evaluated by varying rates by +/- 20%. Future groundwater recharge is an uncertain parameter which is unconstrained by calibration data.
4. IRs 78 & 88, wherein the effective porosity of the Paleoweathered zone was reduced by an order of magnitude to allow the initial source mass to migrate toward receptors 10-times faster. Effective porosity of the Paleoweathered zone is an uncertain parameter which is unconstrained by calibration data.
5. IR-96, wherein the transverse dispersivity was reduced to 1m to be consistent with ratios of longitudinal-to-transverse dispersivity published in the literature (e.g., Gelhar et al.; 1992) based on anisotropic settings. Transverse dispersivity is an uncertain parameter which is unconstrained by calibration data.

### **2.0 Post-Decommissioning Scenarios: Simulation Approach**

Post-decommissioning reactive transport was evaluated using the same sub-domain model as was used for all other scenarios presented within the EIS. The sub-domain model area and mesh were unchanged from previous simulations.

Where applicable (i.e., for IR-55), groundwater flow boundary condition values were updated to reflect the revised groundwater flow solution, and the hydrogeologic property values were updated to match those within the alternatively calibrated groundwater flow model. For all other simulations, only individual parameter values (e.g., hydraulic conductivity, recharge, porosity or dispersivity) were altered.

Transport boundary conditions and parameters were left unchanged from the Base Case condition. The 3D geochemical reactive transport simulation was completed using FEFLOW coupled with PiChem (i.e.,



the same approach followed for earlier simulations). The PHREEQC database, boundary and initial conditions, and simulation approach were the same as described within the EIS for the Base Case scenario. The full suite of 31 constituents was applied for selected scenarios, however as those simulations can take 3 to 4 weeks to complete, not all scenarios were able to be run with the full suite of constituents.

### **1. IR-55 Scenario: Higher Hydraulic Conductivity - Intermediate Sandstone Aquitard**

The IR-55 scenario documents an alternative calibrated groundwater flow model which was developed with a hydraulic conductivity of  $1.0\text{E-}07$  m/s within the Intermediate Sandstone Aquitard. This scenario also contained higher hydraulic conductivity values within the Desilicified Zone ( $1.4\text{E-}04$  m/s) and Lower Sandstone Aquifer ( $4.1\text{E-}05$  m/s); as such, the deeper units along the flow path between the Ore Zone and Whitefish Lake were all simulated as having increased hydraulic conductivity values. To maintain calibration, shallow materials along the flow path between the Ore Zone and Whitefish Lake were simulated to have a lower hydraulic conductivity than the Base Case (e.g., Overburden and Upper Sandstone Aquifer). For a full list of parameter values see the IR-55 groundwater flow response.

In general, the alternative calibrated model does not fit the observation data as well as the Base Case simulation presented within the EIS; however, the calibration statistics are acceptable. The alternative calibrated groundwater flow model results in higher volumes of groundwater flow converging upon Whitefish Lake, which lead to greater dilution potential for flow from depth, through the Ore Zone/mining area. As such, it is considered a less-conservative modelled scenario than those already presented within the EIS.

### **2. IR-70 Scenario: Higher Hydraulic Conductivity – Ore Zone**

The hydraulic conductivity of the material remaining post mining within the Ore Zone, and the surrounding clay-rich or sulphide cemented units (i.e., natural barriers), is uncertain. Review comments have suggested that the impact of a higher value for hydraulic conductivity within the Ore Zone needs to be evaluated. While the hydraulic conductivity of the Ore Zone is not considered critical to predictions as it is only a small portion of the source area (i.e., 6% of the assumed Post-Decommissioning source mass), an additional scenario was performed to reflect the uncertainty in the post-mining hydraulic conductivity within the Ore Zone and the surrounding barrier zones; for this scenario the Ore Zone and natural barriers were treated as one uniform zone. As this is a future condition after the uranium ore and associated minerals have been removed, this parameter cannot be calibrated with current data. It is expected that the hydraulic conductivity of the Ore Zone and barriers will be enhanced due to mining, and thus a conservatively high hydraulic conductivity value of  $5.0\text{E-}05$  m/s was assigned for this scenario. This value reflects the understanding that the voids created through mining will be infilled with the overlying desilicified sandstone (i.e., the altered sandstone within the Lower Sandstone Aquifer), and may have a higher hydraulic conductivity than currently within the Lower Sandstone Aquifer (i.e.,  $5.0\text{E-}06$  m/s).

### **3. a), b) IR-71 Scenario: Lower / Higher Groundwater Recharge**

Recognizing that future climate conditions are uncertain, and that the predicted timespan of migration of chemical constituents from within the mining area to Whitefish Lake requires centuries to millennia, the future climate is uncertain. A reduction in groundwater recharge is considered most likely due to enhanced evapotranspiration and surface water runoff; such a reduction would reduce groundwater flow rates which is considered to be less conservative than scenarios presented within the EIS. While current groundwater recharge can be calibrated based on field observations (e.g., stream baseflow, water level fluctuations, etc.), groundwater recharge in future centuries cannot be calibrated.

Review of future climate predictions presented by Environment Canada (climatedata.ca – Key Lake) indicates precipitation will increase by 11 to 15%, and temperature will increase by 2.5 to 4.6°C. The future change in groundwater recharge is not specified but based on the range of variability that others (e.g., Erler et. al., 2019) have found for the foreseeable future (i.e., end of century), a range of +/- 20% was selected for future recharge simulations.

### **4. IR-78 & 88 Scenario: Lower Effective Porosity within the Paleoweathered Zone**

Effective porosity within the units where constituents of potential concern (COPCs) will remain post-mining will affect the persistence of COPCs within the source area, and the residence time within deeper units. Simulations within the EIS illustrate that the most persistent portion of the source area is within the Paleoweathered bedrock, and so the uncertainty of the effective porosity within this unit is considered to be most relevant. As noted in Appendix 7-C of the revised Draft EIS (Table 4-2), the effective porosity within the Paleoweathered zone was enhanced to account for potential matrix diffusion effects. The scenario herein presents the change in predicted conditions if the effective porosity of the Paleoweathered zone is reduced by an order of magnitude, as would be consistent with lesser matrix diffusion effects. This value is not constrained by model calibration.

### **5. IR-96 Scenario: Lower Transverse Dispersivity**

Dispersivity values incorporated within geochemical reactive transport calculations impact the degree of mass spreading as hydrogeologic heterogeneities are experienced. A wealth of literature is available to document that longer plumes experience greater dispersion as they flow through larger volumes of heterogeneous subsurface materials. While reviewers agree with the magnitude of dispersivity values applied within the EIS scenarios, the ratio of dispersivity along the flow paths (i.e., longitudinal) to perpendicular from the flow paths (i.e., transverse) was questioned. In settings with high degrees of anisotropy created by depositional variations (e.g., horizontally stratified sediments such as fluvial sands with silt interbeds), the ratio between longitudinal and transverse dispersivity has been shown to be 100:1 (Gelhar et al.; 1992), particularly for the transverse dispersion component across lower conductivity features such as silt interbeds within sand aquifers (i.e., vertical transverse dispersion in a horizontally dominated flow field). For the Denison Mines setting, where the hydrogeologic material of interest is within hydrothermally altered (i.e., desilicified) sandstone, transverse dispersion is expected to be relatively high and isotropic to be consistent with the isotropic hydraulic conductivity of desilicified sediments. Further, as flow is not horizontally dominated (e.g., vertically upward flow through the Desilicified Zone) differentiating transverse components of dispersivity is not appropriate for this setting.

Since this parameter cannot practically be field verified, nor is it constrained through groundwater flow model calibration, an additional scenario with a lower transverse dispersion rate, such that a 10:1 ratio of longitudinal to transverse dispersion was evaluated.

### **3.0 Reactive Transport Predictions at Whitefish Lake**

Table IR-89-R1-1 presents the transport results simulated for the above scenarios; the Base Case conditions are also provided for comparison. In general, the peak concentrations reaching Whitefish Lake were similar to the Base Case simulation and are within the range of simulation results presented within the EIS. As such these simulation results do not further expand the range of potential outcomes already presented. Further, the simulations indicate that groundwater quality screening criteria (GQSC) are only exceeded for dissolved manganese and iron, as was presented within the EIS.

#### **1. IR-55 Scenario: Higher Hydraulic Conductivity - Intermediate Sandstone Aquitard**

For the IR-55 scenario, which had a hydraulic conductivity of 1.0E-07 m/s within the Intermediate Sandstone Aquitard, concentrations were simulated to be lower (i.e., less conservative) than the Base Case scenario. This is expected to be due to enhanced mixing with fresh water as a result of higher volumes of groundwater flow through those zones with higher hydraulic conductivity values. Under the IR-55 alternative calibrated case, the hydraulic gradient remained relatively unchanged to be consistent with the observed water levels, and thus the groundwater flow rates converging on Whitefish Lake were increased (see simulated baseflow: IR-55), resulting in a decreased contribution of flow from the deep aquifers relative to the total volumetric groundwater flow into Whitefish lake. This results in an overall reduction in the peak concentrations of COPCs in groundwater beneath Whitefish Lake.

#### **2. IR-70 Scenario: Higher Hydraulic Conductivity – Ore Zone**

Simulating a higher hydraulic conductivity for the Ore Zone post mining produced similar peak concentrations reaching Whitefish Lake as the Base Case scenario. As an increase of the hydraulic conductivity by more than one order of magnitude did not make an appreciable difference in the simulated peak concentrations reaching Whitefish Lake, we re-affirm that the hydraulic conductivity of the Ore Zone is not a controlling parameter for mass discharge reaching Whitefish Lake. This is consistent with the mass within the Ore Zone being a relatively small percentage (e.g., 6% uranium by mass) of the total dissolved-phase mass in the mining area Post-Decommissioning, as conceptualized in the model.

#### **3. a), b) IR-71 Scenario: Lower / Higher Groundwater Recharge**

The scenarios where future groundwater recharge was varied by +/- 20% due to future climate change did not appreciably change peak concentrations reaching Whitefish Lake. The findings of these simulations also support the IR-71 response wherein climate change was not simulated because it was expected to produce lower peak COPC concentrations at Whitefish Lake than the Base Case. The simulation with lower groundwater recharge is interpreted to produce a lower hydraulic gradient, and thus a lower rate of groundwater flow from the mining area, than the Base Case. Conversely the higher groundwater recharge case provides more a greater volume of water moving through the sub-surface, resulting in a smaller relative contribution from the mining area. Both cases result in similar, but lower peak concentrations reaching Whitefish Lake.

#### 4. **IR-78 & 88 Scenario: Lower Effective Porosity within the Paleoweathered Zone**

Reduction of the effective porosity within the Paleoweathered bedrock was shown to have the largest impact on simulated peak COPC concentrations reaching Whitefish Lake. Slightly higher peak concentrations than the Base Case were simulated for a suite of COPCs (i.e., As, Cd, Co, P, Ra, Se, Sr, U, Zn). This simulation reflects a reduced ability for matrix diffusion to contain mass within the Paleoweathered zone and slowly release it over time. With the exception of dissolved iron (Fe) and manganese (Mn) concentrations, none of the other (relatively) elevated COPC concentrations reached levels above GQSC within the simulated timeframe. Based on simulated trends, showing decreasing concentrations at depth, additional COPC concentrations are not expected to exceed GQSC even further into the future.

#### 5. **IR-96 Scenario: Lower Transverse Dispersivity**

Reduction of the transverse dispersivity to maintain a ratio of 10:1 for the longitudinal to transverse dispersivity values resulted in higher COPC concentrations reaching Whitefish Lake than for the Base Case. For this scenario, the longitudinal dispersivity remained at the Base Case level (i.e., 10 m), while the transverse dispersivity value was reduced to 1m (5m in the Base Case). As in the other simulated cases, with the exception of dissolved iron (Fe) and manganese (Mn) concentrations, none of the other COPC concentrations reached levels above GQSC within the simulated timeframe.

**Table IR-89-R1-1: Peak Groundwater Concentrations Reaching Whitefish Lake: Alternative Scenarios Consistent with Observed Conditions (all concentrations in mg/L)**

COPC	Groundwater Quality Screening Criteria	EIS Base Case	1. IR-55 Alternative Calibration (K <sub>ISA</sub> = 1.0E-7 m/s; K <sub>DSZ</sub> = 4.0E-5 m/s)	2. IR-70 High Ore Zone Hydraulic Conductivity Post Decommissioning (K <sub>OZ</sub> = 5.0E-5 m/s)	3a. IR-71 20% Lower Groundwater Recharge	3b. IR-71 20% Higher Groundwater Recharge	4. IR 78 & 88 Lower Effective Porosity Paleoweathered Zone (1%)	5. IR-96 Lower Transverse Dispersivity (α <sub>TV</sub> = α <sub>TH</sub> = 1.0m)	Comment
Al	0.05	3.0E-02	3.0E-02	3.0E-02	4.1E-02	3.9E-02	3.7E-02	4.3E-02	Naturally near GQSC, Peak @ 750 yrs.
As	0.005	3.2E-04	3.1E-04	3.2E-04	3.2E-04	3.2E-04	3.4E-04	3.3E-04	Naturally near GQSC, Peak @ 2000-3000 yrs.
Ba	--	3.9E-02	3.5E-02	3.9E-02			3.9E-02		Background
Ca	--	7.0	4.5	7.8	7.2	6.9	6.6	12	Peak @ 400 yrs.
Cd	4.0x10 <sup>-5</sup>	1.1E-05	1.0E-05	1.1E-05	1.1E-05	1.1E-05	1.2E-05	1.1E-05	Peak @ 500-3000 yrs.
Cl	120	9.9	7.1	10.9	10.1	9.8	9.5	14.6	Peak @ 400 yrs.
Co	7.8x10 <sup>-4</sup>	4.2E-04	4.2E-04	4.3E-04	4.2E-04	4.2E-04	4.5E-04	4.5E-04	Late time peak
Cr	8.9x10 <sup>-3</sup>	5.3E-04	5.2E-04	5.3E-04			5.3E-04		Peak @ 500 yrs.
Cu	2.0x10 <sup>-3</sup>	7.0E-04	7.0E-04	6.9E-04			7.8E-04		Late time peak
F	--	6.1E-02	6.0E-02	6.1E-02			6.2E-02		Late time peak
Fe	0.3	<b>1.9</b>	<b>0.66</b>	<b>2.4</b>	<b>2.0</b>	<b>1.9</b>	<b>2.0</b>	<b>4.4</b>	Peak @ 400 yrs.
K	--	3.1	3.2	3.1	3.1	3.0	2.9	3.4	Background
Mg	--	2.8	2.8	2.8	2.8	2.7	2.7	3.9	Background
Mn	0.23	<b>0.28</b>	<b>0.22</b>	<b>0.28</b>			<b>0.28</b>		Peak @ 400 yrs.
Mo	31	3.1E-03	7.3E-04	9.2E-04			8.6E-04		Peak @ 400 yrs.
Na	--	5.1	4.5	5.4	5.2	5.0	6.4	7.6	Peak @ 400 yrs.
Ni	2.5x10 <sup>-2</sup>	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	1.9E-03	2.0E-03	Background
P	--	7.4E-02	5.8E-02	7.4E-02	1.2E-04	1.2E-04	9.4E-02	1.3E-04	Peak @ 500 yrs.
Pb	1.0x10 <sup>-3</sup>	1.2E-04	1.2E-04	1.2E-04			1.2E-04		Background
Ra	3.0x10 <sup>-9</sup>	2.3E-09	1.8E-09	2.1E-09			2.6E-09		Peak @ 400 years and at late time
SO <sub>4</sub>	128	13	3.5	16	13	12	13	30	Peak @ 400 yrs.
Se	2.0x10 <sup>-3</sup>	8.4E-04	8.2E-04	8.4E-04	8.4E-04	8.3E-04	8.4E-04	8.7E-04	Peak @ 400-800 yrs.
Sr	2.5	1.2E-01	7.7E-02	1.4E-01			1.2E-01		Peak @ 400 yrs.
Th	1.24x10 <sup>-4</sup>	3.2E-08	3.0E-08	3.1E-08			3.7E-08		Background
U	0.015	5.4E-04	5.3E-04	5.4E-04	5.5E-04	5.5E-04	1.3E-03	6.0E-04	Late time peak
V	0.12	6.6E-03	1.0E-04	1.3E-04			1.3E-04		Peak @ 400 yrs.
Zn	0.011	4.7E-03	4.6E-03	4.8E-03			5.1E-03		Late time peak
Simulated Time (years)		8720	7600	6400	5600	10000	10000	10000	

## Summary of Additional Simulation Results

Additional long-term predictive simulations of COPC transport were undertaken to evaluate the areas of uncertainty highlighted within the second round IRs. Scenarios tested were limited to those that were consistent with, or did not contradict, available observations. The areas of uncertainty included:

- 1) Hydraulic conductivity of the Intermediate Sandstone Aquitard ( $1.0\text{E-}07$  m/s), Desilicified Zone ( $1.4\text{E-}04$  m/s), and Lower Sandstone Aquifer ( $4.1\text{E-}05$  m/s). The alternative calibrated scenario presented contained higher hydraulic conductivities than the Base Case model for each of these hydrogeologic units with increases of 10, 28, and 4, respectively.
- 2) Hydraulic conductivity of the Ore Zone post-decommissioning was increased to  $5.0\text{E-}05$  m/s, which is a factor of 10 higher than the overlying Lower Sandstone Aquifer. It is considered to reflect a very high value that could result due to the dissolution mining process.
- 3) Groundwater recharge was varied by  $\pm 20\%$  to evaluate potential future climate change impacts on groundwater flow and subsequent COPC transport.
- 4) The effective porosity of the Paleoweathered zone was lowered by a factor of 10 to evaluate a case where the mass was less persistent within this unit, which is the deepest portion of the source zone.
- 5) The transverse dispersivity value was lowered by a factor of 5 to achieve the requested 10:1 ratio between longitudinal and transverse dispersivity values.

All additional scenarios produced similar predicted peak COPC concentrations reaching Whitefish Lake. All scenarios produced concentrations of primary COPCs at Whitefish Lake that are below the groundwater quality screening criteria established, with the exception of iron and manganese due to naturally high background levels, as reported within the EIS.

The key understanding gained, or further supported, through these simulations is that the natural groundwater system has a high assimilative capacity such that reasonable changes to parameters do not produce concentrations of COPCs at Whitefish Lake that exceed the groundwater quality screening criteria (with the exceptions of dissolved manganese and iron, which naturally occur at elevated concentrations). As the peak concentrations reaching Whitefish Lake do not exceed groundwater quality screening criteria within these additional scenarios, no additional or enhanced risk to the natural environment is expected.

## References

- Erler, A. R., Frey, S. K., Khader, O., d'Orgeville, M., Park, Y.J., Hwang, H. T., et al. (2019). Evaluating climate change impacts on soil moisture and groundwater resources within a Lake affected region. *Water Resources Research*, 55, 8142–8163. <https://doi.org/10.1029/2018WR023822>
- Gelhar, L.W., Welty, C., & Rehfeldt, K.R. (1992). A critical review of data on field-scale dispersion in aquifers. *Water Resources Research* 28, no. 7, 1955-1974.



**Attachment IR-102**

Number	IR-102
Comment From	ECCC
Category	Fish and Fish Habitat
Page # in EIS	
Section # in EIS	8.1.3.1 Appendix 8-C, including Appendix II, Table 1 (p. 2)
Comment	<p>In response to IR-102 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>1. Given the limitation of data availability extension of flow records based on the nearest active WSC hydrometric station (Wheeler River (06DA005)) is acceptable although other methods are not shown to be explored by the proponent including rainfall-runoff modelling techniques (such model can be calibrated at 06DA005 thus computed flow at subbasins or sub watershed can be estimated with good degree of confidence), drainage area ratio method, etc. CNSC staff recommends proponent to consider aforementioned methods or similar or provide justification why other methods were not considered.</p> <p>2. In Attachment IR-102 Figure 1 to 7 show the plots of measured versus the estimated daily flows using the relationship developed for extension of daily flows at SA-1, SA-2, SA-3, SA- 4, SA-5, SA-6, SB-3, LA-1 and LA-5. CNSC staff however finds it difficult to determine the predictive accuracy of the relationships based on visual comparisons. Therefore, CNSC staff requests that the proponent provide quantitative measures of prediction accuracy, for example in the form of Root Mean Square Error, correlation coefficient, etc., for the Equations presented in Table 1 of Attachment IR-102.</p> <p>In addition, CNSC staff requests that the proponent provide clarification on whether the current relationships are only limited to baseline characterization or will also be considered for estimation of design flows at SA-4 and SA-5 for culvert/crossing design for the access road.</p> <p>3. Response to third part of the IR to be re-assessed when proponent addresses the above two comments ([1] and [2]).</p>

**Denison Response:**

1. Though other methods exist for extension of flow rates from 06DA005 to the RSA, the Proponent believes it sufficient to rely on the transfer method used in the water quantity (hydrology) component of the EIS. The transfer method is an advanced form of unit area transfer which incorporates additional algorithms to adjust to streamflow response. In some cases, unit area runoff without additional algorithms was used to transfer the record specifically for SA-5, SB-3, LA-1 and LA-5. The transfer method was used for all other nodes in an effort to be most accurate with respect to representing localized flows when using the 06DA005 station as the foundational dataset for extrapolation.

The transfer method employed in the technical assessment (Appendix 8-C) and summarized in the EIS relies on measured data from the LSA and is compared to other measured data within the same watershed. A rainfall-runoff model would rely upon transfer of climate data to site from the closest meteorological station (Key Lake Mine) or interpolated grid data neither of which can be confirmed to accurately reflect site conditions. The transfer method used is the most site specific possible and therefore in our view provides the best level of accuracy and use of empirical data for this time period.

2. To further confirm the viability of the chosen extension method, the Root Mean Square Error (RMSE) between the transfer method and the unit area runoff method was estimated for comparison. Baseline data reported by Ecometrix Incorporated (2019) present hydrometric monitoring data at several of the stations at the Project. These data represent the observed data set against which the synthesized data are checked. The baseline data in some cases are hydrographs from installed sensors and in other cases are point measurements of discharge. The observed and synthesized hydrographs were checked between coincident dates of available data. Two synthesized hydrographs are compared for RMSE, the first hydrographs are those developed using the transfer discussed in the EIS, technical support memo (Appendix 8-C) and previous response to this IR. The second hydrograph is developed using unit area runoff relationships.

As mentioned above, four stations were developed using the unit area runoff method, therefore nullifying the utility of a method comparison for these locations. The remaining five stations include SA-1, SA-2, SA-3, SA-4 and SA-6. RMSE is a comparison of the differences between observed and synthesized data. The squared error is estimated between coincident data points and the RMSE for a dataset is the sum of that error. A perfectly matching data set would have an RMSE of 0 and a negative RMSE is not possible. The following table presents the estimated RMSE values for the two synthesized hydrographs at the relevant stations. For all stations, the reported transfer equation yields a better RMSE than unit area runoff.

**Table 1: Hydrology Station Correlation Coefficients for RMSE Methods as Compared to Historical Data**

Station	Reported Transfer Equation RMSE	Unit Area Runoff RMSE
SA-1	0.252	0.426
SA-2	0.317	0.381
SA-3	0.080	0.345
SA-4	0.090	0.118
SA-6	0.362	0.453

As a result, it is confirmed that the use of the reported transfer equation method is fit for use as part of the hydrology assessment and for the purposes of:

- a) Baseline water quantity characterization
- b) Estimates of change in water quantity as a result of the Operation; and,
- c) Assessment of potential impacts to the environment as part of the EIS including for water quantity and all other components of Section 8 that may be influenced by changes in water quantity.

Therefore, no additional changes to the EIS with regard to this IR are required.

## Attachment IR-103

Number	IR-103
Comment From	ECCC CNSC
Category	Fish and Fish Habitat
Page # in EIS	
Section # in EIS	Section 8.1.3.4 Climate Change Influenced Extreme Events
Comment	<p>This response has not been accepted.</p> <p>In the Context and Rationale of AD-15 in the Annex 1 – Denison Response, ECCC recommends that the Proponent consult CSA PLUS 4013:19 (2019) <i>Technical guide: Development, interpretation and use of rainfall intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners</i> regarding the consideration of future changes in short-duration precipitation extremes. In IR-103, ECCC indicated that in order to assess the accuracy of the Intensity duration frequency (IDF) curves, ECCC required that the Proponent provide the gauged stations generating the values for the modelled data. The Proponent provided the closest gauged stations; however, the future short duration precipitation values were based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes.</p> <p>Additionally, on page 15-19 of the draft EIS states that: “Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” Denison did not provide details on how climate factors will be considered within their adaptive management plans.</p> <p><b>Rationale:</b> Estimates of future short duration precipitation that are based on statistical relationships fitted between local scale observed extreme precipitation and modelled simulations extremes, such as the approach used by the Proponent, are unlikely to provide reliable projections. This is because the amount of information regarding changes in local-scale observed extreme precipitation contained in short records is not sufficient to constrain a regression (model the statistical relationship) between local and larger scale simulations (Li et al., 2019; ECCC 2022). An alternative approach is to base future projections on a comprehensive assessment that integrates climate science understanding and model projections over a large region. The recent Canadian Standards Association (CSA 2019) guidance on IDF for Canadian Water Resources practitioners provides such an assessment.</p> <p>In terms of adaptive management, the Proponent should clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p> <p>In order to assess the Proponent’s adaptive management strategies for future extreme precipitation events, ECCC requests that the Proponent consult the CSA (2019) guidance when using future IDF projections in the Project design and provide revised estimates of the potential future changes in short-duration precipitation extremes over the Project’s duration.</p> <p>1. Provide revised estimates of the potential future changes in short-duration precipitation</p>

	<p>extremes over the Project's duration as relevant to the Project design.</p> <p>2. Demonstrate how the CSA (2019) guidance will be incorporated in the Project design when developing and considering future IDF projections and estimates of the potential future changes in short-duration precipitation extremes.</p> <p><b>References</b></p> <p>CSA Group. (2019). Technical guide: Development, interpretation and use of rainfall intensity- duration-frequency (IDF) information: Guideline for Canadian water resources practitioners. <i>CSA PLUS 4013 :19</i>. <a href="https://www.csagroup.org/store/product/2703080/">https://www.csagroup.org/store/product/2703080/</a></p> <p>ECCC (2022). Draft Technical guide related to the Strategic Assessment of Climate Change: Assessing climate change resilience. <a href="https://www.strategicasessmentclimatechange.ca/28896/widgets/117114/documents/77106">https://www.strategicasessmentclimatechange.ca/28896/widgets/117114/documents/77106</a></p> <p>Li, C., Zwiers, F., Zhang, X., &amp; Li, G. (2019). How much information is required to well constrain local estimates of future precipitation extremes? <i>Earth's Future</i>, 11-24.</p>
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### **Denison Response:**

A review of the CSA Group (2019) document was undertaken and an estimate of the IDF using this guidance was undertaken. The result of this estimate for the Key Lake Mine Station 4063753 using data corresponding to the period 2014 to 2023 was 69.6 mm for the 1:100-year 24 hours storm event. This estimate is greater than the estimate provided by ECCC of 67.2 mm at Key Lake Mine for the period 2011 to 2021 by approximately 4% ([https://climate.weather.gc.ca/prodservs/engineering\\_e.html](https://climate.weather.gc.ca/prodservs/engineering_e.html); [https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer\\_Climate/IDF/](https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer_Climate/IDF/)). The calculated estimate is greater than the ECCC estimate likely owing to large rain events occurring in northern Saskatchewan in 2022.

The IDF\_CC tool Version 5.0 (<https://www.idf-cc-uwo.ca/>) was used to estimate design events at the Project. The previous results reported based on generalized extreme value (GEV) distribution (79.9 mm in current scenario and 88.6 mm in a future scenario). IDF\_CC tool Version 7.0 is the new version of the website and now, using GEV, estimates a 79.9 mm current scenario and 94.7 mm future scenario (RCP8.5 for time period 2015-2100). Within IDF\_CC tool Version 7.0, the Gumbel distribution yields 80.9 mm in current scenario and 95.8 mm for future scenario (RCP8.5 and 2015-2100). These data, as well as similar estimates for the Project and Key Lake Mine are summarized in the following table where all estimates reflect a 1:100-year 24 hour precipitation event and all future scenarios assume RCP8.5 for 2015-2100. The Key Lake Mine is approximately 35 km south-southeast of the Project area for reference.

Scenario Description	Statistical Method	Estimated Period	Location	Data Source	Data period (as indicated)	Estimate (mm)
<b>Environment Canada published IDF curves</b>	Gumbel	Current	Key Lake Mine Site	Key Lake climate station (Station 4063753)	2011-2021	67.2
<b>EIS Document</b>	IDF_CC Tool 5.0 – GEV	Current	Project	Interpolated grid data	Not reported	79.9
<b>EIS Document</b>	IDF_CC Tool 5.0 – GEV	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	88.6
<b>Manual Calculation</b>	Gumbel	2014-2023	Key Lake Mine Site	Key Lake climate station (Station 4063753)	2014-2023	69.6
<b>IDF_CC Tool 7.0</b>	GEV	Current	Key Lake Mine	Key Lake climate station (Station 4063753)	2011-2021	56.4
<b>IDF_CC Tool 7.0</b>	GEV	Predicted Future	Key Lake Mine	Key Lake climate station (Station 4063753)	RCP8.5 2015-2100	68.1
<b>IDF_CC Tool 7.0</b>	Gumbel	Current	Key Lake Mine	Key Lake climate station (Station 4063753)	2011-2021	67.2
<b>IDF_CC Tool 7.0</b>	Gumbel	Predicted Future	Key Lake Mine	Key Lake climate station (Station 4063753)	RCP8.5 2015-2100	73.9
<b>IDF_CC Tool 7.0</b>	GEV	Current	Project	Interpolated grid data	2011-2021	79.9
<b>IDF_CC Tool 7.0</b>	GEV	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	94.7
<b>IDF_CC Tool 7.0</b>	Gumbel	Current	Project	Interpolated grid data	2011-2021	80.9
<b>IDF_CC Tool 7.0</b>	Gumbel	Predicted Future	Project	Interpolated grid data	RCP8.5 2015-2100	95.8

As seen in the table, a range of 1:100-year 24 hour rainfall events can be estimated using different methods, data sources and timeframes. The predicted future estimate originally presented using IDF\_CC Tool 5.0 (Scenario 3) is lower only than those future estimates via Gumbel and GEV estimated for the same timeframe using IDF\_CC Tool 7.0. The IDF\_CC tools follows the same methodology as that used by ECCC and recommended by the above-referenced CSA document. The IDF\_CC tool also makes use of a gridded climate data set and, though Key Lake Mine is only 35 km from the Project, the projected change in rainfall values is substantial. As such, the use of the IDF\_CC tool is conservative. Further to that point, site facilities are designed in consideration of the Probable Maximum Precipitation event of 493 mm. That event is more than 5 times higher the largest predicted scenario by any of the above presented methodologies.

Despite Denison's reiteration that the PMP is adequate for the EA level design basis, Denison is committed to revisiting the estimates of the IDF as per CNSC's recommendations, as applicable, for the licensing phase of the Project.



**Attachment IR-107**

Number	IR-107
Comment From	ECCC
Category	Aquatic Environment
Page # in EIS	
Section # in EIS	Section 8.2.3.3, Existing Surface Water Quality
Comment	<p>In response to IR-107 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions.</p> <p>CNSC and ECCC staff have the following expectations:</p> <ol style="list-style-type: none"><li>1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices.</li><li>2. Confirm which federal requirements were used when assessing potential impacts through EA.</li><li>3. Confirm which data quality objectives were used to establish the baseline, provide references if available</li><li>4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.</li></ol>

**Denison's Response:**

The water quality sampling for baseline was conducted over several years from 2011 to 2019. In years 2015 and 2017 sampling did not occur. Sampling occurred during the open water period and most consistently in May, June, August, September and October. The reviewer is correct in that sampling did not occur on a monthly basis at each of the sampling locations over all years. The table below provides a summary of the periodicity of sampling as it occurred over the described period at each station.

**Table 1: Water Quality Sampling by Year and Location**

Station ID	2011		2012			2013		2014		2016	2018		2019		Total
	May	Jun	May	Aug	Oct	Aug	Oct	Mar	Apr	Sep	Mar	Jul	Jul	Aug	
Lakes															
LA-1		1		1				1		1	1	1			6
LA-2		1						1		1					3
LA-3		1						1		1					3
LA-4								1		1					2
LA-5				1					1	1					3
LA-6				1				1		1	1	1			5
LA-7				1				1		3					5
LA-8										1					1
LA-9										1					1
LAB-1				1				1		1					3
LAB-2										1					1
LB-1										1					1
LB-2									1	1					2
LB-3				1					1	2					4
LA-1											1	1			2
Sub-Total	0	3	0	6	0	0	0	7	3	17	3	3	0	0	42
Streams															
SA-1	1	1	1	1	1	1	1	1					1	1	10
SA-2	1	1	1	1	1	1	1	1					1	1	10
SA-3	1	1	1	1	1	1	1	1					1	1	10
SA-4	1	1	1	1	1	1	1	1					1	1	10
SA-5	1	1	1	1	1	1	1	1					1	1	10
SA-6	1		1	1	1	1	1		1				1	1	9
SB-1	1	1	1	1	1	1	1	1							8
SB-2	1	1	1	1	1	1	1								7
SB-3	1	1	1	1	1	1	1	1							8
SB-4	1	1	1	1	1	1	1								7
SB-5	1		1	1	1	1	1	1							7
Sub-Total	11	9	11	11	11	11	11	8	1	0	0	0	6	6	96
Total	11	12	11	17	11	11	11	15	4	17	3	3	6	6	138

- 1.) The table above identifies that monthly sampling was not completed at each station on an annual basis.
- 2.) For the purposes of the EA, a statistical analysis was conducted to identify the correlation between the water quality data for LA-1, LA-5, LA-6, and McGowen Lake and the full dataset for the LSA. Datasets were highly correlated and therefore the full dataset for the LSA was used as background concentrations in the IMPACT model. This approach was taken to meet the criteria of REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental

Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”.

- 3.) Samples were collected following applicable field protocols and analysis was conducted by CALA accredited laboratories. The conceptualization of sampling in this remote location loosely followed the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). However, due to the remote nature during the baseline sampling, monthly sampling was not deemed feasible.
- 4.) There are no additional data to add to the analysis at this time for either the near-field or far-field water quality models. It is noted that some additional sampling occurred at Whitefish Lake offshore in the general, vicinity of the proposed discharge (diffuser) location in 2022 and continued in 2023. The concentration of constituents from samples collected in 2022 and 2023 were in the range of those measured previously and as a result no changes to the outcomes of the analyses presented in the Draft EIS and its supporting documents would be expected. Denison agrees that regular water quality data collection at a wider range of sampling stations should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). These data would be used to support the licensing process and contribute to the longer term data records for the site.

**Attachment IR-108 / IR108-R1**

Number	IR-108 / IR-108-R1
Comment From	ECCC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.3.3 Aquatic Environment
Comment	<p>In response to IR-107 issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>There are incorrect guidelines remaining in the updated tables, and the supporting information on parameter values used to derive benchmarks has not been provided. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect threshold could allow for effluent to be discharged at concentrations exceeding MDMER limits.</p> <p>See also follow-up IR-108-R1.</p> <ol style="list-style-type: none"><li>1.) Update Tables 8.2-2 and 8.2-3 to include footnotes with the concentrations of environmental modifying parameters such as pH, hardness and DOC used to derive guidelines for Aluminum, Cadmium, Copper, Lead, Manganese, Nickel and Zinc.</li><li>2.) Update Tables 8.2-2 and 8.2-3 to include the correct benchmark guideline value for Aluminum, Molybdenum and Nitrate. Include the concentrations of environmental modifying parameters needed for deriving guidelines. If the most stringent guideline value is not selected for use, provide a rationale for use of the chosen guideline.</li><li>3.) Update Tables 8.2-2 and 8.2-3 to include the calculated guideline value for manganese and the environmental modifying parameter concentrations used to calculate the guideline. A benchmark environmental quality guideline has not been provided for Manganese, however a chronic CWQG guideline exists that can be derived based on environmental modifying parameter concentrations.</li></ol> <p>Update Tables 8.2-2 and 8.2-3 to specify if Total Chromium or Hexavalent Chromium was measured.</p>

**Response:**

Tables 8.2-2 and 8.2-3 have been updated as requested and are provided below and updated in the EIS in their respective sections.

Table 8.2-2: Baseline Surface Water Quality in Local Study Area Lakes and Russell Lake

Parameter	Units	Short-term Benchmark			Long-term Benchmark			McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Notes	Value	Reference	Notes	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Alkalinity	mg/L							2	10	6	3	13	7.7	3	38	15
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.001	0.0051	0.0034	0.0048	0.0078	0.0061	0.005	0.073	0.0201
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.09	0.0266	<0.01	0.07	0.043	<0.01	0.05	0.026
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.008	0.072	0.0229	0.013	0.105	0.0543	0.005	0.036	0.0164
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.000233	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L							0.0023	0.0038	0.003	0.0021	0.0032	0.0027	0.0024	0.0051	0.00328
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	12	7.8	4	16	9.3	4	46	13.4
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<0.00001	0.00003	0.000015	<0.00001	0.00002	0.000013	<0.00001	0.00004	0.000016
Calcium	mg/L							1.1	1.7	1.35	1.2	1.6	1.4	1.1	1.5	1.24
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.5	0.43	0.3	0.4	0.33	0.3	0.4	0.32
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.00024
DOC	mg/L							2	2.6	2.23	2	2.5	2.2	2	2.5	2.22
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							<0.01	0.08	0.03166	0.02	0.07	0.037	0.02	0.08	0.042
Hardness	mg/L							5	6	5.5	5	6	5.3	5	5	5
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.037	0.27	0.12	0.04	0.19	0.11	0.031	0.21	0.1064
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	0.0004	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.00032
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.3	0.5	0.42	0.4	0.4	0.4	0.2	0.4	0.36
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0039	0.029	0.016	0.0046	0.02	0.0142	0.0024	0.019	0.01232





Parameter	Units	Short-term Benchmark			Long-term Benchmark			McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Notes	Value	Reference	Notes	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.001	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	0.02	0.00474

Table 8.2-2 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L							2	14	7.7	8	8	8	7	12	9.5
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0023	0.0025	0.0024	0.0029	0.0029	0.0029	0.0067	0.0096	0.0082
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.05	0.0233	<0.01	<0.01	<0.01	<0.01	0.04	0.025
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.016	0.055	0.0303	0.033	0.033	0.033	0.011	0.028	0.0195
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium	mg/L							0.0033	0.0039	0.0036	0.0034	0.0034	0.0034	0.0033	0.0046	0.004
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	17	9	10	10	10	8	15	12
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L							2.7	3.9	3.5	3.5	3.5	3.5	1.3	1.8	1.6
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	<0.1	0.5	0.3333333	0.4	0.4	0.4	0.2	0.2	0.2
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2.1	2.5	2.3	2.2	2.2	2.2	2.6	3.5	3.1
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02
Fluoride	mg/L							0.02	0.07	0.04	0.03	0.03	0.03	<0.01	0.07	0.04
Hardness	mg/L							9	13	11	12	12	12	5	6	5.5

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.056	0.08	0.070667	0.039	0.039	0.039	0.15	0.15	0.15
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.5	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.029	0.064	0.045	0.019	0.019	0.019	0.0094	0.037	0.0232
Mercury	mg/L				0.000026	CCME		1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-07	1.00E-07	1.00E-06	1.00E-05	5.50E-06
Molybdenum	mg/L				0.07	WHO	(16)	0.0003	0.0013	0.00077	0.0011	0.0011	0.0011	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	0.0001	0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.00015
Nitrate	mg/L	550	CCME		3.0	SEQG		0.05	0.44	0.25	0.05	0.05	0.05	<0.04	0.66	0.35
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	6.70	7.00	6.90	7.20	7.20	7.20	6.70	6.80	6.80
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	mg/L							0.3	0.6	0.5	0.8	0.8	0.8	0.2	0.4	0.3
Radium-226	Bq/L				0.11	SEQG		<0.005	0.006	0.0053333	0.007	0.007	0.007	<0.005	0.008	0.0065
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.7	2	1.8	1.7	1.7	1.7	1.4	1.6	1.5
Conductivity	µS/cm							30	47	38	42	42	42	20	22	21
Strontium	mg/L				205	FEQG	(11)	0.017	0.018	0.017	0.016	0.016	0.016	0.013	0.016	0.0145
Sulphate	mg/L				128	BC MOE	(12)	3.7	8.1	6.5	8.3	8.3	8.3	0.5	0.8	0.65
Sum of Ions								18	28	23	25	25	25	12	21	16.5
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	0.001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.00045

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L							30	35	32	35	35	35	19	30	24.5
TKN	mg/L							0.14	0.22	0.17	0.29	0.29	0.29	0.13	0.35	0.24
TOC	mg/L							2.2	2.6	2.4	2.2	2.2	2.2	2.7	3.6	3.2
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		1	1	<1	4	4	4	<1	<1	<1
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.00115

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmf.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.
- (12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)
- (13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.
- (14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)
- (15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .
- (16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) \times 1000$  (SEQG via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>)

(251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Table 8.2-3: Baseline Surface Water Quality in Local Study Area Watercourses

Parameter	Units	Short-term Benchmark			Long-term Benchmark			Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L							2	13	5.5	2	11	6.75	1	23
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0022	0.0056	0.0037	0.0039	0.081	0.015	0.0013	0.006
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.04	0.014	<0.01	0.04	0.01375	<0.01	0.04
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.005	0.036	0.0143	0.006	0.024	0.013	0.004	0.036
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001
Barium	mg/L							0.0022	0.0035	0.00267	0.0019	0.0041	0.0026625	0.0025	0.004
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	16	6.7	2	13	8.125	1	28
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<1.0E-05	0.00002	0.000012	<1.0E-05	0.00002	0.0000125	1.00E-05	0.00002
Calcium	mg/L							1.3	1.7	1.4	1.2	1.7	1.3375	1.5	1.9
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.6	0.45	0.2	0.4	0.3125	0.5	0.7
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.000275	<0.0002	<0.0002
DOC	mg/L							1.7	2.4	2.13	1.9	2.5	2.225	1.7	2.6
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.026	0.01	0.03	0.01625	<0.01	0.07
Hardness	mg/L							5	6	5.3	4	6	4.75	5	7
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.031	0.31	0.1215	0.041	0.11	0.073875	0.036	0.13
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.000125	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	0.05	0.02375	<0.02	0.03
Magnesium	mg/L							0.3	0.7	0.43	0.3	0.6	0.375	0.4	0.5
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0041	0.025	0.01467	0.0044	0.017	0.010325	0.0066	0.023





Parameter	Units	Short-term Benchmark			Long-term Benchmark			Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0028	0.00074	<0.0005	0.0096	0.001675	<0.0005	0.0011

Table 8.2-3 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L							2	15	7.5	2	8	5.2	3	13
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0025	0.0099	0.0053	0.004	0.014	0.0065	0.0032	0.02
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.05	0.015	<0.01	0.05	0.01444	<0.01	0.04
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.007	0.065	0.0194	0.002	0.04	0.0137	0.006	0.04
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Barium	mg/L							0.0021	0.0032	0.0025625	0.0021	0.0031	0.0025556	0.0023	0.0032
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							2	18	9.125	2	10	6.2222	4	16
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	1.00E-05	0.00007	0.0000175	1.00E-05	<b>0.00004</b>	1.44E-05	1.00E-05	0.00005
Calcium	mg/L							1.3	2	1.5625	1.2	1.4	1.2444	1.2	1.8
Carbonate	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.4	0.6	0.45	0.2	0.3	0.23333	0.3	0.5
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2	2.4	2.275	1.8	2.5	2.2667	1.9	2.5
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.02625	0.01	0.08	0.0233	<0.01	0.07
Hardness	mg/L							5	7	5.625	4	5	4.56	4	6

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.034	0.13	0.077375	0.03	0.11	0.071222	0.036	0.16
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	0.03	0.02125	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.4	0.6	0.4375	0.2	0.4	0.33333	0.3	0.5
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0029	0.019	0.010625	0.0025	0.018	0.0083333	0.0037	0.029
Mercury	mg/L				0.000026	CCME		<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L				0.07	WHO	(16)	<0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	550	CCME		3.0	SEQG		<0.04	0.35	0.112	<0.04	0.31	0.093	<0.04	0.35
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	6.58	7.16	6.85	<b>6.17</b>	6.97	6.72	<b>6.48</b>	7.07
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	0.007	0.0052	<0.005	<0.005	<0.005	<0.005	0.006
Potassium	mg/L							0.2	0.6	0.375	0.2	0.4	0.32222	0.2	0.4
Radium-226	Bq/L				0.11	SEQG		<0.005	0.009	0.00625	<0.005	0.007	0.00544	<0.005	<0.005
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.4	2.1	1.63	1.3	1.6	1.41	1.3	1.9
Conductivity	µS/cm							17	25	19.375	14	20	16.111	14	23
Strontium	mg/L				205	FEQG	(11)	0.012	0.018	0.0141	0.011	0.013	0.0113	0.011	0.016
Sulphate	mg/L				128	BC MOE	(12)	0.4	0.7	0.525	0.4	0.8	0.63333	0.3	0.8
Sum of Ions								7	25	14.125	6	14	10.667	8	22
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	0.0002	0.0001125	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SA-4			SA-5			SA-6	
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean	Min	Max
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
TDS	mg/L							21	32	25	13	28	20	15	28
TKN	mg/L							0.13	0.3	0.215	0.11	0.29	0.213	0.15	0.41
TOC	mg/L							2	2.6	2.325	1.9	2.7	2.3111	1.9	2.6
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		1	3	2	<1	3	1.89	1	6
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0012	0.0006	<0.0005	0.0017	0.0007445	<0.0005	0.0006

Table 8.2-3 (Continued)

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L							<1	24	<6.7778	3	13	7.375
Aluminum	mg/L				0.1	SEQG/CCME	(5)	0.0052	0.012	0.0089	0.0016	0.0086	0.0054
Ammonia as N	mg/L				5.74	SEQG/CCME	(4)	<0.01	0.04	0.01333	<0.01	0.04	0.0138
Ammonia, *unionized	ug/L				6.98	SEQG/CCME	(4)	0.003	0.024	0.012	0.005	0.032	0.0134
Antimony	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L				0.005	SEQG/CCME		<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L							0.0025	0.0041	0.0031111	0.0026	0.004	0.0030625
Beryllium	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L							<1	29	<8.3333	4	16	9
Boron	mg/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00011	SEQG/CCME	(18)	0.00004	SEQG/CCME	(18)	<1.0E-05	0.00002	1.11E-05	<1.0E-05	<b>0.00004</b>	0.000016
Calcium	mg/L							1.1	1.7	1.3778	1.2	1.7	1.3625
Carbonate	mg/L							<1	<1	<1	<1	<1	<1
Chloride	mg/L	640	SEQG/CCME	(6)	120	SEQG/CCME	(6)	0.1	0.2	0.17778	<0.1	0.2	<0.175
Chromium	mg/L				0.001	SEQG/CCME		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Cobalt	mg/L				0.000295	FEQG		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.0009	SEQG	(19)	0.002	CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L							2.2	3.4	3.0222	2.6	3.2	2.975
Diss. Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L							0.01	0.07	0.023333	0.01	0.07	0.02375
Hardness	mg/L							4	6	5.11	4	6	4.88
Hydroxide	mg/L							<1	<1	<1	<1	<1	<1
Iron	mg/L				0.3	SEQG/CCME		0.042	0.22	0.095111	0.036	0.16	0.098375
Lead	mg/L				0.001	SEQG/CCME	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L				0.2	HC	(14)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L							0.3	0.5	0.38889	0.2	0.5	0.375
Manganese	mg/L	0.501	CCME	(3)	0.26	SEQG/CCME	(3)	0.0053	0.02	0.010633	0.0071	0.016	0.010325
Mercury	mg/L				0.000026	CCME		<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L				0.07	WHO	(16)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L				0.07	WHO	(16)	0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	550	CCME		3.0	SEQG		<0.04	0.4	0.115	<0.04	0.4	0.13
P. Alkalinity	mg/L							<1	<1	<1	<1	<1	<1
pH	units				6.5-9.0	SEQG/CCME	(1)	<b>6.18</b>	6.99	6.70	<b>6.47</b>	6.99	6.73
Phosphorus	mg/L				0.02 - 0.035	CCME	(17)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L				0.1	HC		<0.005	0.008	0.0058	<0.005	<0.005	<0.005
Potassium	mg/L							0.2	0.5	0.33333	0.2	0.5	0.3625
Radium-226	Bq/L				0.11	SEQG		<0.005	0.01	0.0059	<0.005	0.006	0.0051
Selenium	mg/L				0.001	CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L				0.25	CCME		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L							1.2	1.7	1.4	1.3	1.7	1.44
Conductivity	µS/cm							15	22	16.778	15	23	17.25
Strontium	mg/L				205	FEQG	(11)	0.011	0.015	0.0124	0.011	0.015	0.0119
Sulphate	mg/L				128	BC MOE	(12)	0.3	0.9	0.68889	0.5	1	0.725

Parameter	Units	Short-term Benchmark			Long-term Benchmark			SB-3			SB-5		
		Value	Reference	Notes	Value	Reference	Notes	Min	Max	Mean	Min	Max	Mean
Sum of Ions								4	34	12.667	8	22	13.375
Thallium	mg/L				0.0008	SEQG/CCME		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L				0.6	HC	(14)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L							<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L							<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L							14	26	20.556	16	26	20.125
TKN	mg/L							0.16	0.34	0.256	0.18	0.33	0.27
TOC	mg/L							2.4	3.6	3.1111	2.7	3.2	3
TSS	mg/L	15	MDMER Schedule 4	(22)	background + 5 mg/L	CCME		<1	4	2.56	<1	3	1.875
Uranium	mg/L	0.033	CCME		0.015	SEQG/CCME		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L				0.12	FEQG	(13)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.008	CCME	(9)	0.007	CCME	(9)	<0.0005	0.0012	0.00059	<0.0005	0.0016	0.00065

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envbrportal.crmf.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) * 1000$  (SEGQ via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.



Attachment IR-113\_IR113-R1

Number	IR-113 / IR-113-R1
Comment From	ECCC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment
Comment	<p>In response to <u>IR-113</u> issued in first round of IRs: This response has not been accepted for the following reasons:</p> <p>Based on the information provided it is not possible to assess the resiliency of the Project to potential adverse effects from climate change and potential impacts to surface water and sediment quality. The Proponent should review the guidance documents available on the <a href="#">Strategic Assessment of Climate Change</a> (SACC) website with regards to climate change resilience and provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling.</p> <p>Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, lake levels, flow rates, etc., on COPC concentrations in surface water and sediment. The Proponent should refer to the <a href="#">SACC website</a> for guidance on conducting this quantitative analysis.</p> <p>See also follow-up IR-113-R1.</p> <p><u>IR-113-R1</u> Clarify if climate change has been considered in the PMP value provided. If it has not been considered, discuss how potential increases in PMP have been and/or need to be considered in the Project design.</p> <p>Reference Kunkel, K., Karl, T. R., Easterling, D. R., Redmond, K., Young, J., Yin, X., &amp; Hennon, P. (2020). Probable maximum precipitation and climate change. Geophysical Research Letters, 1402-1408.</p>

**Denison’s Response:**

Prairie province hydrology is dominated by cold regions processes so that snowmelt is the primary hydrological event of the year for both the major rivers that derive from the Rocky Mountains and small streams and rivers that arise in Saskatchewan. Climate change impacts on water resources are therefore focused on changes to snow accumulation, snowmelt and infiltration to frozen soils. Climate change scenarios suggest generally warmer and wetter winters for Saskatchewan. Large scale hydrological models that take these scenarios into account suggest changes in the annual streamflow of the South Saskatchewan River ranging from an 8% increase to a 22% decrease, with an 8.5% decrease being an average prediction. Small scale hydrological models for prairie streams suggest a 24% increase in spring runoff by 2050 followed by a 37% decrease by 2080 as the winter snow cover becomes discontinuous. Both model results suggest that there is not a dramatic drying of the prairies to be anticipated under climate change and that in some cases streamflow will increase for certain scenarios and under moderate degrees of climate change. While prairie runoff should increase in the near term, as climate change progresses later in the 21st C there will be dramatic drops in runoff and the flow of small streams to wetlands and depressions and to small prairie rivers (Sauchyn et al 2009).

Changes in temp (warmest max temp) for the region was referenced from the Climate Atlas of Canada ([https://climateatlas.ca/data/grid/782/maxmax\\_2030\\_45/line0](https://climateatlas.ca/data/grid/782/maxmax_2030_45/line0)) for the Tomblin Lake watershed.

The primary source of climate model data presented in their maps, charts and tables is the Pacific Climate Impacts Consortium (PCIC) . The PCIC has provided downscaled projections of daily temperature and precipitation data from 24 climate models using two carbon emission scenarios.

The Climate Atlas of Canada use PCIC’s statistically downscaled data (Bias Correction with Constructed Analogues and Quantile mapping, Version 2; BCCAQv2) derived from 24 CMIP5 global climate models for two emissions scenarios (RCP4.5 and RCP8.5). The Climate Atlas of Canada call the RCP4.5 and RCP8.5 the “Low Carbon” and “High Carbon” scenarios, respectively. We use PCIC’s statistically downscaled

data (Bias Correction with Constructed Analogues and Quantile mapping, Version 2; BCCAQv2) derived from 24 CMIP5 global climate models (the complete list of models can be found at <https://climateatlas.ca/data-sources-and-methods>) (Climate Atlas of Canada, 2023)

The climate model data presented in the Atlas has been statistically downscaled and bias corrected using a method called Bias-Correction/Constructed Analogues with Quantile mapping reordering, Version 2 (BCCAQv2); the work was done by the Pacific Climate Impacts Consortium (PCIC) . [1] This method has been extensively tested by Murdock et al. (2014) and found to outperform many other statistical downscaling methodologies.

The data indicates an ensemble increase in warmest maximum temperature under the high carbon (RCP8.5) scenario of 2.32 degrees Celsius from the background average of 2.59 (1950 to 2022) to 4.91 (2023 to 2065). Increases in temperature can then influence the rates of evapotranspiration thereby reducing water availability. However, in the case of Saskatchewan, the rate of transpiration on an annual basis is not expected to overbalance the increase in precipitation for the region.

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**Table 1: Warmest Maximum Temperature Under High Carbon Scenario Historical to Projected Statistics**

Statistic	Historical (1950 – 2022)			Projected (Ensemble Data 2023 – 2065)		
	Annual Average	10% Confidence Interval	90% Confidence Interval	Annual Average	10% Confidence Interval	90% Confidence Interval
Mean	2.59	1.07	4.17	4.91	3.48	7.14
SD	1.23	0.70	0.72	0.89	0.83	1.17
Min	0.00	-0.45	2.80	3.00	2.05	5.10
Max	5.30	3.00	6.15	7.00	5.25	9.40

The data indicate an ensemble increase in total precipitation under the high carbon (RCP8.5) scenario of 39.21 millimetres from the background average of 454.65 (1950 to 2022) to 493.86 (2023 to 2065). This increase is likely to increase mean annual flows in the Icelander River drainage area thereby increasing the assimilative capacity of the receiving environment of Whitefish Lake.

**Table 2: Total Annual Precipitation Under High Carbon Scenario Historical to Projected Statistics**

Statistic	Historical (1950 – 2022)			Projected (Ensemble Data 2023 – 2065)		
	Annual Average	10% Confidence Interval	90% Confidence Interval	Annual Average	10% Confidence Interval	90% Confidence Interval
Mean	454.65	366.97	558.69	493.86	392.34	603.23
SD	66.85	19.66	28.74	19.35	25.36	31.79
Min	264.60	325.20	506.00	459.00	344.35	555.20
Max	609.20	405.70	626.45	533.00	444.30	672.65

Several uncertainties apply:

- 1) The background water quality conditions of the Icelander River system in future decades may change appreciably as a result of increases in surface run-off, landscape changes and precipitation event intensity and duration. Such changes are not predictable at this time;
- 2) The long-term accuracy of predictive models for precipitation, temperature and evapotranspiration for the region is not such that an estimate of changes to the receiving environment water quality is reasonable at this time. Any estimates would have a large attributed uncertainty. Furthermore, as mine discharge is not expected to increase in volume or constituent concentrations over the mine life, any increase in flows within the Icelander River system would provide for an increase in assimilative capacity.

As a result, quantitative assessment of the potential change in surface water quality at Whitefish Lake under Climate Change is not needed at this time as:

- the design basis PMP is robust and inclusive of projected total annual precipitation under a high carbon scenario
- the level of variability that is likely in future background water quality is high due to changes in precipitation levels and intensity and therefore run-off contributions to the aquatic environment; and,
- predictive models for the future period (2050s) for the region are variable in accuracy.

Rather, the following mitigation measures, monitoring and adaptive management should be employed.

- 1) Changes in water quality in the receiver should be monitored on a consistent basis to understand changes in the background water quality prior to effluent mixing;
- 2) Effluent discharge will be monitored as per the MDMER Schedules 4 and 5;
- 3) Under scenarios of low flow condition, discharge can be limited seasonally or periodically and specific to the assimilative capacity of the receiver (flow proportioned or fixed dilution discharge);
- 4) Adaptive management and adjustment to discharge timing and volume as needed over time to meet criteria based on climate induced changes in flow.

**References:**

Murdock, T., Sobie, S., Hiebert, J., 2014. Statistical downscaling of future climate projections for North America: report on contract no: KM040-131148/A. Available online: [https://www.pacificclimate.org/sites/default/files/publications/PCIC\\_EC\\_downscaling\\_report\\_2014.pdf](https://www.pacificclimate.org/sites/default/files/publications/PCIC_EC_downscaling_report_2014.pdf)

Sauchyn, Dave; Barrow, Elaine; Fang, X., Henderson, Norm; Johnston, Mark; Pomeroy, John; Thorpe, Jeff; Wheaton, Elaine; and Williams, B. 2009. Saskatchewan's Natural Capital in a Changing Climate: An Assessment of Impacts and Adaptation. Report to Saskatchewan Ministry of Environment from the Prairie Adaptation Research Collaborative, 162 pp.

Number	IR-114
Comment From	ECCC CNSC
Category	Change to an environmental component due to hazardous contaminants
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.2.4.2.4 - Tables 8.2-9, 8.2-10 and 8.2-13
Comment	<p>The response has not been accepted for IR-114.</p> <p>The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER.</p> <p>The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations.</p> <p>All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds.</p> <p>Please:</p> <ol style="list-style-type: none"><li>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</li><li>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO<sub>3</sub>) in effluent and the receiving environment.</li><li>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</li><li>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li></ol>

**Denison’s Response:**

The requested tables have been updated to include water quality thresholds derived from receiving environment parameters (background) as well as effluent induced concentrations for completeness. Please see the tables below and updated in Section 8 of the EIS.

**Table 8.2-1: Predicted Effluent Water Quality**

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
General Chemistry, Nutrients and Anions		
Alkalinity	mg/L	12.4
Ammonia (as N)	mg/L	3.9
Un-Ionized Ammonia	mg/L	4.74
Hardness	mg/L (as CaCO3)	250
Conductivity	µS/cm	21.7
Nitrate	mg/L	0.249
pH	pH Unit	7
Phosphorus	mg/L	N/A
Sulphate	mg/L	2600

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
TDS	mg/L	6420
Temperature	deg C	16.5
TSS	mg/L	6
Chloride	mg/L	600
Metals		
Aluminum	mg/L	0.051
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.0027
Copper	mg/L	0.02
Cyanide	mg/L	NA
Iron	mg/L	0.0039
Lead	mg/L	0.0003
Manganese	mg/L	0.03
Mercury	mg/L	0.00001
Molybdenum	mg/L	2.5
Nickel	mg/L	0.0138
Selenium	mg/L	0.042
Strontium	mg/L	1.68
Thallium	mg/L	0.0006
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Radiological		
Lead-210	Bq/L	0.42
Polonium-210	Bq/L	0.15
Radium-226	Bq/L	0.15
Thorium-230	Bq/L	0.9
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7

Table 8.2-2: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(4)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	6.98	6.98	SEQG/CCME	(4)	4.74	0.08	0.05	0.03
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)	0.03	0.0103	0.0102	0.0101
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	(12)	2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)	600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(5)	0.051	0.0	0.0	0.0
Arsenic	mg/L	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--	0.006	0.000	0.000	0.000
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME		0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.000295	0.00149	FEQG	(10)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--	0.02	0.001	0.000	0.000



Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	0.0	0.0	0.0
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	(8)	0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	0.0138	0.00	0.00	0.00
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	205	2.5	FEQG	(11)	1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	(13)	0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

**Notes:**

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmv.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.
- (12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)
- (13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.
- (14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)
- (15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .
- (16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.
- (17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L
- (18) Based on water hardness of >0 to <5.3 mg/L
- (19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})]-8.64497)}) * 1000$  (SEQG via AEP 1996b)
- (20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg} \cdot \text{L}^{-1})] + 0.240[\ln(\text{DOC mg} \cdot \text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.
- (21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)
- (22) MDMER Schedule 4 - maximum authorized montly mean concentration
- (23) Bold numbers indicate exceedance of long-term criteria
- SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.
- CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl  
Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

**Table 8.2-3: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water**

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Alkalinity <sup>(1)</sup>	mg/L	NE	NE	12.4	12.4	NE	NE	NE	--	--	
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614		MDMER Sched 5	(5)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368	5.74	SEQG/CCME	(4)
Un-ionized Ammonia	mg/L	0.01770	0.01770	0.06331	0.06310	0.04813	0.04780	0.04075	6.98	SEQG/CCME	(4)
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	0.0003	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	120	SEQG/CCME	(6)
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME	
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG	(10)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425		MDMER Sched 5	
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116	0.005	CCME	(8)
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC	
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.64	SEQG/CCME	(3)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118	0.07	WHO	(16)
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044	0.07	WHO	(16)
Nitrate <sup>(1)</sup>	mg/L	NE	NE	0.249	0.249	NE	NE	NE	3	SEQG	
Phosphorus <sup>(1)</sup>	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.02 - 0.035	CCME	(17)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE	(12)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Thallium	mg/L	9.97E-05	9.96E-05	1.04E-04	1.04E-04	1.03E-04	1.03E-04	1.02E-04	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143	0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	background + 5 mg/L	CCME	
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1	MDMER Sched 4	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME	
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG	(13)
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.007	FEQG	(9)

Notes

Notes

Estimates of mercury concentration are based on 50% of the detection limit in both background and effluent.

(1) Estimated from near-field model

NE = No estimate for this lake for this parameter

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmq.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L



Attachment IR-115\_IR-115-R1

Number	IR-115 & IR-115-R1
Comment From	ECCC
Category	Fish and fish habitat
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 Aquatic Environment Appendix 10-A (ERA), Section 3.1.1.1
Comment	<p>This response has not been accepted.</p> <p>Items 1. And 3. In the Proponent’s response adequately responded to the IR. However, the water quality thresholds in item two have not been derived using baseline receiving environment concentrations and not all COPCs which require monitoring under the MDMER have been included in the updated table. Additionally, the Proponent did not account for changes in baseline hardness concentrations in the receiving environment due to the deposition of effluent. Water hardness is an environmental modifying factor which can influence the toxicity of COPCs in the aquatic environment, therefore requiring the mentioned COPCs as well as background concentrations of total hardness in the receiving environment to accurately determine potential effects of COPCs upon the receiving aquatic environment. The Proponent should also provide rationale to support that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</p> <p>See also follow-up IR-115-R1.</p> <ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include the following COPCs: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS).</li><li>2. Update Table 8.2-8 to include background concentrations of total hardness (in mg/L CaCO<sub>3</sub>) in the receiving environment.</li><li>3. Provide rationale that all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li></ol>

**Denison’s Response:**

Please see the updated Table 8.2-8 below which has also been updated in the EIS. It has been updated to include; un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS). The background hardness is included and screening criteria for both short-term and long-term criteria are added with notes identifying the rationale for their concentration level based on hardness, pH, temperature and/or other background or effluent induced constituent concentration.

Table 8.2-1: Summary of Background Water Quality Screening Criteria

Constituent	Unit	Background Concentrations (95 <sup>th</sup> Percentile)	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
General Chemistry, Nutrients and Anions										
Alkalinity	mg/L	12.4	--	--	--	--	--	--	--	
Ammonia (as N)	mg/L	0.068	--	--	--	--	5.74	5.74	SEQG/CCME	(4)
Un-Ionized Ammonia	mg/L	0.00019	--	--	--	--	6.98	6.98	SEQG/CCME	(4)
Hardness	mg/L (as CaCO3)	5.26	--	--	--	--	--	--	--	--
Conductivity	µS/cm	21.7	--	--	--	--	--	--	--	--
Nitrate	mg/L	<0.249	550	550	CCME		3	3	SEQG	--
pH	pH Unit	7	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--
Phosphorus	mg/L	<0.01	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)
Sulphate	mg/L	0.69	--	--	--	--	128	429	BC MOE	(12)
TDS	mg/L	28.3	--	--	--	--	500	500	SEQG	--
Temperature	deg C	15	--	--	--	--	ambient temp	ambient temp	--	--
TSS	mg/L	3.9	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--
Chloride	mg/L	0.39	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)
Metals										
Aluminum	mg/L	0.00758	--	--	--	--	0.1	0.1	SEQG/CCME	(5)
Arsenic	mg/L	0.0001	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--
Cadmium	mg/L	0.000019	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--
Chromium	mg/L	<0.0005	--	--	--	--	0.001	0.001	SEQG/CCME	
Cobalt	mg/L	<0.0001	--	--	--	--	0.000295	0.00149	FEQG	(10)

Constituent	Unit	Background Concentrations (95 <sup>th</sup> Percentile)	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
Copper	mg/L	<0.0002	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--
Cyanide	mg/L	N/A	--	--	--	--	--	--	--	--
Iron	mg/L	0.181	--	--	--	--	0.3	0.3	SEQG/CCME	--
Lead	mg/L	<0.0001	--	--	--	--	0.001	0.007	SEQG/CCME	(8)
Manganese	mg/L	0.0198	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)
Mercury	mg/L	<0.00001	--	--	--	--	0.000026	0.000026	CCME	--
Molybdenum	mg/L	<0.0001	--	--	--	--	0.07	0.07	WHO	(16)
Nickel	mg/L	<0.0001	--	--	--	--	0.07	0.07	WHO	(16)
Selenium	mg/L	<0.0001	--	--	--	--	0.001	0.001	CCME	--
Strontium	mg/L	0.015	--	--	--	--	205	2.5	FEQG	(11)
Thallium	mg/L	<0.0002	--	--	--	--	0.0008	0.0008	SEQG/CCME	--
Uranium	mg/L	<0.0001	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--
Vanadium	mg/L	<0.0001	--	--	--	--	0.12	0.12	FEQG	(13)
Zinc	mg/L	0.0011	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)
Radiological										
Lead-210	Bq/L	<0.02	--	--	--	--	0.2	0.2	HC	--
Polonium-210	Bq/L	<0.005	--	--	--	--	0.1	0.1	HC	--
Radium-226	Bq/L	<0.0059	--	--	--	--	0.11	0.11	SEQG	--
Thorium-230	Bq/L	<0.01	--	--	--	--	0.6	0.6	HC	--
Uranium-238	Bq/L	<0.0012	--	--	--	--	3	3	HC	--
Uranium-234	Bq/L	<0.0012	--	--	--	--	3	3	HC	--

**Notes:**

(1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmpp.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

(2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark =  $\exp(0.878[\ln(\text{hardness})] + 4.76)$  where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{(0.979123[\ln(\text{hardness})] - 8.64497)}) * 1000$  (SEQQ via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg} \cdot \text{L}^{-1})] + 0.240[\ln(\text{DOC mg} \cdot \text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)

(22) MDMER Schedule 4 - maximum authorized montly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

## ATTACHMENT IR-137

Original IR Number	IR-137
Follow Up IR Number	-
Dept.	ECCC
Project effects link	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands
Reference to EIS, appendices, or supporting documentation	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>
Context and Rationale (original IR)	<p>Context and Rationale: The CNSC's Generic Guidelines for the Preparation of an EIS Pursuant to the Canadian Environmental Assessment Act, 2012 states that: "The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations."</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project's effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p>Project Footprint: In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p>

The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: "Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA." (p. 9-168)

LSA: The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.

Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects.

For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.

RSA: The Amended Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada states:

Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:

- Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;
- Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;
- Account for planned disturbances; and
- Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.

The proposed Project's cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada.

Reference:

[1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (Environment Canada, 2011).



Information Requirement (original IR)	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"> <li>• Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li> </ul> <p>Specific to boreal caribou:</p> <p>Project Footprint:</p> <ul style="list-style-type: none"> <li>• Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li> </ul> <p>LSA:</p> <ul style="list-style-type: none"> <li>• Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li> </ul> <p>RSA:</p> <ul style="list-style-type: none"> <li>• Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; or</li> <li>• Re-do the assessment with the RSA at the scale of the range</li> </ul> <p>See also related IRs: IR-154 and IR-156.</p>
Rationale for Status (for unaccepted original IR) OR Context and Rationale and IR (for Follow Up IR)	<p>This response has not been accepted.</p> <p>A biologically relevant explanation for the chosen RSA for caribou was not provided. It is not clear if the RSA is representative of the SK1 range for factors such as variability and biophysical features. Describe how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range. This clarification is necessary to ensure the RSA is representative of the entire SK1 Caribou range, including the natural variability of the landscape, and to assess any project effects that may be affected by an inaccurate RSA. It is also required to verify the Proponent's assessment of cumulative impacts to caribou.</p> <p>See also AD-56 in the Advice to Proponent table.</p>

### **Denison's Response:**

#### **Supporting, Contextual Information to Denison's Response in the IR Table**

While appropriate consideration of Project effects on the terrestrial environment is important for all projects undergoing environmental assessment, we highlight that through the selection of the ISR mining method, the Wheeler River Project has a relatively small footprint on the landscape compared to project footprints associated with other more conventional mining methods.

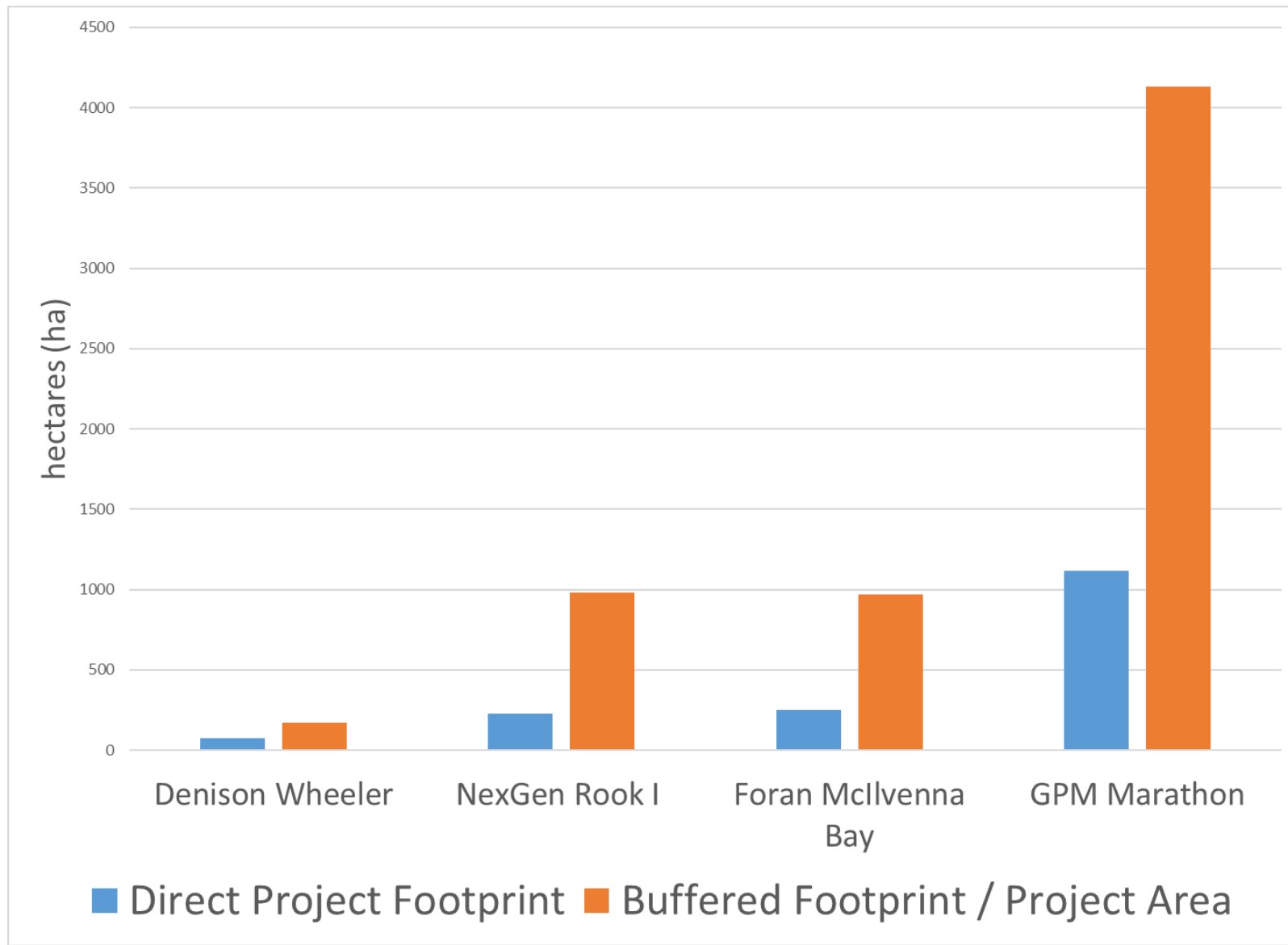
For the reviewer's context and consideration, Table IR-137-1 and Figure IR-137-1 below compare the Wheeler River Project's expected direct footprint (74.8 ha) and Project Area (area of maximum disturbance; 169.9 ha) to expected landscape disturbances associated with:

- a proposed underground uranium mining project in the Athabasca Basin undergoing a joint provincial (Saskatchewan)-federal EA (NexGen's Rook I Project),
- an underground mining project which recently completed the Saskatchewan EA process (Foran's McIlvenna Bay Project), and
- an open pit mining project in Ontario which recently completed the federal EA process (Generation PGM's Marathon Palladium Project).

**Table IR-137-1: Comparison of Wheeler River Project footprint and Project Area to landscape disturbance at other proposed mines**

	Denison's Wheeler River Project (proposed uranium mine in Saskatchewan)	NexGen's Rook I Project (proposed underground uranium mine in Saskatchewan)	Foran's McIlvenna Bay Project (proposed underground copper-zinc mine in Saskatchewan)	Generation PGM's Marathon Palladium Project (proposed open pit platinum group metals and copper mine in Ontario)
Direct Infrastructure Footprint	74.8 ha	228 ha	249.1 ha	1,116 ha
Project Area / Area of Maximum Disturbance	169.9 ha	981 ha	969.9 ha	4,131 ha

ha = hectares



**Figure IR-137-1: Comparison of Wheeler River Project footprint and Project Area to landscape disturbance at other proposed mines**

Attachment IR-236

Number	IR-236
Comment From	ECCC ERAD
Category	Fish and fish habitat
Page # in EIS	
Section # in EIS	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment
Comment	<p>This response has not been accepted.</p> <p>The Proponent made a correlation between precipitation and the Probable Maximum Precipitation (PMP). However, annual maximum and PMP cannot be correlated as they are two separate concepts that require different statistical methods to verify.</p> <p>The Proponent provided two tables which displayed precipitation data under current, existing, and future climate scenarios for two nearby lakes. These were provided to support the Proponent’s response, however, the calculations used to achieve the table figures within the response or Attachment: IR-236 were not provided. As one value cannot be used to infer the other, reviewing the calculations is required to support the Proponent’s conclusions.</p> <p>Please see the following requests:</p> <p>1. In Table 3 of Attachment: IR-236, the historical mean value (1976 to 2005) for the Maximum 1-Day Precipitation is 24.1 mm and is indicated as measured. However, this estimate appears to be derived from ensembles of climate modeled historical precipitation. Thus, proponent to insert a footnote at Table 3 that indicate the total annual as well as maximum 1-day are estimates based on ensembles of climate modeled historical precipitation. The Proponent needs to provide the calculations that were used to reach the conclusions found within Tables 2 and 3 of Attachment: IR-236. Reviewing the calculation will allow for verification of the Proponent’s conclusions. If the currently used data sources do not allow for accurate representation of their conclusions, the Proponent should use complete regional observational data sources to support the conclusions in Tables 2 and 3.</p> <p>2. The analysis of mean maximum one day and mean annual total precipitation [1976-2005] based on weather station (Climate ID 4063755) at Key Lake is roughly 32mm and 470mm respectively. Thus, include both modeled and observed historical precipitation statistics in the EIS for context.</p> <p>Measured data should take precedence over modeled data. The Proponent is taking an ensemble of modeled data to "predict" historical data when measured data is available and can validate the models. Without strong justification, it is not appropriate to replace measured data with "predicted" modeled data.</p>

**Denison’s Response:**

The original response to IR-236 is provided here in its entirety as well as updates that are required for the second round of IRs from the FIRT. This is for the purposes of adding this IR Attachment as an Appendix to Appendix 6-C of Section 6 of the revised Draft EIS.

During the Draft EIS review by the FIRT, there were information requirements (IRs; mainly IR-235 and IR-236, and to a lesser extent IR-103 and IR-104) related to current and future climate precipitation, as well as the probable maximum precipitation event. The information in Attachment IR-236 will be added as *Appendix D Summary of Precipitation Values Presented in the EIS* to Appendix 6-C in the final EIS. The advancement of Project design and the site drainage plan are more closely linked to detailed design to support the licensing process and the precipitation information provided herein and in the revised Draft EIS to support an EA decision is adequate. This new appendix to Appendix 6-C serves to provide clarifications only.

The probable maximum precipitation (PMP) event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program (1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes. As an example, during a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m<sup>3</sup> (*excluding a freeboard of 1 meter*). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In EIS Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.”

Tables 1 to 4 below provide a summary of precipitation information for both current / existing climate and future climate under different emissions scenarios, in order to 1) summarize precipitation data from various sections of the EIS (Section 6 including Appendix 6-C, Section 8, and Section 15) and 2) provide context on the PMP of 493 mm in comparison to precipitation values (annual precipitation, maximum 1-day precipitation, and 1:100 year, 24 hour return).

With specific reference to the second round IR comments response the following is noted:

- 1) Table 3 has been updated to represent the Total Annual and Maximum 1-Day precipitation event for Tomblin Lake as provided from the Climate Atlas of Canada.
- 2) The information provided in Section 6, Appendix 6-C, Table 10 provides both the historical data (2011 to 2022) and the predicted values for the future periods for both Total Annual Precipitation and Maximum 1-Day Precipitation (see Table 2 below). As such, Denison has used the available measured data from the Key Lake data station for presentation in Appendix 6-C. With the update provided to Table 3 (see #1 above), the information provided for the period from 1976 to 2005 has also been updated to represent measured data.

Denison has used measured data where applicable and this IR will be included as Appendix D in Appendix 6-C of Section 6.



Table 1: Precipitation - Existing Climate – Comparisons of Observed Annual Average Precipitation and Maximum 24-hour Precipitation to PMP

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
Annual average precipitation	456 mm	Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Annual average precipitation	483 mm	Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Maximum 24-hour precipitation	45.9 mm	Occurred on August 8, 2020.  Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 10.7 x lower than PMP</i></b>
Maximum 24-hour precipitation	72 mm	Occurred July 12, 1998. Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 6.8 x lower than PMP</i></b>
1 in 100 year, 24 hour return	79.9 mm	Calculated using IDF_CC Tool for the Wheeler River Project. Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b><i>1:100 is 6.2 x lower than PMP</i></b>
1 in 100 year, 24 hour return	56.4 mm	Return Period Estimate based on data from the Key Lake Mine using the IDF_CC Tool (~32 km away from Wheeler River Project). Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b><i>1:100 is 8.7 x lower than PMP</i></b>

Table 2: Precipitation – Future Climate - Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)

Year	Total Annual (mm)				Maximum 1-day (mm)			
	Measured	RCP 2.6	RCP 4.5	RCP 8.5	Measured	RCP 2.6	RCP 4.5	RCP 8.5
2011-2020	455	518	509	508	48	29	27	27
2030		528	503	537		27	24	26
2040		487	498	514		28	29	24
2050		504	524	520		26	29	33
2060		513	515	523		26	33	26
2070		527	534	568		29	31	28
2080		539	551	547		30	33	28
2090		543	545	548		31	32	35
2100		546	535	559		23	25	28
Overall Increase:		28	26	51		-6	-2	1

Table 3: Precipitation – Future Climate - Historical and Future Precipitation Data (Total Annual and Maximum 1-day) for Tomblin Lake, Climate Atlas (provided in EIS, Section 15, Table 15.5-1 and 15.5-2)

Period	Total Annual (mm)			Maximum 1-day (mm)		
	Historical	RCP 4.5	RCP 8.5	Measured	RCP 4.5	RCP 8.5
Historical mean (1976-2005)	495.7			27.9		
Near Term (2021-2050)		484	487		25.9	25.9
Far Term (2051-2080)		500	509		26.7	27.5

Table 4: Precipitation – Future Climate - Predicted Precipitation (1:100 year, 24-hour return) for Key Lake and Wheeler River Project, 2020 to 2050 using IDF\_CC Tool (provided in EIS Section 8)

Location	1:100 year, 24-hour return
Key Lake Mine	62.0
Wheeler River Project	88.6

## Attachment: IR-237

Number	IR-237
Dept.	CNSC
Project effects link	EA follow-up and monitoring program
Reference to EIS, appendices, or supporting documentation	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)
Context and Rationale	<p><b>Context:</b> CNSC's <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: "The EIS should provide discussion on the follow-up program's requirements, and include:</p> <ul style="list-style-type: none"> <li>objectives and structure of the follow-up program and the VCs targeted by the program</li> <li>tabular summary and explanatory text of the main components of the program including: <ul style="list-style-type: none"> <li>a description of each monitoring activity under that component</li> <li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li> <li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li> <li>the specific monitoring objective for that activity</li> <li>planned schedule</li> </ul> </li> <li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li> <li><u>possible involvement of independent researchers</u></li> <li><u>program funding sources</u></li> <li>information management and reporting (reporting frequency, methods and format)</li> <li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li> </ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures."</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: "Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively" (p. 7-109) and that "At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process" (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>

Information Requirement	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>
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### **Denison's Response:**

As noted previously, Denison concurs that follow-up program documentation will evolve over the planning process and is committed to providing complete and up to date documentation as the EIS is finalized and prior to the EA Decision. Per the IR request Appendix 16-C has been updated with the most recently available information concerning follow-up programs. For reference, Table 1.5-1 in Appendix 16-C has only been updated so that references to EIS documentation is consistent with the revised submission that is part of the overall IR response package that is being submitted to CNSC for the second round of FIRT comments. Table 1.5-1 conveys appropriate information of the conceptual level and provides relevant context. An additional table (Table 1.5-2) that provides more detailed monitoring program information has been added to Appendix 16-C.

For ease of review, specific notes per the EIS Guidelines are provided below to provide context to the remainder of the response. Text in *italics* is taken from the EIS Guidelines; whereas text in **bold** is commentary provide by Denison. It is noted that this narrative was provided in the initial response to IR-237 during FIRT first round comments and has been updated accordingly.

*The EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.* **Note from Denison – Table 1.5-1 in Appendix 16-C identifies a framework or preliminary program upon which EA follow-up actions will be managed, as well as all phases of the Project in which the proposed individual follow up programs will be executed. Table 1.5-2 (a new table) provides further specific details as to locations, rationale, duration, frequency, sampling method and constituents.**

*The EIS should provide discussion on the follow-up program's requirements, and include:*

- *objectives and structure of the follow-up program and the VCs targeted by the program -* **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs, provides an overall program structure and identifies the VCs targeted by the program. Table 1.5-2 (a new table) provides further rationale for the proposed sampling specific details as to locations, rationale, duration, frequency, sampling method and constituents.**
- *tabular summary and explanatory text of the main components of the program including:*
  - o *a description of each monitoring activity under that component -* **Note from Denison - Table 1-5.1 in Appendix 16-C identifies each proposed monitoring activity for the various technical disciplines within which the environment assessment has been organized. A new Table 1-5.2 has been added to Appendix 16-C to provide more detail on the environmental monitoring activities, such as locations, rationale, duration, frequency, sampling method**

and constituents. This information is consistent with the current status of the development of the overall Environmental Monitoring Plan.

- o *which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)* - **Note from Denison - Table 1-5.1 in Appendix 16-C generally identifies whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures (see column “Monitoring Program Objective(s)”;** however, it is agreed that further clarity could be provided in this regard. To this end, in the new Table 1.5-2, there is a column named Rationale, which indicates specifically whether the proposed follow up activities are related to verifying EA predictions and/or to determine effectiveness of mitigation measures with rationale. Requirements regarding compliance with provincial / federal guidelines / standards are also noted in this column.
- o *the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)* – **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the relevant section of the EIS to which each proposed follow up activity refers. Further clarity has been provided as requested in this regard. In the updated version of Table 1-5.1 a further, more specific reference to the section / subsection has been added to the “EIS Reference” column for greater traceability between the assessment section of the EIS for each of the technical disciplines and the proposed follow activities. This is generally the Monitoring and Follow-Up subsection of each EIS chapter, where the objectives of the monitoring are listed.**
- o *the specific monitoring objective for that activity-* **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs. Additionally, Table 1.5-2, there is a column named Rationale, which indicates specifically whether the proposed follow up activities are related to verifying EA predictions and/or to determine effectiveness of mitigation measures with rationale. Requirements regarding compliance with provincial / federal guidelines / standards are also noted in this column.**
- o *planned schedule* - **Note from Denison -Table 1-5.1 in Appendix 16-C identifies the phases of the Project in which the proposed individual follow up programs will be executed. It is premature in Denison’s view to develop specific “schedule” associated with all follow-up activities that are proposed. As noted in draft EIS Section 1.7.5, Licensing and Permitting, as well as in other responses to FIRT IRs, the Project is proceeding through sequential EA and licensing process. Given the sequential process to which Denison has committed it is planned that further detail will be developed to align with detailed engineering design through licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Notwithstanding the above, the proposed duration of each monitoring program (i.e., applicable project phases) and frequency of monitoring are provided in Table 1.5-2.**

*roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results* - **Note from Denison – At this time and commensurate with the level of detail at which the follow up activities have been defined the proponent assumes responsibility for**



execution of all proposed activities. This may change as the program details are developed, and Denison presumes this is likely as it continues to work with the key Indigenous groups. It is noted however that provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners and therefore it is inappropriate (and may remain so) that specific details regarding follow up activities be shared without the expressed consent of the agreement signatories. Regulatory agencies at the provincial and federal levels are expected to largely play a review/approval role consistent with their responsibilities under various laws/acts/licenses/permits under which the Project, and follow up activities, will be executed. At this time there are no specific plans with local and regional organizations as it pertains to the design, implementation and evaluation of the program results; but this may change in the future. Per the above, Denison has added additional detail into Section 1.5 in Appendix 16-C with respect to roles and responsibilities consistent with the information provided in this IR response. As noted, full disclosure of such information may not be possible as it would be subject to non-disclosure covenants between Denison and its key Indigenous partners; nevertheless, more specific information will be provided as is available.

- *possible involvement of independent researchers* – **Note from Denison** – Involvement of independent researchers in follow up activities has not been identified at this time. This does not preclude possible involvement of independent researchers in the future; however, need for such has not been specifically flagged. As noted above, provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners, and such follow up activities and monitoring could include independent research. The sharing of information related to this type of independent research can and would only be shared with the expressed consent of the agreement signatories. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.5 clarifying the role of independent research that is consistent with our current understanding of such.
- *program funding sources* – **Note from Denison** – As noted above, the proponent assumes responsibility for execution of all proposed follow up activities that have been identified and therefore the funding of such. Also as noted above, provisions for follow up activities and monitoring that may be included in agreements developed between Denison and its key Indigenous partners will be subject to non-disclosure covenants in those agreements. This would include information concerning any funding that may be associated with these programs. It would be inappropriate (and may remain so) that specific details regarding any funding that may be provided for follow up activities be shared without the expressed consent of the agreement signatories. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.5 clarifying funding sources that is consistent with our current understanding of such.
- *information management and reporting (reporting frequency, methods and format)* – **Note from Denison** – A framework for information management and reporting is provided in Section 1.2 of Appendix 16-C. As described in Section 1.2 of Appendix 16-C specific information management and reporting structures associated with follow up activities are proposed to be developed as part of the development of the Project Environmental Management System (EMS). The Project EMS will be developed during licensing and permitting and that this information, including more detailed information regarding information management and reporting (e.g., reporting frequency, methods and format) will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.

- *possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program* – **Note from Denison** – As noted above, Denison is committed to continuing the ongoing process of identifying opportunities for the participation of the public and Indigenous groups through its engagement process. For example, as recent as October 2023, Denison has engaged with Indigenous Communities of Interest about how the outcomes of the environmental assessment process become key areas of focus by the licensing and approvals regime – including in relation to environmental monitoring. All discussion and materials related to these engagement sessions can be found in Section 4 of the revised Draft EIS. Further to this, Denison has planned a comprehensive and technical workshop with ERFN in March, 2024, and expects to undertake the same for KML soon thereafter, focused very specifically on the aspects of items licensed or approved post-environmental assessment. This will include environmental monitoring and among other things the relationship to country foods, including potential country foods to be monitored as part of monitoring programs. As the lifecycle regulator for the Project, Denison is required to provide information related to the outcome of these discussions into forthcoming updates in the IER to the CNSC. Input provided in these meetings, and others as they occur, would be integrated into monitoring program development as appropriate. Per the above, Denison has added narrative to the text of Appendix 16-C in Section 1.4 where consultation and engagement is discussed.

Denison also notes that the information provided herein and in Appendix 16-C represents a snapshot in time. Since follow up activities will span the full lifecycle of the Project, identification of potential opportunities for involvement is an ongoing process that will also span the full lifecycle of the Project.

**Advice Response Table – Denison’s Response, February 2024 (Summary Advice Comments where EIS and Supporting Document Revision have been indicated)**

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-50	Environment and Climate Change Canada (ECCC)	Section 2.2.1.4.2, Wellfield Operation Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	Providing a report or memo by the Proponent’s consultant Newmans Geotechnique Inc. as a public record will more effectively explain the “information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting [sic] Saskatchewan mining operations”, than a summary (attachment IR-10) of the material presented by Greg Newman during the meeting with the FIRT on April 19, 2023.	The response from the Proponent in IR-10 is accepted based on the meeting between ECCC, Denison and the CNSC, as well as the Proponent’s consultant and the presentation by Greg Newman (Newmans Geotechnique Inc.) as well as the summary of the meeting noted in attachment IR-10. However, the Proponent should provide a public record of the consultant’s memo or a report that explains the details of the freeze wall containment and monitoring that were provided during the April 19, 2023, meeting instead of the summary provided by the Proponent in attachment IR-10.	The April 19, 2023, presentation from Newmans Geotechnique Inc. to the CNSC is provided here as Attachment AD-50.
AD-51	Canadian Nuclear Safety Commission (CNSC)	Section 8.3.3 and 8.5, Aquatic Environment and Fish health	Denison has committed to additional baseline data gather as part of their response to IR-107.	Also related to IR-120 and IR-125, CNSC staff recommend Russell Lake be included in this baseline collection to increase the robustness of the established baseline in the final EIS.	Acknowledged. Denison will consider this request as it develops the plans for additional baseline collections, as well as the monitoring program design documentation for aquatic environment monitoring that is planned to be part of the licensing submission. It is noted that no aquatic environment effects are predicted to accrue in Russell Lake in relation to any phase of the Project and the concentrations of all water quality constituents are predicted to remain below aquatic protection values.
AD-52	CNSC	Section 8.3.3.1, Methodology and Metrics	Denison has indicated that exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.	Related to IR-121, CNSC staff recommend that Denison add text to EIS to reflect that no gross abnormalities in fish were observed during field work.	The text of revised Draft EIS Section 8.3.3.2 has been revised as recommended to indicate that that no gross abnormalities in fish were observed during baseline field work.
AD-53	CNSC	Section 8.3.8, Monitoring and Follow-up	<p>Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre- development."</p> <p>Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.</p> <p>Denison has committed to inclusion of reference lakes in study designs used to assess changes in fish communities / populations over time.</p>	Related to IR-122, CNSC staff recommend that Denison strengthen discussion of reference lakes, and their use, in EIS.	<p>Additional text (see below) has added to the fifth paragraph of Section 8.3.8 of the revised Draft EIS regarding aquatic environment monitoring program sampling areas and “reference lakes” more specifically, as follows.</p> <p>“Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development conditions, as well as through contemporaneous comparison of “exposure area” versus “reference area” data. In this context an “exposure area” is an area downstream of potential mine influence and a “reference area” is an area outside of potential mine influence. Where possible, the reference area would be located in the same drainage, upstream of mine influence where conditions closely mimic those downstream as is possible and where there is no, or reduced likelihood that exposure and reference fish populations can co-mingle.”</p>
AD-54	CNSC	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use	The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting	Related to IR-128, Denison should have follow-up discussions with the Ministry of Saskatchewan Highways, Indigenous Nations and communities (including KML and ERFN) and stakeholders regarding adding additional pull-outs to the highway to ensure safety for northern residents.	Acknowledged. We note that the Ministry of Highways and Infrastructure is responsible for construction and maintenance of highways in the province and Denison has no power or authority to construct pull-outs. However, Denison is committed to ongoing engagement throughout the life of the project and can provide input to Ministry of Highways and Infrastructure as applicable.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
		Section 12 Section 14	with Indigenous Nations and communities and are presented in the EIS.		
AD-55	ECCC	Section 9.2.5.2.7, Waste and Hazardous Materials Management	Vehicles and equipment with engines adhering to Tier 4 emission standards should be employed where feasible in order to minimize emissions. Regardless of engine tier used, best management practices should be followed, including proper maintenance of engines and anti-idling measures.	Related to IR-139, the Proponent should commit to following best management practices regarding the use of vehicles and equipment, including proper maintenance of engines and anti-idling measures.	Section 2.8 of the EIS and the commitment register included with this submission outlines Denison’s plan to regularly maintain and inspect equipment and machinery to make sure they are in good working order.
AD-56  IR-137	ECCC	Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou	The EIS and the IR response did not provide sufficient information to understand how the Regional Study Area (RSA) boundaries for caribou were determined.	<p>Related to IR-137, An assessment typically involves setting a geographic area for the assessment for the direct and indirect effects of a proposed project; this area is sometimes referred to as the Local Study Area (LSA). ECCC advises that the LSA is likely to extend beyond the Project footprint and a 500m buffer. ECCC demonstrated that the application of a 500m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale (Environment Canada, 2011). However, adverse effects of projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individuals of boreal caribou can vary and extend several kilometers depending on project activities and ecological context. The LSA should at the minimum capture the above-mentioned effects.</p> <p>A Proponent will also set a geographic area for the assessment within which the cumulative effects of the proposed Project are possible; this is sometimes referred to as the RSA. Typically the range(s) is(are) the proper scale to assess cumulative effects. However, assessing cumulative effects may require a different approach for large continuous ranges than for smaller discrete ranges. The impact of disturbance that may be concentrated in part of a large continuous range may be masked given the size of the range. For large continuous range it may be relevant to assess cumulative effects at the scale of the range but also at a smaller scale.</p> <p>The Proponent should consult with experts of the relevant jurisdiction in order to determine the local and regional study area, and provide a justification of the extent of the study areas in the impact statement.</p>	<p>The reviewer is also referred to the response to IR-137 and the response to AD-56 should be read in conjunction with it. The following is provided for reference.</p> <p>As per accepted environmental assessment methodology, the spatial boundaries were established to capture the extent of the expected/likely adverse effects, both direct and indirect, on the various valued components, that were expected as a result of the Project.</p> <p>The Project Footprint was delineated as the maximum extent of physical, direct disturbance resulting from the Project.</p> <p>The LSA was delineated to capture the extent of all direct, and most indirect effects of the Project on the wildlife VCs, including woodland caribou.</p> <p>The RSA was delineated to capture the extent of all likely Project effects, in consideration of the life-requisites and behavior of the various VCs being assessed (i.e., a habitat-based assessment) including ungulates (e.g., woodland caribou) which are known to have large home ranges. The RSA was also delineated in the context of the cumulative effects assessment, as it related to the region. Further the RSA is considered representative, as it includes habitat (ecosite types) that are found throughout the SK1 range. In particular, based on the habitat and its potential to support woodland caribou (as classified by the Saskatchewan Ministry of Environment) within the RSA is relatively consistent with the remainder of the habitat in the SK1 range (see Figure 2.1 in Appendix 9-F of the revised draft EIS).</p> <p>These study areas are appropriate, in that they capture the extent of the likely adverse effects of the Project on the VCs, to provide an ecologically relevant determination as to the likely adverse effect on the regional population of all assessed VCs, including woodland caribou (i.e., no dilution of the effects over the entire SK1 range – although this has been provided for context).</p> <p>The 500 m buffer around a physical disturbance was considered in the context of the extent of sensory disturbance, to allow Denison to determine the geographical extent of an effect (i.e., limited to the LSA, limited to the RSA) to allow the appropriate characterization of the effect to inform the determination of significance.</p> <p>Cumulative effects occur when the adverse effects of the Project, overlap in time and space, with the adverse effects from other projects and activities. As such, the RSA is the appropriate scale to appropriately conduct a defensible cumulative effects assessment – i.e., the effects of projects that are beyond the RSA spatial extent would not likely result</p>

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					<p>in residual effects that could act cumulatively with the Project’s effects, and consideration of effects that do not overlap spatially or temporally, are not cumulative, by definition.</p> <p>The Project is likely to add another 0.4% of anthropogenic disturbance (considering the Project Area of 169.6 ha) resulting in up to 1.9% of total anthropogenic disturbance in the Terrestrial RSA. As such, the Project's contribution to the cumulative effect is 0.001% of additional disturbance in the SK1 range, which is below the accepted threshold level of anthropogenic disturbance based on the SK1 range plan (ECCC 2020). The Ministry of Environment has indicated that the current level of anthropogenic disturbance is 53% within the SK1 range, which is below the accepted threshold level of 55% for anthropogenic disturbance for the SK1 range.</p>
AD-57	ECCC	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p>In their response to IR-167, the Proponent states: “Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre- clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre- construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>ECCC does not recommend active nest searches in most cases and for most species, in part because there is a great degree of difficulty associated with reliably detecting nests and a high likelihood of disturbing or damaging active nests while searching.</p> <p>Exceptions to the general nesting period exist, and these include interannual variation and nest searches for certain species which may breed outside of these</p>	<p>Related to IR-167, provide details on how vegetation clearing related to site development will be conducted to avoid harm to migratory birds and species at risk (SAR).</p>	<p>The reviewer is also referred to the response to IR-167 and the response to AD-57 should be read in conjunction with it. The following is provided for reference.</p> <p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snowpack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and</p>

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			general periods. Under the MBCA it is prohibited to destroy a nest with a live bird or viable egg, even if this occurs outside of what might be considered a normal nesting period.		implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.  <b>References:</b>  B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119  Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.  Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).
AD-58	HC	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	Section 6 of the Draft EIS contains Table 6.1-1 (p. 6-7), which lists radionuclides as a key indicator for air quality. Only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.	Related to IR-177, consider rewording Table 6.1-1 to “radon” instead of “radionuclides” to avoid confusion.	Acknowledged. The revision to Table 6.1-1 has been made as suggested.
AD-59	CNSC	Section 10.1.6.1.1, Human Receptors Selection and Characterization	Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.  While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.  In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor	Denison has addressed IR-180, but has not considered the suggestion for establishment of additional treatment technologies of COPCs.  CNSC staff maintains that there may be the need to establish additional treatment for effluent should environmental monitoring during operation indicate COPC’s are accumulating in the environment beyond what is anticipated in the EIS.  This is a firm reminder that this will be evaluated as part of the licensing phase of the project, should it proceed.	Acknowledged; it is understood that consideration of treatment technologies will be part of the licensing phase of the Project.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?		
AD-60	CNSC	Section 11, Perceived Risks to Lands and Resources	<p>The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social” effect, meaning that even if people know their fears are “perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well- being” (ERFN and SVS 2022a).” (p. 11-11)</p> <p>CNSC’s Generic Guidelines for the Preparation of an EIS state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEAA 2012). For the mitigation measures intended to address the effects of changes to the environment for Indigenous peoples, the Proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.” These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.</p>	<p>Related to IR-207, as Denison continues to work with Indigenous Communities of Interest on community specific monitoring regimes, please provide additional information in the IER on any updates on engagement activities to date that have taken place with KML and ERFN and any other Indigenous Nations and communities who utilize the area, with respect to follow-up monitoring plans that are being developed to support the Project licensing and permitting.</p> <p>If Denison has made commitments with respect to this, this is information that should also be included in the commitments report.</p>	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-61	CNSC	Various sections of the EIS, including: Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<p>ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).</p> <p>Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs.</p>	Related to IR-129, Denison needs to ensure that the proposed monitoring regime with ERFN, KML and other Indigenous Nations who utilize the area are included in the commitments table for future EIS submissions.	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-62	CNSC	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	IR-238 requested that Denison provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.  As well, it requested that Denison provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.	Related to IR-238, If Denison has made commitments with respect to engagement activities with Indigenous Nations and communities on potential, this is information that should be included in the commitments report.	Please see response to IR-238 and as noted previously Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-63	ECCC	Appendix 6-C Climate Baseline and GHG Emissions Report	ECCC recommended that the identification of the sources of GHG emissions and quantification of these emissions be described for the post-decommissioning phase, as was done for the other phases. ECCC recommended that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the Strategic Assessment of Climate Change (SACC) and the Draft Technical Guide Related to the Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment.	Related to AD-18, ECCC recommends the identification of the sources of GHG emissions and quantification of these emissions be described for the post decommissioning phase. This information will be useful for future development of a net-zero plan.	The Post-Decommissioning phase consists of physical, chemical, and biological monitoring of the site that will be conducted to confirm that the site is chemically and physically stable. Post-Decommissioning extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program or direct release of the land back to the Crown. The Post-Decommissioning monitoring program will be designed and conducted in accordance with the provincial and federal regulations and licence conditions.  For the purpose of the environmental assessment and the stage at which Project development currently stands, Denison believes the information provided on GHG emissions within the EIS documentation is appropriately focused on the Project phases with greatest activity which contribute to Scope 1 and 2 emissions.  As noted previously in response to AD-18, in accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data become available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.
AD-64	ECCC	Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report	ECCC noted that more specific data, such as regional data from provinces, forest companies, or literature may be available. The use of Table 20 of the draft Technical Guide does not apply.  ECCC recommended that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands.  ECCC recommended that the Proponent provide a quantitative and qualitative description of the Project’s	Related to AD-19, ECCC recommends that the Proponent revisit the land use calculation provided in the draft Environmental Impact Statement as the use of Table 20 of the draft Technical Guide for the above ground mass of vegetation species is not appropriate. This table is for above-ground woody vegetation in cropland systems which does not apply in this instance. A simple site survey would determine above-ground biomass on site using basic information such as site class and species. More specific data, such as regional data from provinces, forest companies, or literature may be available, while generic national	It is anticipated the GHG and climate change components of the Project will be re-evaluated once more detailed, site-specific data becomes available; this will be done after the EIS process is concluded and possibly as part of sustainability reporting. This analysis is expected to include more detailed study around overall GHG emissions (including land use changes - forest/vegetative biomass, soil carbon, wetlands), carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.	<p>data is available (e.g., Biomass Estimates for Major Boreal Forest Species in West-Central Canada (publications.gc.ca), Canada’s Forest Biomass Resources: Deriving Estimates from Canada’s Forest Inventory (nrcan.gc.ca)).</p> <p>ECCC reiterates the advice that the Proponent provide information regarding the consideration of biomass that are not above ground, specifically whether soil carbon and wetlands are taken into account.</p> <p>ECCC also restates the advice that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.</p>	
AD-65	CSNC	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit  Appendix 7-C, Section 3.5	In response to IR-82, Denison highlights the importance of the S redox couple (S(2-)/S(6+)) near the ore zone.	Related to IR-82, CNSC staff recommend that Denison consider the inclusion of hydrogen sulfide test kits for in-field measurements of H2S to supplement qualitative interpretations (e.g., absence of "rotten egg" odor associated with sulfide) relating to redox conditions.	Acknowledged and Denison thanks CNSC staff for this recommendation. The recommendation will be considered within the context indicated during future planning.
AD-66	ECCC	Appendix 7-C, Numerical Modelling: Post Decommissioning Evaluation,Section 2.3.1.4, Desilicified Zone	<p>The Proponent states in both the EIS and their response that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>In their IR response, the Proponent stated that the hydraulic conductivity used as the model base case (5x10-6 m/s) is similar enough to the geometric mean value (6x10-6 m/s) that no consequential change to the model would occur if the geometric mean were to be used. The use of the value of 5x10-6 m/s as the model base case was not substantiated.</p> <p>ECCC accepts the response to Part 1 of the IR as the Proponent has stated that 5x10-6 m/s and 6x10-6 m/s are similar enough hydraulic conductivities that redoing modelling with the geometric mean is not expected to consequentially change outputs for either the PHREEQC orFEFLOW model. However, the reasoning for selecting the value of 5x10-6m/s was not clear.</p>	Related to IR-89, while repeat modelling using the geometric mean hydraulic conductivity of 6x10-6 m/s is not required, include a statement in the EIS to indicate that the geometric mean hydraulic conductivity was not used in the model and providing justification for using the value of 5x10-6 m/s instead.	<p>The revised Draft EIS text (Appendix 7-C, Section 2.3.1.4 has been updated to report the geomean of the desilicified zone will be updated to 4.8x10<sup>-6</sup> m/s. The previously reported value of 6x10<sup>-6</sup> m/s was erroneous.</p> <p>“A hydraulic conductivity value of 5x10<sup>-6</sup> m/s was uniformly assigned to the model layers representing the Desilicified Zone. This value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10<sup>-6</sup> to 2x10<sup>-5</sup> m/s, with a geomean of 4.8x10<sup>-6</sup> m/s. As within other units, the geomean value was not applied directly, but rather a rounded value slightly higher than the geomean was applied throughout the entire desilicified zone. The value applied within the desilicified zone is considered conservative as it is a factor of 1.9 higher than the most-reliable hydraulic conductivity estimates (i.e., values obtained through pumping tests measured the conductivity as 2.7x10<sup>-6</sup> m/s) and is equivalent to the geomean value.”</p>
AD-67	Health Canada (HC)	Appendix 10-A, Section 3.2.1.3.1, p.3.43-3.44	<b>Inappropriate use of an outdated standard in assessing health and environmental effect(s) from</b>	The CAAQS are recommended as the most stringent air quality standard for assessing health and	Acknowledged. The reviewer is referred to the response to IR-190 for a discussion of the use / interpretation of the CAAQs in the EIS.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
			<p>short-term exposure to nitrogen dioxide (NO2).</p> <p>The Draft EIS technical supporting document (Appendix 10-A) appears to misinterpret Health Canada’s 2016 Human Health Risk Assessment for Ambient Nitrogen Dioxide (NO2) in setting its screening criteria and evaluating the health impacts from exposure to Nitrogen Dioxide. The document states:</p> <p>“Health Canada published a national one-hour maximum acceptable level of 400 µg/m3 for NO2 in ambient air using a risk assessment approach (Health Canada, 2016b). This value considers sensitive human populations.”</p> <p>This statement is inaccurate.</p> <p>As indicated in Health Canada’s 2016 publication, this value (400 µg/m3) refers to the National Ambient Air Quality Objective (NAAQO) for NO2, developed in the 1970s. The Canadian Ambient Air Quality Standards (CAAQS) were later developed in consideration of both human health and the environment to replace existing Canada-wide standards, including the NAAQOs, and in many cases are the most stringent Canadian air quality standard, guideline or objective.</p> <p>The new CAAQS for NO2 also recognizes that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). In other words, NO2 is considered to be a non-threshold substances, meaning that health effects may occur at any level of exposure. Therefore, guideline values should not be construed as limits to which polluting up to is allowed.</p>	<p>environmental effect(s) from short-term exposure to NO2 in the project.</p> <p>The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, Health Canada suggests using model results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The modelling results should be able to indicate the frequency of CAAQS exceedances, which can be used in the discussion as to whether any anticipated human health impacts are anticipated</p> <p>Modelled predictions within an air quality assessment’s study area should be compared to the most stringent air quality standards, guidelines or objectives applicable to the region that may be affected by project activities. In this case, CAAQS are the most stringent levels and CAAQS are not restricted to applications only within the context of the Air Quality Management System (AQMS). Evaluation against the CAAQS may be considered in determining the nature and severity of the project’s impact on air quality levels and the resulting mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS.</p> <p>As health effects can occur even at levels of exposure below the limits set out in the CAAQS, they should not be viewed as “pollute-up-to” levels. It should be acknowledgeable that health risks exist below the guidelines. In addition, the principles of keeping clean areas clean and continuous improvement are operative, thus proposed mitigation measures should not be confined to meeting the standards, but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>This advice is also relevant to IR-190 and may be of use in responding to that request for a comparison of the predicted maximum concentrations to the most protective applicable air quality standards available (i.e., CAAQS).</p>	

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-68	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	<p>ECCC recommended the inclusion of an assessment of potential GHG mitigation measures throughout all phases of the Project including a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the draft Technical Guide.</p> <p>ECCC also recommended the development of a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.</p>	Related to AD-49, ECCC notes the comment provided by the Proponent stating, “Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances”. ECCC continues to recommend that the Proponent align with best practices by including in the EIS a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination and a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.	The information presented in the Draft EIS meets the requirements of CEAA 2012. Per Denison’s response to AD-49 (Annex 1, page 419/419) the company will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances but is not intending to include this information in the revised Draft or Final EIS.
AD-69	CNSC	Appendix 16-C	<p>The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p> <p>The CNSC’s Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS), also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p>CNSC staff requested in the March 2023 letter to Denison (e-Doc 6991467) a Commitments Table for the Wheeler River EIS. This letter requested information of all commitments made by Denison with detailed information such as:</p> <ul style="list-style-type: none"><li>• details of the commitment</li><li>• which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>• where the commitment is referenced (which document, table, etc. and where it can be found)</li><li>• how this commitment will be tracked (project EA follow-up program, site-wide programs, etc.)</li></ul> <p>Several commitments to Indigenous Nations and communities from the August 2023 submission appear to be missing from this table and should be included in the next submission.</p>	<p>For the next draft EIS submission, the evergreen Commitments Table should be updated to include:</p> <ul style="list-style-type: none"><li>• which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>• how this commitment will be tracked (project EA follow-up program, site- wide programs, etc.) and;</li><li>• all commitments to Indigenous Nations and communities</li></ul>	Please refer to the commitments register included with Denison’s IR response package.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-70	ECCC	Appendix 16-C Summary of Monitoring & Follow-up Programs	ECCC recommended that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Related to AD-48, ECCC acknowledges that the Project will likely be required to report annually per section 46 of the Canadian Environmental Protection Act as the annual emissions are likely to be over 10,000 tonnes of CO2e. However, ECCC’s suggestion incorporates additional components to align with the goal outlined in Appendix 16-C of the draft EIS to “assess the environmental performance of the project relative to the predictive assessment that has been completed in support of the environmental assessment process”. This would involve comparing actual vs. estimated emissions following the terms of the SACC’s net GHG emissions equation and evaluating the effectiveness of GHG-related mitigation measures.	Greenhouse gas emissions (GHGs) were not included as a valued component in the EIS, and as such, Denison is not proposing to add GHG monitoring to the EA follow-up monitoring to remain consistent with the methodology and scope for an EA completed under CEAA 2012. The annual GHG reporting will provide the required and relevant information to regulators per the Canadian Environmental Protection Act. Denison’s ESG reporting framework will be developed as the Project advances and will be scoped beyond the components of the EIS.
AD-71	ECCC	Conceptual Caribou Management Plan	Section 4.2.1 of the Conceptual Caribou Management Plan states that "The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area." Calculation of home range is normally based on statistical analyses of telemetry data. Home range cannot be inferred from telemetry points and incidental observations from a map	Related to IR-149, the Conceptual Caribou Management Plan should be corrected to remove the reference to caribou home range.	Acknowledged - Version 2 of the Caribou Mitigation Plan (now titled Caribou Management Framework) has been updated to re-word the sentence highlighted by ECCC.  For reference and further information, it is noted that Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.



## Attachment: AD-50

Original IR Number	AD-50
Follow Up IR Number	n/a
Dept.	ECCC
Project effects link	n/a
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4.2, Wellfield Operation Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping
Context and Rationale	Providing a report or memo by the Proponent's consultant Newmans Geotechnique Inc. as a public record will more effectively explain the "information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting [sic] Saskatchewan mining operations", than a summary (attachment IR-10) of the material presented by Greg Newman during the meeting with the FIRT on April 19, 2023.
Advice to Proponent	The response from the Proponent in IR-10 is accepted based on the meeting between ECCC, Denison and the CNSC, as well as the Proponent's consultant and the presentation by Greg Newman (Newmans Geotechnique Inc.) as well as the summary of the meeting noted in attachment IR-10. However, the Proponent should provide a public record of the consultant's memo or a report that explains the details of the freeze wall containment and monitoring that were provided during the April 19, 2023 meeting instead of the summary provided by the Proponent in attachment IR-10.

### Denison's Response:

Below are the Newman Geotechnique PowerPoint slides from the April 19, 2023 meeting with the CNSC.



The image shows two slides from a presentation. The top slide is the title slide, and the bottom slide is the outline slide. Both slides have a dark blue background with a light blue abstract graphic on the right side. The top slide features the NGI logo in the top left corner, the title 'ISR Freeze-Wall Queries...' in large white text, and the subtitle 'PRESENTATION TO CNSC BY NGI' and 'APRIL 26, 2023' in smaller white text. The bottom slide features the NGI logo in the top left corner, the title 'Outline' in large white text, and a bulleted list of topics in white text. At the bottom of the bottom slide, there is small white text: 'Newmans Geotechnique Inc. www.ArtificialGroundFreezing.com' on the left, '1/15/2024' in the center, and '2' on the right.

 **ISR Freeze-Wall Queries...**

PRESENTATION TO CNSC BY NGI  
APRIL 26, 2023

 **Outline**

- NGI qualifications
- Ground freezing basics
- Phoenix deposit freeze-wall
- IR 10 Queries
  - Freeze-wall integrity for containing solution
  - Fluid pressure interaction with freeze-wall
  - Exothermic reaction of solution with freeze-wall

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## NGI qualifications

- Newmans Geotechnique Inc. (NGI)
- Freezing engineering since 1995
- Ground Freezing Consulting with focus on
  - Ground water control, ground stabilization using freezing
  - Mine planning, shaft sinking, civil works
  - Construction in natural or artificially frozen ground
- Uranium Mining Freezing Related...
  - Cameco McArthur River freeze-walls
  - Cameco Cigar Lake bulk freezing
  - NexGen Rook I shaft freezing
  - Fission Uranium bulk freezing
  - Cameco Rabbit Lake tailings thawing / consolidation
  - Areva – various studies

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## Ground freezing outcomes

- Controls water flow by reducing permeability
- Allows for short and long term strength gain and stability improvement
- Permeability
  - Water freezes over a range of temperatures below 0°C. Once mobile water in pores changes phase, water flow is so impeded it, in effect, ceases.
    - In sand, limited flow when colder than -1°C
    - In clay, limited flow at -2°C, no measureable flow when colder than -5°C
- Strength
  - Freezing strengthens porous materials by increasing cohesion
    - E.g. an unfrozen clay with cohesion of 1.7 MPa is weaker than pure ice with UCS of about 5 MPa
  - Frozen ground can experience plastic deformations (glaciers flow)
  - Mohr-Coulomb analysis shows static plastic yielding
  - Creep analysis shows time dependent elastic-plastic strains

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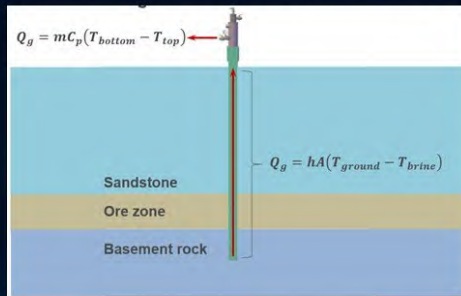
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## Ground freezing basics

- Has been used for over 120 years. First project was a 500 ft deep shaft in UK
- Inject chilled  $\text{CaCl}_2$  down poly tubes and it removes heat as it flows back in annulus between poly tube and steel casing.
- Pipes are "keyed" into basement rock to prevent bypass flows below.
- Pipes are installed from surface to create a barrier to flow over all depths.



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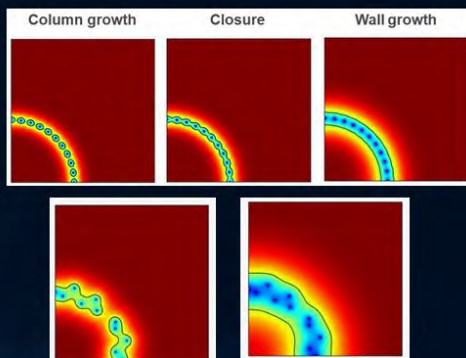
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## Ground freezing basics

- Ground heat is extracted around each pipe
- The frozen columns eventually "close" and water flows are cut off
- Over time, the freeze-wall grows much thicker.
- Deviation in drilling is forgiven over time



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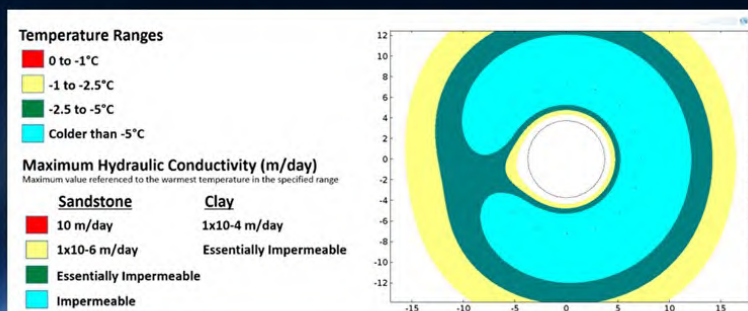




## Freeze wall influence on hydraulic conductivity

Temperature is related to hydraulic flow rates

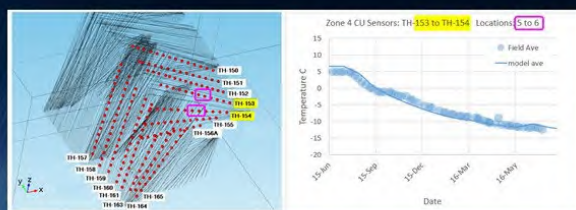
- As temperatures drop below freezing, the flow paths for liquid water to move are closed off
- The amount of reduction in  $K_{hyd}$  depends on ground type and temperature as shown here for a simulated shaft freeze where two pipes have been assumed permanently damaged and off line.



## Freeze wall creating a hydraulic barrier around a high grade ore zone (McArthur River)

Temperature strings installed offset from the wall used to:

- validate the models
- then use the model to understand the bigger picture

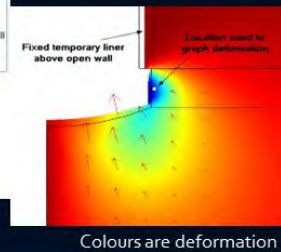
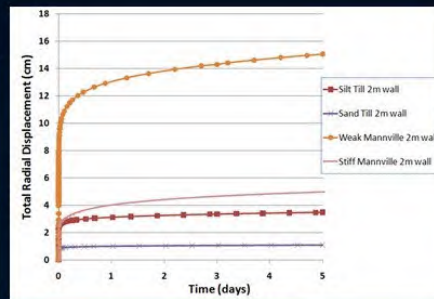
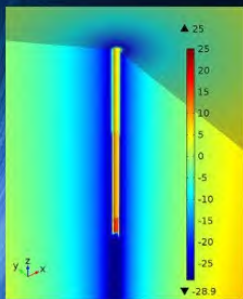




## Freeze wall stabilizing ground prior to large shaft excavation (BHP Jansen Mine)

Temperature is quite warm at base of shaft where cutting machine is working

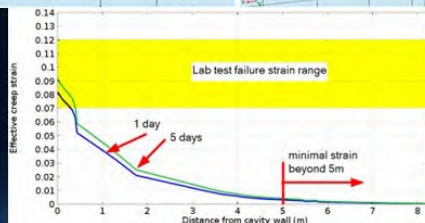
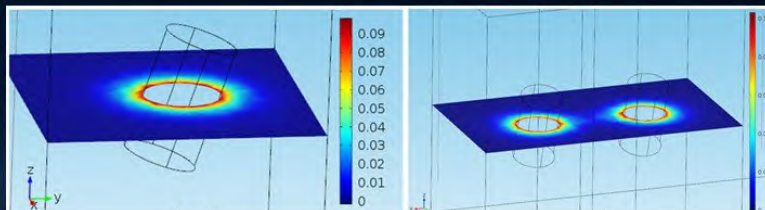
- Shaft opening is 10 m diameter in this case
- Freeze wall is blue in colour and stabilizes the ground to support the open shaft
- Deformations here are much more than anticipated at Phoenix given that freeze wall at Phoenix will be thicker than those used in this conservative model.



## Freeze wall stabilizing ground with Jet Boring mining at Cigar Lake (from CNSC presentation Aug 2013)

Jet boring cavities are 10 m high by 3.5 m diameter

- Ground is frozen
- Creep in frozen ground results in up to 22 cm displacement but corresponding strains are well below failure range

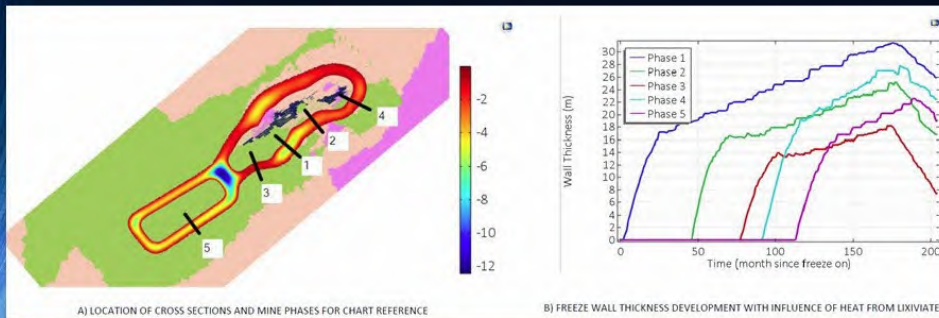






## Phoenix freeze-wall

- Frozen and mined in phases
- Freeze-wall is offset from ISR grid patterns by 27 m
- Freeze-wall grows very thick, wall growth is controlled by cycling on/off active freezing to limit over growing in thickness



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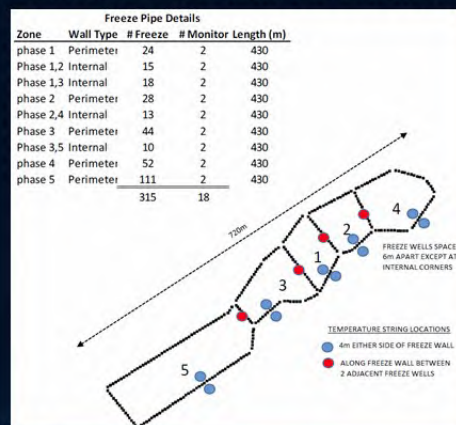
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## Phoenix freeze-wall

- Total of 315 freeze pipes and 18 dedicated thermal monitoring wells that have sensors spaced from below ore to surface
- Temperatures are monitored on both sides of the freeze-wall
- Data is used to calibrate the FEM model of the freeze over all ground types



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## CNSC IR 10 Queries

### 1 Freeze-wall integrity for containing solution

- Design meets all main criteria for a freeze-wall
- Freeze wall is keyed into basement and extends to surface so no overtopping or underflow
- Fluids are isolated – ground water cant get in, lixiviant cant get out
- Freeze wall is very thick (between 18 and 30 m) and is 27 m away from ISR injection and recovery wells
- Freeze wall temperatures are monitored and checked against thermal models

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## CNSC IR 10 Queries

### 2 Fluid pressure interaction with freeze-wall

- In deep shaft freezing or at McArthur River mine (530 to 640 m deep) there are mine openings at atmospheric pressure inside the freeze-wall with 6000 kpa fluid pressure outside the freeze wall.
- The walls at Phoenix will be much thicker than either the above and there will be fluid pressure on both sides of the wall.
- It is very very unlikely that the freeze wall will "see" pressure or stress gradients anywhere close to what it can withstand.
- Even if it did, freeze-walls are plastic and can deform without failing.

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## CNSC IR 10 Queries

### 3 Exothermic or other reactions of solution with freeze-wall

#### Freezing point of lixiviant...

- An acid/water strength of 80g/L H<sub>2</sub>SO<sub>4</sub> (~8% w/w) will freeze around -4 °C
- An acid/water strength of 55g/L H<sub>2</sub>SO<sub>4</sub> (~5% w/w) will freeze around -2 °C
- A peroxide/water strength of 15g/L H<sub>2</sub>O<sub>2</sub> (~1.5% w/w) will freeze around -1 °C
- A peroxide/water strength of 5g/L H<sub>2</sub>O<sub>2</sub> (~0.5% w/w) will freeze similar to water
- The freeze-wall will be formed with -30°C coolant. It will immobilize any lixiviant that flows near it. Potash mine shafts are frozen in saline soils with freeze points as low as those noted above.
- If lixiviant freezes off near freeze wall, it cannot bring in more solution to sustain an freeze-wall degradation

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## CNSC IR 10 Queries

### 3 Exothermic reactions of solution with freeze-wall

#### Exothermic Reactions...

- The ground at Phoenix is low sulphur content and should not generate much heat
- All design work so far assumed it DID generate heat and the freeze wall is maintained even assuming the entire ore phase region is generating heat.
- The freeze walls at McArthur River routinely withstand the heat of hydration of stope concrete backfilling where temperatures reach in the 50 °C range over the short term.
- The freeze walls in mine shafts routinely withstand ventilation heat in the range of 20 to 30 °C
- The peak temperature is not the sole issue. It is the peak T and the rate of heat generation. The freeze wall continually removes heat on both the ore and non ore sides. Even if the ore side warms due to lixiviant, most of that heat will not flow past the mid-line of the freeze wall so the wall thickness on the non ore side is not significantly impacted.
- If actual temperature monitoring shows the ground near the freeze wall warming more than anticipated, the freeze plant on/off cycling can be changed or the coolant temperature lowered.

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## CNSC IR 10 Queries

### 3 Exothermic reactions of solution with freeze-wall

#### Exothermic Reactions...

- "WHAT IF" models were solved

Ore Zone Sustained T	Freeze Plant Cycling?	Freeze wall Status
10 (base design case)	Yes	No impact
30	Yes	Thins but stable
50	Yes	Thins but too thin, possible issues
50	No	Thins but stable

There are controls that can be applied based on field observations

**ANNEX 1 TO FIRT ROUND 2 IR RESPONSE PACKAGE FEBRUARY 2024 (Complete  
Wheeler River Project FIRT IR Round 1 Response Package)**

Annex 1 Responses to Information Requirements

**Federal Indigenous Review Team (FIRT) – Denison’s Responses to Information Requirements for the Wheeler River Project Environmental Impact Statement**

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-01	English River First Nation (ERFN)	Current use of lands and resources for traditional purposes	General	<p><b>Context:</b> Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the <i>Traditional Knowledge Study and Health and Socio-Economic Study Report</i>. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN’s rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user.</p> <p><b>Rationale:</b> It is important for the proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and sociocultural and economic perspective.</p>	<p>The draft EIS should be revised to reflect the totality of ERFN TK and land use information.</p> <p>Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated.</p>	<p>Denison has met with ERFN regarding the IR and has gained a better understanding of the specific concern raised in the IR. ERFN's relationship and connection to the land is important. Denison will continue to work with ERFN to refine its understanding of this relationship and will work with ERFN to make sure this is accurately reflected in the final EIS.</p> <p>Despite the passing of the late trapper/resource harvester referred to throughout draft EIS, ERFN has communicated to Denison that ERFN considers his use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use. Changes will be made throughout the EIS to reflect that the late ERFN land user is but one of many current and future land users, and should be considered as representative of future land uses and expression of rights.</p> <p>For example, statements about the land being inactive at this time or statements that suggest that other land users are limited or have not provided documented use of the area will be removed and repositioned so as to reflect the importance of the area to ERFN. This may result in the inclusion of additional mitigation and enhancement measures. Denison will continue to work with ERFN on the list of Project elements that ERFN feels required additional refinement or that are sources of concern as the EIS review process continues.</p>	<p>As noted in the IR response, the final EIS will be updated. To support review of the response, a few examples of updates to the draft EIS are provided, with new text in <b>bold</b>, and deleted text in <del>strike</del>through:</p> <p>Example 1:</p> <p><i>10.1.6.1.4 Human Health Risk Assessment Results</i> (excerpt only) The ingestion rate for caribou, based on engagement with a local fisher/trapper, was 175 kg/yr of caribou (equivalent to approximately 2 to 3 servings per day). This ingestion rate is conservative compared to an annual caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) from the ERFN’s Country Food Study (CanNorth 2017) and 54.4 kg/yr for the total game diet for a high traditional foods consumer in the Boreal Shield as per the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al. 2018). Thus, the local fisher/trapper <b>represents</b> <del>is relatively extreme</del> <b>an intensive land user</b> with respect to local game consumption. <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 2:</p> <p>10.1.6.2 Residual Effects Characterization (excerpt only)</p> <p>For non-carcinogens, the results of the HHRA predicted no exceedances of the HQ benchmark (HQ&lt;0.2) for human receptors for non-carcinogens (cadmium, copper, chromium, cobalt, molybdenum, uranium, and zinc) during all phases of the Project. The one exception was selenium for the fisher/trapper at Russell Lake, where the incremental Project HQ for the fisher/trapper from fish ingestion (northern pike and white sucker) was predicted to be 0.93. <del>The traditional foods diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper which is representative of one person, who consumes a unique composition and quantity of traditional foods. Most</del> <b>Many</b> people fishing, hunting, and trapping in the Project Area would consume traditional foods more consistent with the average traditional foods consumer diet, which was developed from the ERFN country foods study (CanNorth 2017). <b>Denison recognizes that ERFN considers the fisher/trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project Area will be continued and strengthened through generations of future use.</b></p> <p>Example 3:</p> <p>11.1.2.1 English River First Nation</p> <p>Indigenous Knowledge (referred to as Traditional Knowledge or TK by the ERFN) was provided by ERFN for consideration in the EIS. This included several reports:</p> <ul style="list-style-type: none"><li>• <i>Wheeler River Project – Summary of Health and Socio-Economic Study Results</i>, which summarizes results from 16 interviews that were conducted for the health and socio-economic topics (ERFN and SVS 2022a).</li></ul>

<sup>1</sup> Unless otherwise stated, the section noted refers to the draft EIS.  
<sup>2</sup> Where IR contents note “See also related IR(s)”, responses from Denison may be similar or provided in a single detailed response, but it was preferred to keep original IRs distinct.



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							<ul style="list-style-type: none"><li>• <i>Wheeler River Project - Summary of Traditional Knowledge Study Results</i>, which analyzed and presented results from 21 land use interviews that provided both IK and LK and included details on ERFN’s resource harvesting locations, species harvested, travel routes, cabins and special sites (ERFN and SVS 2022b).</li><li>• <i>The English River First Nation Country Foods Study Final Report</i>, which conducted in 2016 through funding secured from the First Nations Environmental Contaminants Program to complete a country foods study. The study involved three components: a dietary study, a sampling program, and a human health risk evaluation. The overall study objectives were to examine country food usage by ERFN community members and to assess if the country foods are safe to eat. The involvement of ERFN community members was one of the fundamental goals of the study, which relied heavily on TK to identify what and where to sample (CanNorth 2017a).</li><li>• <i>The English River First Nation Aboriginal Traditional Knowledge Summary Report</i>, which was compiled by Environment Canada on behalf of ERFN to summarize information for the purposes of recovery of the Woodland boreal caribou population. Ten individuals (mostly Elders) were selected by ERFN to complete TK interviews to understand boreal Caribou in the English River Traditional Territory (ERFN 2011).</li></ul> <p>Local Knowledge also was provided by an ERFN trapper, fisher, and resource harvester (ERFN Trapper) who resided in and conducted resource use in the Project Area. The ERFN Trapper explained the use of the area by outfitters and cabin lease holders, fish and wildlife abundance and distribution, species harvested for traditional use, and navigation and travel along waterbodies and roads. On October 29, 2019, at Denison’s Project exploration camp, the resource user attended a full-day interview. Notes from this interview were finalized on January 2, 2020, with their approval and are used in most ILRU components herein. Unfortunately, prior to the filing of the EIS, the ERFN Trapper passed away. <b>Despite his passing, ERFN considers the ERFN Trapper’s use of the area as representative of current and future land users and expects that the relationship to the Project area will be continued and strengthened through generations of future use.</b></p>
IR-02	Canadian Nuclear Safety Commission (CNSC)	Mitigation Measures	General  Appendix 16-C	<p><b>Context:</b> Denison’s 2019 Wheeler River Terms of Reference states: “The EIA will also discuss the monitoring programs required to demonstrate regulatory compliance and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.”</p> <p>The CNSC’s <a href="#">Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS)</a>, also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p><b>Rationale:</b> The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p>	CNSC staff expect Denison to provide a comprehensive list of commitments along with the next version of the EIS, including any commitments made to Indigenous Nations and communities and other stakeholders (As committed in the Wheeler River Terms of reference, and as noted in the November 28 <sup>th</sup> , 2022 email from CNSC staff to Denison: <i>Future Submission of a Commitments Table for Wheeler River EIS</i> ).	A list of commitments, including specific commitment or mitigation measures related to Project effects as an outcome of engagement, made in the draft EIS, throughout the Federal information request period and the Provincial comment response period, will be included with the submission of the revised draft EIS. For clarity, this would not include any private, confidential accommodations made under contractual agreements.	No EIS updates are anticipated to address this IR at this time.  Denison acknowledges that a comprehensive list of Project-related commitments will be provided for the record as part of the process of finalizing the EIS.
IR-03	CNSC	Site preparation	Section 1.3.2 Temporal Boundaries	<p><b>Context:</b> The EIS and TSD-ERA provide assessment on the project timeframe, including construction, operation, and decommissioning phases.</p> <p><b>Rational:</b> The site preparation phase is not included in the timeframe</p>	Please provide an assessment of those facility characteristics and activities that may interact with the environment during the site preparation phase, along with an assessment of their potential effects, in order to reflect the entire lifecycle or provide a rationale for its exclusion.	The EIS phase 'Construction' includes site preparation activities and as such these site preparation activities have been assessed within the EIS and the supporting documentation, including Appendix 10-A.	Section 5.3.4 of the final EIS will be modified as follows:  Temporal boundaries are based on the different phases of the Project: <b>Construction (including</b>

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			Appendix 10-A (ERA)	(EIS and TSD-ERA). As per REGDOC 2.9.1, the sub-section 4.1.1 Complexity of the environmental risk assessment requirements states that “The applicant or licensee shall identify facility characteristics and activities that may interact with the environment during the relevant phase of the facility or activity’s lifecycle (for example, site preparation, construction, operation, and decommissioning.”		<p>EIS Section 5 Approach and Methodology of the Assessment, Section 5.3.4 outlines the temporal boundaries for the assessment and the Project activity tables used throughout the EIS include elements of site preparation in the Construction phase. The list of key project activities included in the Construction phase are included below; elements related to site preparation are shown in <b>bold</b>:</p> <p>Construction Activities</p> <ul style="list-style-type: none"><li>• <b>Development of access roads and air strip</b></li><li>• <b>Site preparation and earthworks; clearing, levelling, and grading of the Project Area</b></li><li>• Power generation - generators</li><li>• Installation of main substation and distribution of power around site</li><li>• Wellfield and freeze hole drilling; ground freezing</li><li>• Batch plant operation (concrete); crusher at borrow area</li><li>• Development of surface infrastructure (camp, operations centre, plants, ponds, pads, and support facilities)</li><li>• Waste management (composting, domestic and industrial landfill operation, recycling)</li><li>• Water management (including treatment and site runoff)</li><li>• Groundwater supply</li><li>• Surface water withdrawal</li><li>• Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)</li><li>• On-site and off-site operation of vehicles and transport of materials</li><li>• Air transportation for workers</li><li>• Regulatory site inspections</li><li>• Engagement – site visit from Interested Parties</li></ul>	<p><b>site preparation), Operation, Decommissioning, and Post-Decommissioning</b>, as described in Table 5.3-3.</p> <p>Section 1.3.2 of Appendix 10-A will be modified in the final EIS as follows:</p> <p>Consistent with the Wheeler River Project EIS, the temporal boundaries of the assessment include the following Project phases: construction (<b>which includes site preparation</b>), operation, decommissioning, and post-decommissioning (Table 1-1).</p>
IR-04	Environment and Climate Change Canada (ECCC)	Fish and fish habitat	Section 2, Project Description Section: Glossary	<p><b>Context:</b> The Proponent defines ‘clean waste rock’ as “Waste rock generated as sandstone cuttings and core from drilling activities associated with well and freeze hole development that does not have uranium containing materials”.</p> <p>ECCC notes that the use of the term “Clean Waste Rock” could be misunderstood to mean that the waste rock is devoid of any contaminant. Even when the waste rock referred to as “clean waste rock” does not contain uranium materials, it could contain other metals or contaminants that could have adverse environmental effects. It is also not clear whether the “clean waste rock” is characterized for Acid Rock Drainage/Metal Leaching (ARD/ML) given that some portion of the basement rock is to be drilled out to anchor the freeze walls and may have ARD/ML potential.</p> <p><b>Rationale:</b> The current definition of ‘clean waste rock’ in the draft EIS could lead to inappropriate handling and disposal if it is assumed to be devoid of any metals or other contaminants that might negatively affect the environment.</p>	Provide a clear and more detailed definition of the term ‘clean waste rock’.	<p>Clean waste rock is defined as non-mineralized and non-potentially acid generating (PAG) rock. Clean waste rock will be sent to a storage pad (clean waste rock pad) that is proposed to be lined with an impermeable geomembrane collecting precipitation that will be monitored for quality and would allow for treatment if necessary.</p> <p>The clean waste rock pad is expected to hold approximately 7,800 m³ of clean waste rock.</p> <p>Further characterization and test work are ongoing to confirm the ARD/ML characteristics of this waste rock. From the historically completed testing it is recognized that the non-mineralized mine rock is expected to include both non-PAG and PAG mine rock.</p> <p>The clean waste rock pile is being evaluated for potential segregation of the PAG mine rock. However, it is noted that, as observed in the six field barrel tests on Phoenix mine rock, including four bins that were identified as containing PAG mine rock, no net-acidity was observed over at least the first two years of the field barrel testing. In all barrel tests the pH values were greater than 7 and were producing substantial alkalinity (SRK, 2020). This indicates that the potential lag-time to net-acid generation would be on the scale of years and monitoring/collection/potential treatment could be pursued as conditions at the clean rock pile develop.</p> <p>It is noted that the non-mineralized mine rock is expected to have central tendency (i.e., median) solids contents that are generally similar to the average upper continental crustal abundance contents (Rudnick and Gao, 2014).</p> <p>The field barrel tests have all maintained neutral pH conditions and metals concentrations and their respective loading rates have generally either been stable or decreasing over the test duration (SRK 2020). However, further testing is required to confirm the expected behaviour at field-scale over operational-timescales.</p> <p>It is noted that comparing field barrel leachate concentrations are not directly representative of expected contact water within an at-scale storage pad; however, it is recognized that the clean waste rock pad is of a modest size and that loadings to contact water are expected to be directly correlated with the quantity of rock held within a catchment. Further, the barrel tests were performed on materials that were crushed to less than 1mm, field-scale mine rock of larger grain sizes would be expected to have appreciably lower mass loading rates than the unit rates observed in the field cells.</p> <p>Confirmatory sampling of both the waste rock and drainage at the clean waste rock is planned during both construction and operations.</p> <p>References:</p> <p>Rudnick, R.L. and S. Gao. 2014. Composition of the Continental Crust. Treatise on Geochemistry (Second Edition) Volume 4, 2014, Pages 1-51</p> <p>SRK Consulting Inc. (SRK).2020. Wheeler River On-site Kinetic Leach Tests, Progress Update – Draft. Prepared for Denison Mines Corp. January 2020.</p>	<p>Section 2.2.4.8 of the final EIS will be updated as follows:</p> <p>Clean waste rock (<b>non-mineralized and non-potentially acid generating [PAG] rock</b>) will be generated as sandstone cuttings and core from drilling activities. Based on the current wellfield and freeze wall design, approximately 7,800 m³ of clean waste rock will be generated. Clean waste rock will be stored on a 2,500 m2 single geomembrane liner (Figure 2.2-26) and can be used for road construction and/or concrete production. <b>The clean waste rock will be assayed and tested for PAG during Operations to ensure the material can be reused when required.</b></p>
IR-05	CNSC	Change to an environmental component due to hazardous contaminants	Section 2.2.1.2	<p><b>Context:</b> Water volumes for mud/diamond drilling is listed as minimal as the mud will be re-used. The mud is identified as a mixture of water, clay, and environmentally friendly polymers that clean out the cuttings and help to keep the drilling bit cool.</p> <p><b>Rationale:</b> Although the mud for drilling will be re-used, there could be environmental impacts should there be an accident while drilling.</p>	Please identify the components of the environmentally friendly polymers for the drilling mud and potential environmental impacts should the mud not be recovered.	Two primary drilling methodologies are planned for the development of the wellfield that will be comprised of monitor, injection, recovery and freeze wells. The two primary forms of drilling are diamond and mud rotary drilling. Diamond drilling will be used for freeze, monitor and small diameter injection wells. Mud rotary drilling will be used for recovery and larger diameter injection wells. Both methodologies employ similar mud management programs as part of the drilling process in that they both use a combination of light polymer and bentonite products to stabilize the subsurface formation during drilling and well installation.	No EIS updates are anticipated to address this IR at this time.

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						<p>Various products are used at specific depths to stabilize the formation and include Ultra PAC, Sawdust, Prima Seal, Premium Gel, Prairie Drill, KCl, Hyper drill, Hydrated lime, Envirofloc, Caustic Soda, Calcium Chloride, Purevis and bentonite. All products used on the Wheeler River Project are considered environmentally friendly and safe for use for workers as indicated by their respective safety data sheet (SDS) and product data sheet (PDS. The use of drilling muds was addressed within the A&amp;M hazards screening (Table 3-2; in Appendix A of Appendix 14-A) and characterized it as a low risk event.</p> <p>Potential worker safety risks primarily include slipping hazards at the worksite as the products generally create non-adhesive bonds in surfaces that are contacted.</p> <p>All of the products used are routinely landspread on farmer’s fields in the Oil and Gas industry in both Saskatchewan and Alberta at the same quantities or greater proposed for use on the Wheeler River Project. As a vast array and combination of products are used, the specific compositions are not presented herein but are available upon request.</p>	
IR-06	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>• feasibility of meeting remediation targets.</li><li>• groundwater flow conditions and validation of flow models.</li><li>• mobilization of contaminants (e.g., Al, Se or V).</li><li>• potential for free gas evolution/two-phase flow.</li><li>• identifying composition of lixiviant and production solutions.</li><li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>	Please see Attachment IR-06.	<p>The following text will be added to the final EIS, under a new heading, Section 2.2.1.6 ISR Mining-Related Inputs for the EIS:</p> <p>It is important to note that Denison is completing a sequential EA and licensing process for the Project (see Section 1). Detailed ISR mining-related information needed to support licensing and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.</p> <p>For the EIS, an understanding of ISR design is needed to describe potential effects related to Project activities within the biophysical environment (EIS Part II, Section 6 to 9), human environment (EIS Part III Sections 10 to 13), and accidents and malfunction (Section 14) assessments. Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.</p> <p>Importantly, since the mine design includes the freeze wall, movement of mining solution is restricted and contained horizontally during operations. Wellfield pumping provides the hydraulic containment to keep mining solution within the 50 m mining area (see Section 2.2.1.4.2). During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface water or down gradient groundwater environments, and the groundwater assessment (Section 7) focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions. During mining area remediation (see Section 2.3.3.1.1), the freeze wall will remain in place until decommissioning objectives are achieved. Refinement of the mining area decommissioning objectives and associated modelling will be done through updates to the Decommissioning Plan, and will be bounded by the objectives evaluated in the EIS.</p>
IR-07	ECCC	Fish and fish habitat	Section 2.2.1.4.2, Wellfield Operation  Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	<p><b>Context:</b> The description in Sections 2.2.1.4.2 and 2.2.1.4.2.2 refer to the differential rates of injection and withdrawal, which implies that more solution will be withdrawn through the recovery well than volume of mining solution injected. According to the description of the site, a freeze wall will create a barrier between the uranium deposit to be mined and outside the isolated area to prevent inflow of groundwater from the sandstone outside the freeze wall. Secondly, it was indicated that the basement rock below the uranium deposit will prevent infusion of groundwater from below.</p> <p>The Proponent stated that inward hydraulic gradient will be created</p>	Clarify where the extra groundwater will come from to sustain this differential rate of injection and withdrawals during operation and if this extra water has been accounted for in the model and the amount of water that ends up in the receiving environment.	<p>The freeze wall will provide hydraulic containment between the internal wellfield and the external regional groundwater system with each well pattern maintaining a minimum 1% 'bleed' to maintain hydraulic gradients towards recovery wells.</p> <p>The "extra" water pumped (i.e., the water pumped in excess of injection) will be derived from stored groundwater within the sandstone units above the ore zone, and from the underlying paleoweathered zone, within each phase of Operation that is surrounded by freeze walls. The volume of stored water was estimated using the calibrated groundwater flow model, which contains 3D volumes for the saturated soil and rock within each of the walled phases, including appropriate porosity values. These volumes of stored water were compared to the volume pumped within each phase of operation, over the expected period of extraction</p>	No EIS updates are anticipated to address this IR.



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				<p>by recovering more solution than is being injected. In general, the wellfield will operate to draw a minimum of 1% more solution out of the wellfield compared to solutions injected in. This will help avoid increased subsurface pressures from injection pressure build up within the deposit.</p> <p><b>Rationale:</b> It is not clear where the extra groundwater will come from that will sustain this differential rate of injection and withdrawals as the freeze wall and bedrock basement will isolate the injection well from groundwater.</p> <p>If it is assumed that there is limited amount of groundwater present in the sandstone layer above the uranium deposit, that amount of groundwater in the sandstone layer is finite and will be exhausted at some point. Therefore, it is not clear where the extra groundwater will come from. If the extra volume of water is not accounted for in the modelling, that would ultimately affect the volume of water that ends up in the receiving environment and likewise the amount of contaminants contained.</p>		<p>based on the mining plan. The stored volume of water was calculated to be 3.4 (Phase 1) to 9.7 (Phase 4) times the estimated excess pumped volume. In other words, there is ample stored water within each walled phase to supply the excess pumped volume. The excess pumping creates a hydraulic gradient toward the ore zone within each walled phase, which will help to avoid vertical spreading of the UBS during operations. If monitoring during operations indicates water levels are falling quicker than anticipated, additional water could be added within the walled phase, within the Upper Sandstone Aquifer.</p> <p>The volume of water reduction within each phase of operations was evaluated within model simulations presented in Appendix 7C, Section 2.7. The volume reduction within mined phases was found to be minor compared to the volume of water pumped from the Upper Sandstone Aquifer located outside the freeze wall confines and within the regional groundwater system during decommissioning (i.e., pumping at 35.5 m<sup>3</sup>/hr). The pumping of groundwater for process water results in an order of magnitude more water volume extraction than the estimated volume required to replenish stored water when the freeze walls are thawed.</p>	
IR-08	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.1.4.2.2 Project Description	<p><b>Context:</b> This section describes how an inward hydraulic gradient will be created within the mining area as a secondary containment method for control of mining solution. While the process is described, there is no information on contingency measures in place for pump failure or system maintenance solutions. There is also no information on how quickly the hydraulic gradient, and therefore secondary containment, would be compromised if any pumps stopped working. It is also unclear how primary containment (i.e., well design) failure, such as physical/mechanical issues compromising casings, would affect the creation of the hydraulic gradient and secondary containment as well.</p> <p><b>Rationale:</b> It is important to have contingency planning in place in the event that there are any issues with the hydraulic gradient and secondary containment system for control of the acidic mining solution.</p> <p>There is no information in this section on how the hydraulic gradient (i.e., secondary containment) would be maintained if a well or pump (i.e., Primary containment) experienced problems.</p>	Provide further information regarding how the inward hydraulic gradient system functions, with particular focus on how the hydraulic gradient and secondary containment will be maintained if any wells or pumps were compromised.	<p>The following highlights the three levels of containment that will be in place to mitigate the potential for loss of containment of the mining solution. Mining solution containment was discussed in the draft EIS, Section 2.2.1.4.2 Wellfield Operation. As noted in the IR, the hydraulic gradient created in the mining zone between injection and recovery wells provides for secondary containment.</p> <p>i. Primary Containment (Well Design) The well configuration is designed to make sure fluids, whether injected or extracted, are confined to set depth locations. In the case of most injection and extraction wells, this would refer to the surface injection point and the screened location at the ore zone depth. The cased and sealed well in all other portions of the well design ensure no interaction with groundwater from other formations from surface to the deposit depth, thus preventing dilution from inward fluid flow of formation waters or outward migration from the well. Well integrity is monitored through live pressure monitoring systems in the annulus of the wells for leak detection and scheduled compliance checks via wireline tools of well integrity.</p> <p>ii. Secondary Containment (Hydraulic Gradient) Hydraulic gradients within the wellfield are maintained initially on a per pattern basis comprising of a single extraction well with four injection wells. In this initial stage of wellfield operations, all solutions from the four injection wells are drawn towards the single extraction well. As wellfield development progresses subsequent adjacent patterns are constructed. In these subsequent stages, the fluid from the injection wells is now drawn toward multiple extraction wells, essentially dividing the recovered solution between the number of operating extraction wells. As subsequent progression of wellfield development evolves, the inward hydraulic gradient of fluids injected will be further divided by adjacent extraction wells.</p> <p>In upset conditions, such as pump failure, or during scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. This is a standard approach used in ISR mining. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.</p> <p>iii. Tertiary Containment (Freeze Wall) The freeze wall provides two main benefits:</p> <ol style="list-style-type: none"> <li>A defined area for the mining process to occur with the establishment of clear ‘no flow’ boundaries being the freeze wall itself.</li> <li>Essentially removes the effects of the regional groundwater system and regional hydraulic gradient within the confines of the freeze wall. In the event of an upset condition, groundwater velocity is essentially null preventing any migration of fluids up or down gradient. This allows time to recover any fluids in a controlled manner while re-establishing operating conditions in what would otherwise be considered a ‘stagnant’ system.</li> </ol>	<p>The following text will be added to the final EIS in section 2.2.1.4.2.2 Secondary Containment of Mining Solutions.</p> <p>“In the case of an upset condition, such as pump failure, or scheduled pump maintenance when a given extraction well would be shut down purposefully, the fluids that would normally be recovered by a particular extraction well would then temporarily be recovered by one of the adjacent extraction wells within the larger extraction well network. When the upset conditions or scheduled maintenance have been completed, the “normal” mining solution recovery pattern would be restored to the original flow path. In this way, and by design, hydraulic containment is maintained at all times.”</p>
IR-09	CNSC	Geology and Groundwater	Section 2.2.1.4.2.2	<p><b>Context:</b> This section indicates that mining solution within the mining area can primarily be controlled by maintaining an inward hydraulic gradient. The inward hydraulic gradient will be created by recovering more solution than is being injected.</p> <p><b>Rationale:</b> If, for some reason, the recovered solution is much more than that being injected, an excessive drawdown could be created. If, by accident, mining solution is leaking into the upper sandstone aquifer through crack in injection/recovery well casing at the same time, it would be challenging to remediate the upper sandstone aquifer in dry conditions (due to excessive drawdown).</p>	Please clarify if any measure will be implemented to avoid excessive drawdown and develop contingency measures to address such accident.	<p>The measures that will be implemented to avoid excessive drawdown are as follows:</p> <p>Continuous (real-time) water level monitoring will be implemented for hydraulic head measurements in individual wells as well as the surrounding open aquifer system contained within the boundaries of the freeze wall. These monitor wells will be installed at various depths throughout the mining area (i.e., within the freeze wall) ranging from the shallow groundwater system to the deposit depth and further, through the paleoweathered zone, into basement rock below the deposit and mining horizon. The mining methods operational success and efficiencies are benefitted by maintaining a shallow depth to water to reduce the magnitude of hydrostatic head needed to be applied to pump within each recovery well.</p> <p>In the event that excessive drawdown was identified through the monitoring system, it could be mitigated. Water would be pumped into the overburden aquifer to offset such injection and pumping imbalance. Water sources would include those from both groundwater and surface sources previously assessed.</p> <p>It is noted that leakage of “mining solution” into the upper aquifer is a hypothetical accident</p>	No EIS updates are anticipated to address this IR.

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						or malfunction that would not be allowed to persist as it would be identified by monitoring. Individual wells will be monitored for integrity and well operation would stop if a leak were detected to prevent or limit migration of fluid outside of the mining zone. Further, all monitor, injection and recovery wells can be retrofitted with down hole pumps to recover solution that may have leaked or migrated in an upset condition. Additional recovery wells can be installed at select depth to further increase recovery if the need should arise.	
IR-10	ECCC	Fish and fish habitat	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>	<p>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</p> <p>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</p> <p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p><b>Technical Discussion Required:</b> Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause.</p>	Denison met with the FIRT reviewers on April 19, 2023 to discuss the response to IR-10. Greg Newman, from Newmans Geotechnique Incorporated, attended the meeting to provide information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting Saskatchewan mining operations. A written response to IR-10, summarizing the material presented by Greg Newman, is included here as Attachment IR-10.	No EIS updates are anticipated to address this IR.
IR-11	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3 Project Description	<p><b>Context:</b> It is unclear how much contact water may be produced during the drilling of the mine well field during the construction phase of the proposed Project. Figure 2.2-14 indicates that no water will be produced during the drilling process in the construction phase. In Section 2.2.1.2 both mud rotary drilling and diamond drilling are proposed for the creation of wells. Both processes require water, however only mud rotary drilling produces liquid mud that is then reused in the drilling process.</p> <p><b>Rationale:</b> It is unclear if the liquid mud produced during drilling can be reused indefinitely with further water additions, or if this eventually becomes the clean sand grain cutting and how it will be disposed of (i.e., liquid or solid waste). If the mud produced from drilling is classified as liquid waste and disposed of as contact water, it is not clear if this is accounted for in the site water management plan and water balance during the construction phase. Contact water from well drilling during the construction phase has not been quantified or accounted for in Figure 2.2-1, and therefore it is unclear if proposed infrastructure during the construction phase has the capacity to contain this waste stream in addition to the waste streams currently outlined in Figure 2.2-1.</p>	Provide further information on potential wastewater produced during the construction phase from drilling processes, and if proposed infrastructure can contain any water produced.	A centrifuge will be used for separating out solids during both diamond and mud rotary drilling to recycle fluids. Only solid drill cuttings, not wastewater, will be produced and all muds and waters will be recycled as part of the drilling process. Upon completion of a drilling campaign, all remaining mud and water will be stripped of remaining solids, treated with mud zymes to break down polymers, and injected back down into the mineralized horizon. During active drill campaigns clean water will be held in approved tanks as part of the drill program between well drilling.	No EIS updates are anticipated to address this IR.
IR-12	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p>	<p>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</p> <p>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</p> <p>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</p>	<p>1. and 2. Denison's approach to site water management is keep non-contact water “clean” – that is, the management approach provides that non-contact water does not come into contact with site aspects that may impart constituents/contaminants of concern and that non-contact water mingles with contact water. Contact water is water expected at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17), and also includes leachate collected from landfills. As such, runoff from the airstrip and site roads is considered non-contact water and will not be actively managed. However, should a spill occur, the spill response plan will be followed. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs.</p> <p>By following best practice and mitigation measures outlined in the EIS, Denison does not anticipate a need to continually manage water at the airstrip or along site roads as the water here will be clean, non-contact runoff. Examples of relevant mitigation measures include:</p> <ul style="list-style-type: none"> <li>• Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>• Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li> <li>• Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li> <li>• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul> <p>Refer to Section 14 of the draft EIS for the screening and evaluation of various accident and malfunction scenarios. Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Additionally, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water</p>	No EIS updates are anticipated to address this IR.

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				<p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.</p>		<p>removal means such as vac trucks or sump pumps could be employed and the areas would be re-graded to minimize water accumulation.</p> <p>3. As indicated in the response to IR-12, points 1 and 2 above, Denison expects contact water requiring management is at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17). For this area, the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m<sup>3</sup>. The wellfield runoff pond has been sized appropriately (38,200 m<sup>3</sup> with 1 m of freeboard) to contain this volume of water.</p> <p>4. Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.</p>	
IR-13	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	<p><b>Context:</b> The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).</p> <p>It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.</p> <p><b>Rationale:</b> ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.</p> <p>Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.</p>	<p>Please provide:</p> <p>1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching;</p> <p>a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML.</p> <p>b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.</p> <p>2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,</p> <p>3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.</p>	<p>1. The waste rock from the basement is potentially acid generating due to localized pyrite mineralization. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units. Rock recovered from basement during drilling will be further characterized prior to or during drilling activities.</p> <p>1a. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further explorative works are ongoing part of ongoing Engineering activities and with confirmation of characterization through assays of representative samples.</p> <p>1b. Basement rock will be tested for potential for acid generation. It is expected that a portion will be potentially acid generating. Select and systematic assays are conducted to characterize pyrite distribution throughout the deposit and adjacent geological units.</p> <p>2. All basement rock will be stored on the special waste pad. Waste rock from the sandstone will also be characterized primarily based on geological and geochemical characteristics, and if a portion of the waste rock is potentially acid generating, it will also be stored on the special waste pad. See also response to IR-04</p> <p>3. Clean waste rock will be generated as sandstone cuttings from drilling activities. Clean waste rock will be stored on the clean waste rock pad. The clean waste pile will be assayed and tested for Potential Acid Generation (PAG) during operations to ensure the material can be reused when required. Potentially acid generating waste rock will be stored on the special waste pad. Special waste is defined as mineralized materials that cannot be disposed of in the clean waste pile. It is primarily made of drill cores and cuttings from wellfield construction. A double-lined process water pond with leak detection has been designed to capture water from various areas, including the process precipitates storage pad and special waste pad. The pond will be designed to hold up to 30,000 m<sup>3</sup> of water and will be located next to the processing plant. The pond has been designed to hold a probable maximum precipitation event. The pond will be able to receive water from all site ponds and monitoring wells.</p> <p>The ponds that are designed to receive materials recovered during drilling activities are all lined with a leachate collection pond that will be monitored for water quality. The environmental monitoring program that will be presented during licensing will cover characterization of materials placed in the clean and special waste ponds to ensure environmental protection.</p>	<p>Section 2 of the final EIS will be updated per below:</p> <p>2.2.4.7 Special Waste and Special Waste Pad</p> <p>During Operation, the special waste pad is expected to contain special waste that is primarily mineralized core, <del>and</del> cuttings from wellfield development, <b>basement rock, and any waste rock determined to be potentially acid generating (PAG)</b>. Special waste from drilling activities is defined as uranium containing materials that cannot be disposed of in the clean waste pile, <b>including PAG waste rock</b>. Special waste will be determined by Denison geologists based on ore zone intersection expectations, <del>and</del> probe reading taken during wellfield drilling activities, <b>and results of systematic assays to characterize the acid generating potential of the waste rock</b>. Based on the current wellfield and freeze wall design, approximately <del>150</del> <b>2,000</b> m<sup>3</sup> of special waste rock will be generated.</p> <p>Denison will examine opportunities to reprocess the mineralized core and cuttings generated during wellfield development to recover uranium. This reprocessing may be done by placing the material in tanks with mining solution or placing the material underground into the mining area at the end of a well's production.</p> <p>The special waste pad may be used to temporarily store other materials that may be radioactive (e.g., contaminated soil) prior to final disposal in the industrial landfill or a licensed off-site facility.</p> <p>The special waste pad is estimated to be 2,500 m2 in size and will be constructed with a double composite liner system with leak detection capabilities (Figure 2.2-25). Any contact water coming off the special waste pad will be directed to the wellfield runoff pond (Section 2.2.3.5).</p> <p>2.9.1.3.3 Waste Management Program</p> <p>The Waste Management Program would include requirements and processes to ensure that Denison's activities that involve planning for, handling, transporting, processing, storage, and disposal of wastes are performed in a manner that complies with applicable regulatory and licence requirements and protects workers, the public, and the environment.</p> <p>The Waste Management Program would include identification of waste inventory and the characteristics of the waste (radiological and hazardous non-radiological), waste segregation, waste packaging and transfer requirements, and the plan for storage or disposal of the wastes. <b>The Waste Management Program will detail the plans for waste rock segregation based on mineralized content and acid generating potential.</b></p>



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IR-14	CNSC	Wastes and Decommissioning	Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)  Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)	<p><b>Context:</b> The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)</p> <p>Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as <i>Complete</i>.</p> <p><b>Rationale:</b> Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.</p>	How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?	<p>Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached. Please see response to IR-28 for information on how Denison will provide this information as the EA process advances.</p> <p>The option to leave concrete foundations in place will be discussed with Indigenous Nations and communities as decommissioning plans become more defined.</p> <p>The conceptual decommissioning plan (CDP) included in the draft EIS contains the appropriate level of detail for this stage of the Project. As described in Section 2.3.3, the details of the decommissioning plan will evolve and become more specific as the Project advances. The subsequent iteration of the plan is the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan will evolve over time and the plan will become more refined as the Project advances. Denison is committed to continue to engage with Indigenous Nations and communities to solicit input.</p> <p>The comment in Section 4 on page 4-33: "Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?" was addressed in the draft EIS in the following manner:</p> <p>- Concern about responsible authority for restoring the environment, including contaminants when mining concludes: Denison is responsible for decommissioning. Denison’s decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure.</p> <p>- How long will it take to have the environment fully restored: Based on best practice and technical studies completed for the Project, the active decommissioning phase is anticipated to be 5 years. The Post-Decommissioning phase extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program (Government of Saskatchewan 2009) or direct release of the land back to the Crown. Post-Decommissioning is expected to last 15 years and during this phase, monitoring will be conducted until the site-specific decommissioning and reclamation objectives for the Project are met.</p> <p>- if Denison is no longer the operator, how will this be completed?: The financial assurance process provides certainty that the Project can be decommissioned as planned. The Project will not be issued an approval to operate until the decommissioning plan and associated cost estimate are accepted by the Minister of Environment and the financial assurance is in place. If Denison is unable to complete the decommissioning for any reason (e.g., bankruptcy), the finances are available for the Province of Saskatchewan to complete the activities as planned. The PDP will include an associated estimate for the decommissioning costs and Denison will provide financial assurance to confirm the identified decommissioning activities can be completed as planned. Updates to the financial assurance are done in conjunction with updates to the decommissioning plan, on a frequency of every five years during operations.</p> <p>References: Government of Saskatchewan. 2009. <i>Institutional Control Program: Post Closure Management of Decommissioned Mine/Mill Properties Located on Crown Land in Saskatchewan</i>. Ministry of Energy and Resources. December 2009.</p>	Refer to IR-28 for information on EIS updates related to issues and concerns.
IR-15	ECCC	Fish and fish habitat	Section 2.2.3.4 Project Description  Section 8.1.3.4.2, Aquatic Environment	<p><b>Context:</b> In Section 2.2.3.4 it is stated that the estimated PMP event for Project infrastructure planning is 483.3mm. In Section 8.1.3.4.2 it is stated that the PMP is 489.3 mm.</p> <p><b>Rationale:</b> It is unclear which value is the correct PMP value and if Project infrastructure has been planned correctly.</p>	Provide the correct PMP value and verify that Project infrastructure has been designed utilizing the correct value.	<p>The PMP event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program (1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes.</p> <p>The PMP value in Section 2 will be updated from 483.3 mm to 493 mm in the final EIS. The PMP value used in Section 8 (489.3 mm) will not be updated because it is less than the design PMP and, as such, was conservative.</p> <p>References:  Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.  Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p>	Section 2.2.3.4 of the final EIS will be updated as follows: “The pond will be surrounded by a 2.0 m berm, have capacity for 0.5 m storage from a probable maximum precipitation (PMP) event estimated to be <del>483.3 mm</del> 493 mm, and allow for maintenance of 1.0 m of free board.”

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IR-16	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> The EIS and technical supporting documents do not provide sufficient justification for the selection of the proposed wastewater treatment systems for the industrial wastewater treatment plant or the domestic wastewater treatment plant.</p> <p>In addition, it is not clear how the upper bound of the industrial wastewater treatment plant effluent quality was obtained.</p> <p><b>Rationale:</b> Draft REGDOC-2.9.2 formally documents the CNSC’s expectations to licensees for controlling releases to the environment. For proposed new facilities, these expectations include conducting a best available technology and techniques, economically achievable (BATEA) Assessment, and determining key parameters necessary to support the EIS. These include identifying:</p> <ul style="list-style-type: none"> <li>environmental release targets to inform the design of wastewater treatment systems to constrain the quantity and concentration of contaminants and physical stressors released into the environment,</li> <li>the best available technology and techniques through an options analysis; and</li> <li>the anticipated influent characteristics, overall treatment efficiencies, and maximum predicted design release as the output of the assessment.</li> </ul> <p>Consideration of the principle of pollution prevention and BATEA is also a requirement of REGDOC-2.9.1.</p> <p>CNSC staff have met with Denison to discuss the expectations in draft REGDOC-2.9.2.</p>	<p>Please provide a summary of the BATEA assessment to justify the selection of the wastewater treatment plant system.</p> <p>As part of the summary, please identify the anticipated environmental release targets used to inform the design, as well as the maximum predicted design release concentrations and loadings to the receiving environment. The maximum predicted design releases should be used in the ERA to demonstrate protection of people and the environment.</p>	<p>Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (e.g., effluent quality) needed for the EIS were developed by Denison’s Project engineers early in the EA process to allow for the biophysical and human assessments to advance. An example of one of these outputs is the IWWTP effluent quality. The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects.</p> <p>As stated in the Draft REGDOC 2.9.2 Denison understands that a BATEA assessment be conducted to determine the predicted design release characteristics as part of the licence application for a new facility or activity.</p> <p>Outside of the EIS process, the Project detailed engineering is progressing, including the design of the IWWTP and associated refinement of effluent quality predictions. Denison is following Draft REGDOC 2.9.2 to arrive at a treatment option that remains within the bounds of the EA, which ultimately predicts no significant impacts to the receiving environment. The maximum design release characteristics for the IWWTP will be provided as part of Denison’s licence application to the CNSC.</p> <p>Denison met with the CNSC specialist from the Health Sciences and Environmental Compliance Division on December 7, 2022 to discuss the approach associated with a sequential EA and Licensing, and it was agreed that the above approach is acceptable.</p> <p>Denison is committed to completing the BATEA and providing the details to the CNSC.</p>	No EIS updates are anticipated to address this IR.
IR-17	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<p><b>Context:</b> It is also acknowledged that Denison stated in meetings with CNSC staff that Denison intends to propose final release targets to the CNSC as part of the licence application submission.</p> <p><b>Rationale:</b> It is not clear in the submission whether Denison has considered whether any applicable technology-based performance standards exist in Canada or internationally, and would be relevant as effluent discharge targets, in order to ensure principles of pollution prevention are applied. Consideration of this would help ensure that the proposed effluent discharge targets harmonize with existing federal, provincial/territorial, and/or municipal requirements. For example, there are release limits for radium-226, TSS, and pH outlined in the federal Metal and Diamond Mining Effluent Regulations, which have been demonstrated to be achievable in the uranium mine and mill industry.</p> <p>In addition, countries like the United States, where in-situ recovery has been conducted in the past, have specific technology-based limits. These are known as New Source Performance Standards and are identified in US Code of Federal Regulations (US CFR) 40, Chapter 1, Subchapter N, Part 440 - Ore Mining and Dressing Point Source Category. It is not clear whether these have been considered in Denison’s assessment. These should be considered when identifying suitable achievable technologies.</p>	Denison should harmonize their proposed Effluent Release Targets with the technology-based performance standards that exist in the Metal and Diamond Mining Effluent Regulations where applicable, or other suitable international regulations.	<p>Denison appreciates the comment and is committed to meeting all MDMER release targets.</p> <p>The effluent quality predictions in the EIS provide a bounding scenario of the basis of the assessment of Project effects. Denison is undertaking a sequential EA and licensing process under the NSCA. For context, the EA process for a Project under CEAA 2012 and the Saskatchewan Environmental Assessment Act is long and complex. As such, the inputs and outputs (effluent quality) developed for the IWWTP were necessary and determined by Denison’s Project engineers early in the process to allow for the EIS biophysical and human assessments to advance.</p> <p>Proposed effluent release to the environment starts at Operation phase and BATEA information will come with the application for the license to operate. Please also see response to IR-117.</p> <p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three."</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project (see IR-16). The effluent quality predictions provided in the EIS will continue to bound the assessment, and provide a conservative representation of risk to human health and the environment.</p>	No EIS updates are anticipated to address this IR.
IR-18	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description Appendix 8-E	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The</p>	<ol style="list-style-type: none"> <li>Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</li> <li>Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</li> <li>Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</li> </ol>	<p>Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria and other requirements of the regulations. The lack of the MDMER general parameters and Schedule 4 substances in the draft EIS table 2.2-1 should not be misconstrued to mean Denison was not intending to meet these requirements. Rather these tables were developed based on rigorous screening to identify COPCs and then model these in the receiving environment. Table 2.2-1 in the draft EIS is not reflective of the proposed monitoring parameters during effluent release. Regardless, Denison will update the table; please see the response below.</p> <p>1) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p>	Table 2.2-1 and Appendix 8-E will be updated in the final EIS; the updated version of the table is provided in attachment IR-18.

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				<p>proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.	<p>2) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted.</p> <p>3) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Parameters specific to Schedule 4 have been assessed and predicted. Schedule 5 parameters are included where available. As Schedule 5 parameters do not have screening criteria, they will be monitored by Denison consistent with the MDMER upon falling under this regulation.</p> <p>4) Please see attachment IR-18 for updated Table 2.2-1 which is consistent with the updated Table 8.2-10 (as updated for IR-114). Applicable screening criteria have been updated to identify most applicable acute or chronic thresholds for the protection of aquatic life.</p> <p>5) As noted in response to IR-16 and IR-17 effluent discharge criteria as depicted in the draft EIS provide a bounding scenario of the basis of the assessment of Project effects and final effluent quality will meet prescribe limits developed through licensing and permitting, as informed by the BATEA evaluation process. In that context, it is expected that the uranium concentration in effluent would be lower than assumed for the purpose of the evaluation in the draft EIS and it is understood that uranium concentrations (or concentrations of other constituents) that resulted in acute toxicity would be not be permitted. Accordingly, the need for and types of mitigation measures as might be needed for uranium (or other constituents) would be developed as part of the process of developing final effluent quality limits in the permitting and licensing processes.</p>	
IR-19	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.4 Project Description	<p><b>Context:</b> In this section, it is proposed that the IWWTP precipitate pond will have a single geosynthetic composite liner system, which is used for ponds/pads that only store non-radioactive materials.</p> <p>However, from Section 2.2.3.9 on industrial wastewater treatment, it is unclear if the precipitates from the stage three neutralization process that are pumped to the IWWTP precipitates pond will have any residual radioactivity.</p> <p><b>Rationale:</b> For the protection of the surrounding environment, it is important that any ponds/pads that are expected to store radiological contaminants be designed to have proper controls (i.e., liners with monitoring systems) in place.</p>	<p>1. Confirm the characterization of the precipitates that are to be stored in the IWWTP precipitate pond.</p> <p>2. If radiological constituents are expected within those precipitates, update the draft EIS to ensure the proposed geosynthetic liner system for the IWWTP precipitate pond will be adequate to ensure the protection of the surrounding environment.</p>	<p>1. The IWWTP precipitate pond will contain non-radiological, gypsum-like material. As outlined in Section 2.2.4.5 and 2.2.4.6, any radioactive precipitates generated during the first stage of the IWWTP will be directed to the process precipitate pond, not the IWWTP precipitate pond. Waste segregation and management will be important for Denison during Operation. The Waste Management Program will be established and approved by the CNSC as part of licensing. Denison will conduct regular assays of slurry sent to the IWWTP precipitate pond during Operation to confirm the quality of these precipitates.</p> <p>2. In consideration of the above, radiological constituents are not expected within the IWWTP precipitate pond.</p>	No EIS updates are anticipated to address this IR.
IR-20	NRCAN	Fish and fish habitat	Section 2.3.3.1.1 Appendix 7-C	<p><b>Context:</b> The proponent’s objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent’s acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCAN’s opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent’s decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>	NRCAN requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.	Please see response to Attachment IR-20, IR-67, IR-69.	In the final EIS, Table 3-5 in Appendix 7-C will be updated. The updated table is provided here as Appendix B to Attachment IR-20, IR-67, IR-69.
IR-21	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.3.3.1.3, Project Description	<p><b>Context:</b> The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p><b>Rationale:</b> From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>	Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.	<p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p> <p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface. Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p> <p>Further, this potential subsidence, if it were to occur, would be limited to the footprint directly above the deposit which will not contain any decommissioned waste management infrastructure. Two main Project components containing waste in the Post-Decommissioning</p>	No EIS updates are anticipated to address this IR.



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						<p>period will be the IWWTP precipitate pond (which will contain non-radioactive gypsum-like material) and the Industrial Landfill. All other wastes will be disposed of off-site. Spatially, the mining area is about 500 m from the IWWTP precipitate pond and about 800 m from industrial landfill.</p> <p>Given the negligible risk and magnitude of surface subsidence (2.4 to 2.8 mm) which would be limited to the footprint directly above the deposit, along with the distance from this area to on-site decommissioning wastes, there is negligible risk for effects of subsidence to the planned decommissioning of waste management infrastructure.</p>	
IR-22	NRCan	Fish and fish habitat	Section 2.10  Appendix 2-C, section 1.1.1.4	<p><b>Context:</b> With respect to the choice of In-Situ Recovery (ISR) mining solution, two alternatives were assessed: alkaline and acidic lixivants (Appendix 2-C, sec. 1.1.1.4). In the consideration of technical and economic feasibility of the alternatives (Table 2, Appendix 2-C), the proponent concludes that: Option 1 (alkaline) is not technically feasible based on the uranium deposit geochemistry. Option 2 (acidic) is technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium. Accordingly, the alkaline alternative was not carried forward into the Environmental Assessment (EIS, Table 2.10-1; Appendix 2-C, Table 3).</p> <p>While acidic ISR solutions are widely used internationally (e.g., Kazakhstan), in the United States, where the environmental regulatory regime is more strict, alkaline solutions have been used exclusively since 1970.</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent should provide a more thorough technical justification for adopting an acidic ISR lixiviant.</p>	<p>In the Alternative Means Assessment (Appendix 2-C), NRCan requests that the proponent provides a more thorough technical justification for selecting an acidic ISR lixiviant rather than a less environmentally problematic alkaline leach used exclusively in the USA.</p>	<p>The following additional information will be added to Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution:</p> <p>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</p> <p>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth, grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub>- complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previously examined in detail.</p> <p>As noted in Table 2 of Appendix 2-C, the alkaline leach option for mining solution was determined to not be technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium.</p>	<p>Appendix 2-C Alternative Means Assessment, Section 1.1.1.4 Mining solution will be updated as follow (additions in <b>bold</b>, deletions in <del>strike</del>through):</p> <p><b>Two options were considered for mining solution: Option 1: alkaline solution and 2. acidic solution.</b></p> <p>Factors determining the choice between acid or alkaline ISR technology are: composition of the host rock and ores, reagent cost and consumption, the degree of uranium recovery, and the intensity of the process (IAEA 2001). The leach intensity is determined as the sum of the leach duration, solution ratio (liquid/solid), and average uranium concentration in the recovery solution.</p> <p><del>1. Alkaline solution</del> Alkaline or high-pH mining solutions are used at a number of uranium ISR operations. The mining solution is typically made with carbonate or bicarbonate. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. Ores with a higher carbonate content normally require alkaline (bicarbonate) leaching.</p> <p><del>2. Acidic solution</del> Acidic or low-pH mining solutions are used at a number of uranium ISR operations. The acidic mining solution is typically made with dilute sulfuric acid. The single most important factor in the process is the rock composition within the productive aquifer, and in particular, the concentration of calcium carbonate. For economic sulphuric acid leaching, the carbonate content should not exceed 2% CO<sub>2</sub>.</p> <p><b>In 2017, Denison completed core testing at a laboratory in the United States that was familiar with in situ recovery (ISR) mining and processing methods. The two lixiviant or leach solutions were 1) an alkaline solution and 2) an acidic solution. The alkaline solution was comprised of 2,000 ppm sodium bicarbonate and 500 ppm hydrogen peroxide. The sodium bicarbonate is a complexing agent and the hydrogen peroxide is an oxidant. This alkaline leach solution used in the laboratory is similar to lixiviant solutions used for ISR mining in the US. The acidic solution was prepared with sulfuric acid and hydrogen peroxide, in varying concentrations as the testing proceeded. After 30 pore volumes, the alkaline leach had recovered less than 1% of the uranium in the core. For comparison, the acidic leach recovered around 30% of the uranium in the core after 30 pore volumes and just under 90% of uranium was recovered after 120 pore volumes.</b></p> <p><b>At the Phoenix deposit, carbonate and organic concentrations are quite low, which makes acid leach for uranium much more amenable at reasonable concentrations. Moreover, the ISR test work completed in 2017 highlighted alkaline leach would be ineffective and uneconomical. An excerpt below from the 2017 ISR laboratory report highlights the challenges with alkaline leach, pointing to the deposit specifics (depth,</b></p>

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							<p>grade, location) which inhibit the ability to leach via alkaline methods:</p> <ul style="list-style-type: none"><li>• “Bicarbonate is limited in practice by the chemical cost and physical ability (chemical addition rates) to increase wellfield concentrations appreciably above 2-3 g/L as HCO<sub>3</sub>.”</li><li>• “Field oxygen additions are limited by injection well depths (i.e., depth to ore) which, along with injection pressures, determines the maximum concentration of O<sub>2</sub>(g) which could be successfully introduced to the wellfield.”</li><li>• “pH control is critical to prevent potential calcium carbonate (Calcite, CaCO<sub>3</sub>) precipitation within the wellbore and/or ore-body.”</li></ul> <p>In 2018, Denison contracted a third-party consultant with expertise in Australia's ISR industry to complete a desktop review of various ISR test work completed for the Phoenix deposit, including the 2017 study described above. The third-party review of the alkaline and acid leach test work noted that for the alkaline bottle roll leach, it was unsurprising that the uranium extraction, 0.8%, was so low. Assuming the formation of the UO<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub> complex, the sodium bicarbonate consumption by the uranium would be ~188 kg/t, not including any potential bicarbonate consumption by any other phases present in the ore. The amount of sodium bicarbonate added in the test is calculated to be 7.2 kg/t, which was grossly inadequate. It is likely that given sufficient carbonate/bicarbonate and oxidant, alkaline leaching of the ore would technically be feasible, but it is likely in practice that the carbonate consumption would be excessively high. The rate of carbonate leaching is also much slower than acid, and the introduction of oxidant is also more difficult in an alkaline system.</p> <p>Alkaline leach is commonly used in the United States due to the primary components that make up their ore bodies. They are rich in carbonates and organics, which makes uranium quite difficult and costly to mine via acid leach as the acid is consumed by these constituents prior to any uranium being liberated and leached itself. These issues are not of concern with alkaline leach. There is currently one operation in the United States (Lance Uranium Project – Eastern Wyoming) that uses acid leach. The company had switched to acid leach after a failed trial of alkaline leach/mining due to high carbonates in the ore body that were not previous examined in detail.</p>

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IR-23	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	<p><b>Context:</b> There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.</p> <p>A few examples:</p> <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There's lots of heavy muskeg there. A lot of us have been there, and we'd like to know there'll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn't happen. Even the permafrost is now further down. In the Wheeler River area, where there's some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> <p><b>Rationale:</b> Appendix 2-C, Alternative Means assessment, states (p.3): "Engagement with Interested Parties naturally included alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and <i>Appendix 2-A Engagement Database Summary – Project Description</i> for details of engagement information referenced in this alternative means assessment."</p> <p>It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.</p>	Please explain how comments and concerns collected during Denison's engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it's appendices.	<p>Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement topics, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. Two main areas where comments and concerns fed into and informed the Alternatives Assessment are: 1) Appendix 2-C, Section 1.2 Consideration of Technical and Economic Feasibility along with Land Use Screening, and 2) Appendix 2-C, Section 1.4 Evaluation of Alternative Means.</p> <p>The comparative evaluation of alternative means is presented in Appendix 2-C, Table 6 to Table 22. The evaluation considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in Appendix 2-C, Table 5, following the application of mitigation measures described in Appendix 2-C, Table 4. In each case, the preferred alternative and rationale for its selection were identified. In addition, specific input received from Indigenous groups and other Interested Parties that contributed to the selection of the preferred option was highlighted, when applicable. The alternative means assessment provided in the tables in this section was conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives.</p> <p>To follow-up on one of the examples listed in the context and rationale section of this IR, 16-EN-DesNd-101.1 was a comment related to interest in business opportunities. As noted in Appendix 2-A, this comment factored into the comparative evaluation of alternative means for waste management, domestic waste disposal in the section outlining input received from Interested Parties. For additional background, two options were under evaluation: Option 1 was collection and disposal off-site by a third-party contractor and Option 2 was collection and disposal in an on-site domestic landfill. The following text is available in Appendix 2-C, Table 17: Waste Management – Domestic Waste Disposal - Alternative Means Assessment:</p> <p>During seven years of engagement activities for the Project, Denison has understood the importance of designing a project that minimizes interactions with the biophysical environment and the importance of continued land use by Indigenous groups. Looking at domestic waste disposal options, the option to transport domestic waste off site to a nearby licensed facility may generate a local economic opportunity (16-EN-DesNd-101.1, 19-EN-VB-132.5, 21-ENSUR-446.48). However, the transport of material off site would increase traffic, which may have a negative effect on traditional land use, infrastructure and services, and wildlife (16-EN-ERFN-100.15) (21-EN-SUR-446.68). Increased traffic would also increase greenhouse gas emissions. Concerns related to climate change were raised during engagement and consultation activities completed by Denison (e.g., 22-EN-ERFN-621.15, 22-EN-SUR-652.57). It should be noted that these concerns pertain to climate change rather than GHG emissions specifically. The concerns included observations of climate-related changes that have been noticed by the English River First Nation (e.g., depth of permafrost; 16-EN-ERFN-100.17) and observations by the English River First Nation Trapper who provided local knowledge in support of the EIS (19-LK-ERFNTrap-134.232). While no specific feedback was received on the domestic waste disposal options, the above provides context on how Denison's fulsome engagement activities have influenced the selection of a preferred alternative for domestic waste disposal.</p> <p>Based on the evaluation of alternative means, a preferred alternative means for each respective Project component or activity was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided and input received by Interested Parties is presented. As shown in the above example, the input received from Interested Parties was an important part of the multifaceted evaluation.</p>	See attachment IR-24 for proposed content for final EIS Section 2.10, which, relative to the draft EIS, includes the addition of Section 2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment.
IR-24	CNSC	Alternative Means	Section 2.10.2 Alternative Means	<p><b>Context:</b> While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p><b>Rationale:</b> As noted in the Agency's <a href="#">Operational Policy Statement on Addressing "Purpose of" and "Alternative Means" under the CEAA 2012</a>: "If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice."</p>	Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.	Additional details from Appendix 2-C will be provided in Section 2.10 of the final EIS. Also, an example of alternative means evaluated for mining method will be added into Section 2.10.2 in the final EIS. It is noted that no new information would be presented in the final EIS Section 2.10.2 beyond that which was presented in the draft EIS Appendix 2-C.	See Attachment IR-24 for proposed updates to Section 2.10.2.
IR-25	CNSC	Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p><b>Context:</b> The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: "As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS." (p. 11-36)</p>	Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.	<p>A study agreement was signed with the MN-S to complete a Metis Knowledge Study by the end of October 2023. Denison has met with the MN-S to discuss the next steps and anticipated timeline, however no information has been provided to Denison, to date. When the study is completed within the agreed upon timeframe, Denison will update the final EIS to include relevant information in the assessment.</p> <p>It is important to note that Denison has incorporated Metis land use information and perspectives into the draft EIS, through the funding of the Kineepik Metis Land and Occupancy information along with the KML VEC statement, of which relevant information has been incorporated directly into the draft EIS to determine effects to the human environment.</p>	The final EIS will be updated with applicable information pertaining to the effects assessment from the Metis Knowledge Study when provided within the agreed upon timeframe (end of October 2023).



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				<p><b>Rationale:</b> More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.		
IR-26	CNSC	Precautionary principle and approach	Section 3.4.8 Lands Taken Up from an Indigenous Perspective (p. 3-14)	<p><b>Context:</b> Denison states: “Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach. Examples of concrete actions to address uncertainty in cases where IK and LK have differing conclusions on predicted Project effects include addressing uncertainty through monitoring and follow-up programs and communicating results of those monitoring and follow-up programs to demonstrate they have been responsive to the IK shared.” (p. 3-14)</p> <p><b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “In documenting the analyses included in the EIS, the proponent will demonstrate that all aspects of the project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.</p> <p>A document by Canada’s Privy Council Office, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a>.” (Section 2.5)</p>	Please clarify how the precautionary principle, and the Privy Council Office’s, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a> has been considered and incorporated into the EA described in the EIS.	<p>Page 3-14 of the EIS notes that "Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach."</p> <p>The precautionary approach to the evaluation of effects is described in Section 5.8.1.2.2 of the EIS, which specifically deals with the confidence of predictions and states:</p> <p>"In this EA, the precautionary approach to the evaluation of potential effects was adopted, recognizing areas of uncertainty and uses conservative assumptions and approaches within the assessment process. Areas of uncertainty in the process and in predictions for each VC are identified and discussed in each VC-specific section, or on a KI-specific basis as applicable."</p> <p>"Confidence predictions are defined as low, moderate, or high. Where a high degree of uncertainty regarding a residual adverse effect is evident, the confidence level may be low. A high level of confidence is assigned to predictions that have direct, site-specific quantitative data to support the predictions. Low or moderate degrees of uncertainty are manageable through monitoring and follow-up programs to confirm the absence, presence, and extent of residual adverse effects."</p> <p>The Privy Council Office’s, A Framework for the Application of Precaution in Science-based Decision Making About Risk was not specifically referred to in making decisions regarding discrepancies among IK and western scientific knowledge. Rather ERFN, KML/Pinehouse, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML/Pinehouse declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). An example of where greater precaution was exercised is found in the conclusions for effects on Indigenous Land and Resource Use, in which the overall confidence rating was moderate based on the communities’ previous experience with the uranium industry, but could not "be considered as high as the Indigenous COIs lack certainty about ISR mining technique" (Section 11.1.6.4).</p>	No EIS updates are anticipated to address this IR.
IR-27	CNSC	Cumulative Effects Analysis	Section 3.4.8	<p><b>Context:</b> During an outreach and engagement trip by CNSC in October 2022, an abandoned exploration camp adjacent to the proposed Wheeler River site was observed. This site has not been identified within the EIS as part of the cumulative effects assessment. As noted in section 3.4.8, KML has also raised concerns with Denison related to abandoned camps and industrial waste left with no programs for clean-up.</p> <p><b>Rationale:</b> Section 9.4.3 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> states that “The applicant shall assess any residual adverse environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area.”</p>	Please specify why abandoned exploration camps and industrial waste aren’t taken into consideration when completing cumulative effects assessment.	<p>Section 5.9 outlines the general methods and approach for cumulative effects assessments, while each biophysical and human environment assessment provides details on their Valued Component (VC)-specific approach. The inclusion list in Section 5 does include exploration and mining activities, and options for other projects and activities, as appropriate.</p> <p>With this approach the footprint of the abandoned exploration camp was considered within the terrestrial cumulative effects assessment.</p> <p>Section 11 Land and Resource Use notes that existing projects or activities were not considered as part of the cumulative effects assessment because they were captured and assessed within baseline conditions or existing conditions. This approach would include the abandoned exploration camp adjacent to the proposed Wheeler River site.</p>	No EIS updates are anticipated to address this IR.
IR-28	CNSC	Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>3. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>	Please see response in Attachment IR-28.	<ul style="list-style-type: none"><li>• Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices</li><li>• Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)</li><li>• Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)</li><li>• Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)</li><li>• Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)</li><li>• Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)</li><li>• Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)</li><li>• Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)</li><li>• Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)</li><li>• Table 4.3-10: Key Issues and Concerns from Ya’thi Néné Lands and Resources Office (and corresponding table in the IER)</li></ul>

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							<ul style="list-style-type: none"><li>Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse</li><li>Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval</li><li>Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse</li></ul> A new table will be included for Peter Ballantyne Cree Nation as well into the final EIS and in the IER. <ul style="list-style-type: none"><li>Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description</li><li>Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description</li><li>Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater</li><li>Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment</li><li>Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment</li><li>Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health</li><li>Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use</li><li>Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life</li><li>Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics</li><li>Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions</li><li>Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project</li></ul>
IR-29	CNSC	Current use of lands and resources for traditional purposes	Section 4.3.2 and IER	<p><b>Context:</b> In this section, Denison includes the engagement with BNDN and includes a summary of issues and concerns table for the Nation. Within the history of interactions (Section 4.3.3.2.1).</p> <p><b>Rationale:</b> Denison states that they have been providing information on the project to BNDN in 2019, 2021 and again in 2022 and that Denison and BNDN have not responded to date in order to advance further engagement and dialogue.</p>	Please ensure updated information of any additional engagement activities that Denison has completed with BNDN related to understanding their current and traditional land use and potential interests near the proposed project is provided.	<p>Denison is able to provide the following information with respect to engagement with BNDN.</p> <p>Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.</p> <p>On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.</p> <p>On May 10, 2023, Denison met with BNDN again, to discuss a process for engagement going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison’s access to data BNDN previously referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to further funding from Denison to BNDN. Denison continued to request the available site-specific information in order to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN in order to potentially adjust engagement approaches with BNDN.</p> <p>On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided further information from BNDN that BNDN would connect with Denison in the future to determine next steps together.</p> <p>On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.</p> <p>Subject to the development of a specific engagement process between Denison and BNDN, as identified above, Denison is committed to maintaining an open dialogue with BNDN regarding their interests in the Project. Denison will make sure the above information, and any further information in this respect, including potential resolution of issues, will be included in the final EIS and an update to the IER.</p>	Updates will be included in the final EIS Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER) as part of response to IR-28.
IR-30	CNSC	Indigenous physical and cultural heritage	Section 4.3.2.1.3, Table 4.3.2	<p><b>Context:</b> Concerns were raised during engagement sessions that “Elders are not being consulted as most of the engagement has been through online means and without a translator”.</p>	How has Denison adapted engagement with Elders from the ERFN since receiving this comment on March 31, 2021?	Since receiving the comment about the challenge with virtual engagement activities and associated translation for those requesting it, Denison has incorporated simultaneous Dene translation into the Zoom virtual meeting feature. This was used in a virtual meeting	No EIS updates are anticipated to address this IR.

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				<b>Rationale:</b> There’s no indication that a translator has been employed to engage with Elders since 2021 in the engagement Table 4.3.2.		undertaken for the Athabasca Basin First Nations and Communities, in September 2021. The feedback received was overwhelmingly positive. Going forward, should Denison have to deploy virtual meetings where translations are required, this tool will be deployed again.  For all in person meetings, Denison provides a translator, who can assist with anyone requiring discussion to occur in their language.	
IR-31	CNSC	Indigenous Engagement	Section 4.4.2.1.3, Key Engagement Activities (p. 4-88)	<b>Context and Rationale:</b> Regarding the following: “An open house for the general public was planned to be hosted in 2022 on preliminary effects and mitigation, but due to concerns identified by MN-S about hosting a public open house in a community with a significant Métis population, this meeting was postponed by Denison. Denison looks forward to rescheduling the meeting in collaboration with the MN-S.” (p. 4-88)	Please provide an update on the evolution or progress of this engagement with local communities, following collaboration with MN-S (or otherwise).	Denison continues to respect the delegated Duty to Consult to the Metis Nation - Saskatchewan for a number of communities with strong presence of Metis Citizens for engagement about the Wheeler River Project. As such, Denison will follow the Metis Nation - Saskatchewan direction in this regard until such time as this direction changes.  Denison is pleased to report that on February 11 and 12, 2023, the MN-S coordinated a meeting for Denison, the CNSC, the Province of Saskatchewan and the Metis Locals from Northern Regions 1 and 3 to provide an overview of the Project and respond to questions and concerns.	Updates will be included in the final EIS accordingly.
IR-32	CNSC	Current use of lands and resources for traditional purposes	Section 5.3  Section 9.0 Terrestrial Environment	<b>Context:</b> Some sections of the EIS (such as Fish and Fish Habitat, Indigenous Lands and resource use) indicate that Indigenous and/or local knowledge was considered when defining the spatial boundaries. However, this is not included in other sections, such as Terrestrial Environment.  <b>Rationale:</b> Section 5.2.2 of CNSC’s Generic EIS Guidelines require that spatial boundaries be defined by considering, but not limited to, the following criteria: Community and Indigenous traditional knowledge, ecological and technical considerations.	Please provide any additional details about how any comments or concerns raised were considered in defining the spatial boundaries with Indigenous Nations and communities with respect to spatial boundaries, for the Terrestrial Section and which specific Indigenous Nations and communities were engaged on these topics and how their input and knowledge was incorporated into the EIS.  If already presented in the EIS text body, please indicate where this information can be found or link to Section 4 of the EIS or in the IER.	The rationale for the definition of study areas for the purpose of the assessment of the Terrestrial Environment valued components (VCs) is described in Section 9.1.1 of the draft EIS. The Project Area and Local Study Area (LSA) were delineated based on the expected extent of potential direct (footprint) and indirect (sensory disturbance) Project effects; whereas, the Regional Study Area (RSA) considered an 8 km buffer around the Project Area to provide an appropriate spatial scale upon which potential Project effects could be evaluated at the landscape scale where key Terrestrial Environment VCs reside and move within and upon which cumulative effects could be assessed.  No specific comments or concerns were raised on the spatial scale of the Terrestrial Environment study areas during engagement activities, though considerable input was solicited / received regarding many of the Terrestrial Environment VCs that helped to contribute how the assessment study areas were defined. This is especially true in consideration of the relatively high number of comments received through engagement regarding wildlife (as represented by ungulates, furbearers, woodland caribou, and birds in the draft EIS) and wildlife use by local and Indigenous people/ communities (see Sections 9.3.3.1.2, 9.3.3.2.2, 9.3.3.3.2, 9.4.3.1.2, 9.4.3.2.2, 9.4.3.3.2 in the draft EIS Appendix 9-A for details). Cumulatively, this input puts high importance on and speaks to the broad knowledge of wildlife in the vicinity of the Project, informing the need to define the RSA to an appropriate spatial extent, as was the case on the draft EIS.  In addition, and within the context of the IR, it is appropriate to also consider the assessment of terrestrial environment from the perspective of Land and Resource Use per Section 11 of the draft EIS, since the two (Terrestrial Environment and Land Are Resource Use) are so intimately related. For context the Terrestrial Environment RSA, fits within the Indigenous Land and Resource Use RSA. Section 11 of the EIS is focused on Land and Resource Use and includes consideration for various terrestrial VCs and key indicators (KIs) as resources. With respect to Indigenous Land and Resource Use, the definition of spatial boundaries is offered in Table 11.2-2 which notes that the LSA is inclusive of direct and indirect effects to relevant VCs will occur, including the maximum combined extent of supporting VCs associated with the aquatic, terrestrial, noise, and health LSAs. It is inclusive of trapping, fishing, and travel through and adjacent to the Project Area. The RSA is inclusive of trapping block N-18, which represent a familiar reference for local Indigenous communities and capture the broad land usage patterns of local communities. Trapping blocks are defined regions and have membership that is regulated by a local trapping association and membership is generally only open to local Indigenous community residents though non-Indigenous trappers may also participate as members of the trapping association. If resource use activities were displaced, it is likely this would still occur within the N-18 trapping block area where individual resource users already have familiarity.	No EIS updates are anticipated to address this IR.
IR-33	CNSC	Residual Effect Characterization	Section 5.8.1, Definitions for Residual Effects Characterization and Significance  Section 5.8.1.1, Residual Effects Characteristics  Section 8, Table 8.3-9: Fish and Fish Habitat - Surface Water Quality	<b>Context:</b> Denison uses specific criteria (Residual Effect Characteristics: Direction, magnitude, geographic extent, duration, frequency, reversibility, context and likelihood) and associated ratings (e.g., adverse/positive, low/moderate/high) for the predicted effects assessment. However, it is unclear whether an aggregation method was used in order to determine whether impacts will be significant or not significant, depending on the combination of rating categories (i.e., weightings that were calculated, use of decision rules).  For example, medium term and long term are both used to represent the same time category: “Effects are expected to last between 3 to 38 years (i.e., effects expected during Construction through to the end of post-Decommissioning).” (See table 8.4-13 on p. 8-200 compared to table 8.4-12 on p. 8-199 and table 8.5-9 on p. 8-246).  <b>Rationale:</b> The Generic Guidelines state: “The method used to describe the level of the adverse effect should be transparent and reproducible.”  In Table 8.3-11, duration was moderate, but again uses same rationale. There is no ‘moderate’ in Table 8.3-8, and by the same rationale, this should be medium-term to be consistent with definitions provided and summary Table 8.3-12.  It was noted that all three tables should be deemed medium-term	If an aggregation method was used and ratings (e.g., High, medium, low) were weighted, what weightings were used, how were these calculated? Please also describe any decision rules that informed the determination of significance.  If no aggregation was used, how did Denison ensure that results were consistent, given the varying rankings for each of the key criteria, and varying combination?  Regarding inconsistencies in ratings, please use consistent terminology for same rating.	Denison did not use an aggregation method with weighted ratings. The assessment approach and methodology was outlined in draft EIS Section 5, Approach and Methodology. Please note that Section 5.8 provided a guide for technical leads to conduct residual effects evaluation; however, Section 5.8 also recognizes that the specific definitions and ratings for some characteristics may be developed on a VC-specific basis as presented in each VC-specific section.  Denison reviewed the draft EIS to ensure results were consistent. This included checks on the consistent application of characteristics and ratings along with any supporting rationale. Nevertheless, as pointed out by the CNSC, there appear to be some inconsistencies in Section 8 of the draft EIS. The final EIS will be updated, specifically Section 8 where inconsistencies were highlighted in IR-33 context and rationale text. Importantly, these are effectively editorial issues and do not change the assessment summaries or conclusions.	Ratings for duration and frequency in Section 8 of the final EIS will be updated. Residual effect characteristics and ratings will be consistent between definitions tables and subsequent summary (results) tables within a section.  This will include consistent use of the ratings for the residual effect characteristic of duration, as follows: <ul style="list-style-type: none"><li>• Short-term – Less than 3 years (i.e., effect happens during Construction only).</li><li>• Medium-term – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</li><li>• Long-term – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</li></ul>



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				based on definitions of ratings outlined in Table 8.3-8. Frequency was also showing up as "continuous" and "continuously" in these tables.			<p>This will include consistent use of the ratings for the residual effect characteristic of frequency, as follows:</p> <ul style="list-style-type: none"> <li>• Infrequent – Effect occurs several times at sporadic intervals.</li> <li>• Frequent – Effect occurs many times on a regular basis.</li> <li>• Continuous – Effect occurs continuously.</li> </ul>
IR-34	CNSC	Cumulative Effects Analysis	Section 5.9.2.2 (p. 5-41)	<p><b>Context:</b> Denison identifies the Gryphon deposit as a project that is not reasonably foreseeable. The direct quote from the EIS indicates that the “Development of the Gryphon deposit as an underground mine was evaluated at the prefeasibility level in 2018 but has not advanced to feasibility study or EA. Denison has not announced an intent to proceed with the development of the Gryphon deposit.” (p. 5-41)</p> <p><b>Rationale:</b> The guidance <a href="#">Assessing Cumulative Environmental Effects under the CEAA, 2012</a> defines <i>Reasonably Foreseeable</i> as a “physical activity [that] is expected to proceed, e.g. the proponent has publicly disclosed its intention to seek the necessary EA or other authorizations to proceed.”</p> <p>In a press release by Denison Mines (2018: <a href="#">Denison announces decision to advance Wheeler River Project following positive PFS results</a>), Denison publicly disclosed intention to seek the necessary EA for Gryphon to proceed: “After careful consideration of the risks and opportunities associated with permitting and concurrent advancement of project engineering activities, the Company has decided to submit a PD and initiate the EA process in early 2019 for the Phoenix ISR operation, and to bring the Gryphon operation forward, at a later date, as required to achieve the PFS plan of Gryphon first production by 2030.”</p> <p>Further, Denison’s <a href="#">Wheeler River Webpage</a> references a “start of pre-production activities for the Gryphon operation in 2026”</p>	Please update the cumulative effects assessment in the EIS to include the Gryphon deposit as a Present or Reasonably Foreseeable Project.	<p>Denison has not publicly disclosed its intention to seek the necessary EA or other authorizations to proceed with mining the Gryphon deposit on the Wheeler River property at this time and does not meet any of the criteria for a reasonably foreseeable project as per the guidance for Assessment Cumulative Effects under the CEAA 2012 (below). A future physical activity could be considered reasonably foreseeable and should generally be included in the cumulative effects assessment if one or more of the following criteria are met:</p> <ul style="list-style-type: none"> <li>• The intent to proceed is officially announced by a proponent. This information could be found in news media, the proponent’s website or via an announcement from the proponent directly to regulatory agencies.</li> <li>• The physical activity is under regulatory review (i.e., the application is in process). This can be known, for example, if information about the review or application is available on a government website, or an EA notice has been made public.</li> <li>• The submission for regulatory review is imminent. This could be known if the collection of data has already commenced, regulatory authorities have been contacted about information requirements, or through an announcement from the proponent.</li> <li>• The physical activity is identified in a publicly available development plan that is approved or for which approval is anticipated (e.g., a wastewater treatment plant in a city’s long term development plan).</li> <li>• The physical activity supports – or is consistent with – the long-term economic or financial assumptions and engineering assumptions made for the project’s planning purposes.</li> <li>• A physical activity is required in order for the project to proceed (e.g., rail or port transportation facilities, or a transmission line).</li> <li>• The economic feasibility of the project is contingent upon the future development.</li> <li>• The completion of the project would facilitate or enable the future development.</li> </ul> <p>The Gryphon deposit is an exploration phase property and is inherently captured as such in the cumulative effects assessment because the levels of disturbance from these activities to date are captured with the characterization of existing conditions. It would be inappropriate to consider mining of the Gryphon deposit within the cumulative effects assessment as a mining operation as Gryphon cannot be considered a reasonably foreseeable activity. As is widely understood, very few exploration phase projects become operating mines.</p> <p>We note that the press release and the prefeasibility study referenced in the IR were from 2018. The Wheeler River Project Provincial Technical Proposal and Federal Project Description used to initiate the provincial and federal EA processes was submitted in February 2019. This represents Denison’s most recent plans for development and the Project scope does not include underground mining of the Gryphon deposit. Denison acknowledges that, if development of the Gryphon deposit as an underground mine is proposed in the future, this would require additional regulatory review and approval.</p>	No EIS updates are anticipated to address this IR.
IR-35	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>	Please consider acrolein in the assessment or provide a rationale for its exclusion.	An analysis of acrolein risks is provided in Attachment IR-35.	The analysis provided in Attachment IR-35 will be appended in its entirety to Appendix 6-A in the final EIS.
IR-36	CNSC	Other	Section 6, Table 6.1-11 Baseline External Gamma Monitoring	<p><b>Context:</b> For one of the exposures in the summary table for baseline external gamma monitoring (Table 6.1-11), the cell states "Destroyed in Field".</p> <p><b>Rationale:</b> No rationale or indication as to why or how it was destroyed is provided.</p>	Please provide any additional info available as to how equipment was destroyed.	Gamma monitor 8 was destroyed in the field by wildlife.	Table 6.1-11 in the EIS will be updated to say "Destroyed in Field by Wildlife"
IR-37	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<b>Context:</b> "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.	As described in Section B.1 of Appendix 6-A, staff at the Saskatchewan Ministry of Environment (Air Quality Branch) were consulted on the selection of CALPUFF and developing the CALMET meteorological data set, beginning in 2019. The CALMET consultation included an initial discussion about the general approach, and once the CALMET run was completed, two technical memos were produced and reviewed by Ministry staff including: 1) a memo completed in March 2020 summarizing the general CALMET approach and results (e.g., wind roses, temperature data, precipitation data); and 2) a follow-up memo completed in May 2021, which answered specific questions posed by Ministry staff. Ministry staff also completed a review and provided feedback on the CALPUFF model setup in August 2021.	No EIS updates are anticipated to address this IR.

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				<p><b>Rationale:</b> Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry" OR "Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.</p> <p>Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).</p>			
IR-38	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.1, Potential Interactions Between the Project and Valued Component / Key Indicators	<p><b>Context:</b> In this section, the Proponent identifies primary interactions between Project activities and air quality valued components and their associated key indicators. These primary interactions may result in an adverse effect on the valued component. Among the primary interactions are the use of emergency generators in a backup role should there be an interruption of the provincial electrical grid. However, it is not evident what is the anticipated frequency and duration of interruption to grid power.</p> <p><b>Rationale:</b> The Proponent states in the conservative operation scenario that while the site will be powered from the provincial grid at the operations stage, the back-up power generators were assumed to be operating under emergency conditions as a worst-case scenario. ECCC acknowledges the positive impact of extending the electrical grid to the Project site with resultant reduction in generator emissions. The impact of an interruption in grid power would be greatest during the winter months when energy use would be greatest and surface-based temperature inversions, which vertically trap emissions, would be strongest.</p>	Provide an evaluation of a worst-case scenario of grid power interruptions (i.e., average aggregate length of power outages) during the winter months for this section of the electrical power grid.	<p>Denison expects an average of six outages per year based on information provided by SaskPower. An outage would be anticipated to last a few hours per event.</p> <p>The air quality assessment conservatively assumed that the generators would be in operation 24/7 to predict worst-case concentrations in all months of the year, including the winter months. Given the above, Denison can confirm it has evaluated an appropriately conservative worst-case scenario for use of the diesel generators in the air quality assessment.</p>	No EIS updates are anticipated to address this IR.
IR-39	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.2, Potential Project-Related Effects	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent's CALPUFF model runs indicated exceedances for 24-hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.	Additional information on diurnal and seasonal influences of the modelled exceedances is provided in Attachment IR-39 in this document.	No EIS updates are anticipated to address this IR.
IR-40	CNSC	Air Quality	Section 6.1.6.2.1, Air quality significance determination	<p><b>Context:</b> Significance determination was not conducted for air quality due to interconnectedness with other assessment endpoints.</p> <p><b>Rationale:</b> It is not clear where and how these air quality assessment endpoints were factored into the assessment.</p>	Please provide additional information to demonstrate where and how these air quality assessment endpoints were factored in.	Noted in Section 6.1.1.1 of the draft EIS, Air Quality was identified as an intermediate Valued Component (VC) (i.e., does not have an assessment endpoint). Air quality assessment endpoints and the significance of potential effects of Project-related changes to ambient air quality were considered in Section 9 (Terrestrial Environment), Section 10 (Human Health) and Section 11 (Land and Resource Use). For additional reference, Figure 6.1 2 of the draft EIS is a graphic representation of the main linkages among the Air Quality VC and other VCs, illustrating the flow of assessment information from the Air Quality VC. By way of example, the habitat alteration effects considered for avian and wildlife VC and Key Indicators (KIs) included dust deposition, which could change avian and wildlife use through an indirect effect.	No EIS updates are anticipated to address this IR.
IR-41	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<p><b>Context:</b> The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."</p> <p><b>Rationale:</b> If La Loche monitoring station is located near anthropogenic sources and the project is not, use of this data is not a conservative or realistic representation of background.</p> <p>For a realistic approach, background data considered should be upper 95th percentile (or max if n&lt;10) from an area representative of project location</p> <p>For a conservative approach, background data from an area located even further from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was</p>	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.	<p>The Saskatchewan Ministry of Environment requires that background concentration data be added to air model predictions and an accepted set of data is provided in the Saskatchewan Air Quality Modelling Guideline. Following Ministry requirements, the northern regional data set was selected, which is based on monitoring data from the La Loche station. Because the La Loche station is located near anthropogenic sources, the background values are likely higher than background in the Project Area. This means that the total air model predictions (modelled + background) are likely more conservative than would necessarily have been the case had a similar data set been available that was free of any anthropological influence.</p> <p>Further consideration of the use of the La Loche data set is provided in Appendix 6-A, Section 6.0 of the draft EIS.</p>	No EIS updates are anticipated to address this IR.

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				added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.			
IR-42	Health Canada (HC)	Physical stressors (noise and vibration)	Section 6.2.4.2.2, (p. 6-66)  Section 6, Section 6.2.9, (p. 6-72)	<p>Nighttime noise impacts are not adequately considered for human receptors.</p> <p><b>Context:</b> The EIS states in Section 6.2.9 that, “While the predicted sound levels were less than the guideline values, the increase from baseline was predicted to be noticeable” (p. 6-72). No information is provided on individual noise events occurring during the nighttime period.</p> <p><b>Rationale:</b> While the increase from baseline is predicted to be noticeable, it is important to also consider that changes to the characteristics of the sound from baseline (e.g., a change in frequency, changes in sound modulation, increased impulsiveness or tonality, or a shift in noise from the daytime to being more at night) may cause noise to be even more noticeable. Consult <a href="#">ANSI S12.9-2005/Part 4</a>, clause A.1.3 for further information.</p> <p>In particular, consideration should be given to potential impacts on sleep, where adverse impacts are reported to begin when sound levels inside bedrooms exceed 30 dBA for continuous noise sources and 45 dBA L<sub>A</sub>max for discrete noise events (<a href="#">WHO, 1999</a>).</p>	<p>1. Provide a description of the project- related nighttime noise sources that may impact human receptors as well as a qualitative discussion of the resulting potential impacts on perception considering not only changes in sound levels but also sound characteristics (e.g., tonality, impulsivity).</p> <p>2. Confirm whether individual nighttime noise events exceeding 45 dBA L<sub>A</sub>Max outdoors (or 30 dBA indoors) are expected to occur more than 15 times over the nighttime period at any nearby potentially noise-sensitive human receptor location(s). This may be of particular concern if some construction and/or operations activities occur during sleeping hours.</p>	<p>1. During Construction, the nighttime noise sources that are the highest contributors to sound levels at the nearest human receptor location are expected to be construction equipment (bulldozers, trucks, cement mixing and crusher). During Operation, the primary contributors are truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels per ANSI S12.9-2005 Part 4.</p> <p>2. For Construction, the crusher was modelled at its maximum sound output. The diesel-powered equipment (dozers, drill rigs) was adjusted for partial operation. When adjusted to provide maximum sound levels instead, the predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> during the nighttime hours for either Construction or Operation.</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>Section 6.2.4.2.2 will be clarified as follows: The nighttime sound levels were not predicted to exceed the PSL of 36 dBA at any of the identified receptors during Construction or Operation. As with the daytime sound levels, the maximum predicted nighttime sound levels were predicted at the property identified as 302586/Risk2. The predictions at this location were 35.9 dBA and 34.0 dBA for Construction and Operation, respectively, and were similarly primarily attributable to drilling activity in the wellfield, concrete batching (during Construction), and movement of trucks on the access road. During Construction, the nighttime noise sources that were the highest contributors to sound levels at the nearest human receptor location consisted of construction equipment (bulldozers, trucks, cement mixing and crusher operation). During Operation, the primary contributors at night were truck traffic and drilling in the wellfield. As these are not impulse or tonal sources, no adjustments were made to the source sound levels. The crusher was modelled at its maximum sound output, while the diesel-powered equipment (e.g., dozers, drill rigs) were adjusted for partial operation over the respective daytime and nighttime periods. To account for potential issues resulting from equipment operating at maximum levels (as opposed to daytime and nighttime averages), the models were run with the partial operation adjustments removed, for comparison to the Health Canada recommended criteria value of 45 dBA L<sub>max</sub> at night. The predictions at the nearest human receptors did not exceed 45 dBA L<sub>max</sub> for either Construction or Operation."</p>
IR-43	HC	Physical stressors (noise and vibration)	Section 6.2.5, (p. 6-66)  Section 6.2.5, (p. 6-71)	<p>Mitigation measures for project-related noise were not identified for the Construction phase.</p> <p><b>Context:</b> The mitigation measures provided in Section 6.2.5, including a complaint management system is also to be implemented as part of the EMS, are only proposed for the operations phase.</p> <p>However, construction activities are predicted to last more than one year. Construction noise will involve the use of equipment operating at the site, construction of surface facilities, drilling, and partial operation of the freeze plant. It will also include regular truck trips and air traffic for personnel changes.</p> <p><b>Rationale:</b> It is unclear if listed mitigation measures also apply to the construction phase (or only to the operations phase).</p>	<p>1. Clarify whether mitigation measures and the proposed EMS apply to the Construction phase. If not, identify mitigation measures for noise impacts related to Construction phase activities, and consider applying the EMS to the Construction phase and implementing the community complaints and response procedure from the beginning of construction activities.</p> <p>2. Health Canada suggests that construction noise lasting longer than 1 year be assessed as operational noise, and that noise mitigation measures be applied also to the construction phase. Special consideration should be given to mitigation measures for construction noise that occurs at night, in order to minimize impacts on sleep (i.e., avoiding tonal or impulsive noise sources at night).</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of Appendix H of Health Canada (2017), which identifies additional construction noise mitigation measures that could also be considered to reduce project- related noise.</p>	<p>1. Mitigation measures and the proposed EMS apply to both Construction and Operation. As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison will collaborate with English River First Nation (ERFN) and Kineepik Metis Local (KML) on a community specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous communities of ERFN and KML will be sharing information in an agreed-upon fashion. If noise from construction activities form part of the interests for each of these Indigenous communities.</p> <p>2. See response to IR-42 regarding nighttime work and potential for sleep disturbance.</p> <p>The draft EIS will be updated to include the above clarifications.</p>	<p>The first paragraph of Section 6.2.5 will be revised to clarify the applicability of mitigation measures as follows: "Strategies to reduce the likelihood and magnitude of the predicted effects include source elimination and utilizing planning measures to counter the conditions that contributed to the predicted effects. Mitigation measures <b>to be applied during both Construction and Operation</b> include:..."</p> <p>The first paragraph of Section 6.2.8 will be revised to clarify the applicability of the EMS as follows: "An EMS will be implemented and include air quality and noise management and monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines that have been adopted for this assessment <b>during both Construction and Operation.</b>"</p>
IR-44	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p><b>Context:</b> Section 6.2.8 discusses Monitoring and Follow- up. The proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p><b>Rationale:</b> Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see <a href="#">Health Canada, 2017</a>).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per <a href="#">Health Canada (2017)</a>.</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>	<p>1. Denison is undertaking sequential EA and licensing processes with the CNSC. As such, a detailed management system based on the CNSC’s safety and control areas and focused on anticipated compliance verification criteria will be developed over the upcoming months to support licensing activities.</p> <p>Further to this, a framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section. Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing, and as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.</p> <p>As noted in Section 6.2.8 of the draft EIS, a commitment to have a community complaints and response procedure for noise has been made by Denison. Consistent with Denison’s approach to sequential EA and licensing and as highlighted above the specific details associated with this complaints and response procedure, consistent with provincial and federal guidelines, will be developed at that time. Nevertheless, further information concerning the framework / approach to the community complaints and response procedure is provided below for reference.</p>	No updates to the EIS in response to this IR.



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						<p>Denison is committed to designing the noise monitoring and follow-up plan and an associated procedure in accordance with provincial and federal guidelines and industry best practice.</p> <p>The plan will identify:</p> <ul style="list-style-type: none"><li>• Project-related noise sources and control measures;</li><li>• How complaints will be filed, acknowledged, investigated, and resolved, including general timeframes for each phase;</li><li>• How confidentiality of a complainant’s identity will be respected, if requested, how anonymous complaints can be filed and how assistance for those who may face barriers to the procedure can be accommodated;</li><li>• How those involved in executing the plan will receive training and be made aware of the plan;</li><li>• How potentially affected communities will be engaged;</li><li>• How complaints and their resolutions will be tracked and recorded;</li><li>• How the performance of the plan will be monitored and evaluated and how this information shall be communicated; and</li><li>• How the plan will be updated.</li></ul> <p>It is anticipated that the following procedure specific to noise complaints is expected to be applied:</p> <ul style="list-style-type: none"><li>• Each complaint would be logged/recorded and include the following information:<ul style="list-style-type: none"><li>○ the name, address and contact information of the complainant (if provided);</li><li>○ the time and date of the complaint;</li><li>○ the nature of the complaint; and</li><li>○ meteorological conditions at the time of complaint (i.e., wind direction).</li></ul></li><li>• Determine the specific cause(s) of the complaint and take short-term and immediate actions to resolve the cause of the complaint;</li><li>• Provide a prompt response to the complainant (within 24-hours) and follow-up as needed based on the required actions to resolve the complaint; and</li><li>• Prepare and retain on-site a written report that:<ul style="list-style-type: none"><li>○ identifies the cause of the complaint;</li><li>○ identifies the actions taken to appropriately deal with the cause of the complaint; and</li><li>○ identifies any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.</li></ul></li></ul> <p>2. Denison has committed to working with its Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local), to understand the issues and concerns they have relative to the Project, and resolution of some specific items of interest or concerns may be resolved through the negotiation process of private contractual arrangements or agreements. The noise complaint mechanism will be one area that will be raised specifically with the Indigenous Communities of Interest with reserves and or / residential communities most proximal to the Project (English River First Nation and Kineepik Metis Local).</p>	
IR-45	HC	Change to an environmental component due to hazardous contaminants	Section 6 Air Quality Technical Supporting Document Section 6.3.1	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p><b>Context:</b> Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: “concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel”. However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p><b>Rationale:</b> Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p><b>References:</b> [1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table. <sup>1</sup>	An evaluation of carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022) is provided in Attachment IR-45.	No updates to the EIS in response to this IR.

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				<p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>			
IR-46	HC	Physical stressors (noise and vibration)	Appendix 6-A Table A-1	<p>Low-frequency noise and associated potential human health effects were not assessed.</p> <p><b>Context:</b> Some equipment that may emit low-frequency noise (LFN) have been listed in Table A-1: Assessment Scenarios and Sound Level Data (Section 6 Appendix A); however, no information describing potential impacts of this type of sound on nearby human receptors are presented.</p> <p><b>Rationale:</b> Low frequency noise can be associated with the introduction of noticeable vibrations and rattles in nearby structures. Research indicates that annoyance related to noise is greater when low-frequency noise is present (ISO 1996-1:2003). As sound environments are usually characterized using A-weighted decibel levels (dBA) that reflect the frequencies most audible to the human ear, the impacts of low- frequency noise may need to be assessed separately.</p>	<p>1. Clarify whether any project-related activities (construction, operation and/or decommissioning) may produce LFN that could impact off-site human receptors. Evaluate LFN in the noise assessment, if and where applicable. See Appendix C of <a href="#">Health Canada (2017)</a> for a discussion of LFN.</p>	<p>Appendix C.2 of Health Canada (2017) identifies an approach to assessing LFN from ANSI, which states that the energy sum of the 16-63 Hz octave bands should be less than 70 dBZ to avoid rattles due to LFN. The energy sum of the 16-63 Hz octave bands at the nearest human receptors is expected to be well below 70 dBZ (predictions indicate the values are in the order of 44 dBZ at the nearest human receptor).</p> <p>The draft EIS will be updated to include the additional supporting discussion outlined above.</p>	<p>The following paragraph will be appended to the end of Section 5.1 of Appendix 6-E:</p> <p>"In addition to the Ldn and %HA assessment methods, Health Canada (2017) also recommends assessing the potential for low frequency noise (LFN) impacts such as noise-induced vibration or rattles in building structures. The recommended approach from ANSI is to combine the predicted receptor sound levels in the 16 to 63 Hz octave bands and compare the total to a criterion of 70 dBZ. The maximum prediction for this assessment was 44 dBZ, and, therefore, LFN is not predicted to be a concern for the Project."</p>
IR-47	ECCC	Air Quality	Appendix 6-A, A.1	<p><b>Context and Rationale:</b> Verification of the following calculation is required for assessing predicted emissions of dust from general construction. It appears the result of 0.70 ton/acre/month is incorrect and should instead be 0.314 ton/acre/month.</p> <p>Appendix 6-A, Appendix A, A.1 (p. A4) TSP Emission Factor for General Construction:</p> $EF\ (TSP) = 0.11 \frac{\text{ton}}{\text{acre}} \times 1.2 \frac{\text{ton}}{\text{acre}} \div 0.42 \frac{\text{ton}}{\text{acre}} = 0.70 \frac{\text{ton}}{\text{acre}}$	<p>Explain how the emission factor total suspended particulates (EF (TSP)) result was obtained or rectify if it is incorrect and update the draft EIS to reflect the correction.</p>	<p>The formula incorrectly displayed the wrong units. It is 0.314 ton/acre/month, which converts to 0.70 tonnes/hectare/month. Denison confirms that this was a typographical error, and the result of the calculation is unchanged.</p>	<p>In Appendix 6-A, the formula will be changed to:</p> $EF\ (TSP) = 0.11 \frac{\text{ton}}{\text{acre}} \times 1.2 \frac{\text{ton}}{\text{acre}} \div 0.42 \frac{\text{ton}}{\text{acre}} = 0.314 \frac{\text{ton}}{\text{acre}} = 0.70 \frac{\text{tonnes}}{\text{ha}}$
IR-48	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p><b>Context:</b> Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p><b>Rationale:</b> The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	<p>1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.</p>	<p>A new figure will be added to Section 6.2 of the final EIS showing the Project Area, Local Study Area, the receptor locations, and nearby land leases (both traditional and recreational). A copy of this new figure has been included with this IR response.</p> <p>As noted in the context and rationale for this IR, Denison included the receptor locations on the contour maps with the predicted noise levels (Appendix 6-E, Figures 8 to 15); as such, no edits to the Appendix 6-E figures are proposed in response to this IR.</p>	<p>A new figure will be added to Section 6.2 and a copy of the figure has been included with this IR response in Attachment: IR-48. The new EIS Figure will be 6.2-4; figure numbering will shift and Figure 6.2.4 Baseline Monitoring Locations for Noise in the draft EIS will become Figure 6.2.5 in the final EIS.</p>
IR-49	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The Noise Source Characterization is incomplete.</p> <p><b>Context:</b> Section 3.0 of the Draft EIS Section 6 Appendix 6- E discusses Source Characterization. There is no detail regarding potential tonal or impulsive noise sources in Section 3.0.</p> <p><b>Rationale:</b> The draft EIS should include a description of sound source characteristics (e.g., tonal, impulsive, highly impulsive) in order to properly inform the quantitative noise assessment and which assumptions/adjustments need to be applied and to properly evaluate impacts of project noise on health of affected receptors.</p>	<p>1. Identify any tonal, regularly impulsive, highly impulsive, or high-energy impulsive noises likely to be produced during project activities that could be audible at noise sensitive receptors. Furthermore, describe the timing (e.g., hours of night-time activities), frequency and duration of noise events, and their sound characteristics, including frequency spectrum. See <a href="#">Health Canada (2017)</a> for details.</p>	<p>No tonal or impulse sources were identified for either assessment scenario. Construction activity was assumed to occur 24-hours per day as a conservative measure. The frequency spectrum data for each source is included in Table A.1 of Appendix 6-E.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rational for inapplicability to sources identified.</p>	<p>The following paragraph will be appended to the end of Section 3.0 of Appendix 6-E:</p> <p>"Upon establishing the source sound levels for inclusion in the predictive modelling, the list was reviewed to determine whether there were any sources with special sound characteristics such as tonality or impulse noise. Health Canada (2017) recommends the application of source adjustments in accordance with ISO 1996-1 for such sources as these are associated with increased annoyance. No tonal or impulsive noise sources were identified in the Construction or Operation scenarios."</p>
IR-50	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The description of noise modelling does not document or justify the use of sound level adjustments.</p> <p><b>Context:</b> ISO Standard 9613-2 has been used for the sound level modelling; however, it is unclear if all applicable adjustments have been considered as per ISO 1996-1:2016 (Table A.1).</p> <p><b>Rationale:</b> When modelling techniques are used to estimate present (baseline) or future (construction and operational) sound levels, these techniques and any accompanying assumptions, including the use of sound level adjustments, it is important to provide appropriate documentation and justification.</p> <p>Note that in situations where more than one source characteristic</p>	<p>1. Clarify whether ISO-1996-1:2016 has been considered in the modelling to account for any applicable sound level adjustments. Adjustments should be considered when calculating Ln (night- time sound level) and Ldn (day-night sound level). In addition, if applicable, adjustments can be applied depending on the noise characteristic (impulsive, highly impulsive, etc.), and because the project location is considered to be in a quiet rural area. See: ISO 1996-1:2016 and Health Canada (2017) for details.</p>	<p>No tonal or impulse sources were identified for the assessment scenario. As discussed in Section 6.2.1.2.1 of the draft EIS, the assessment did include the 10 dBA nighttime penalty inherent in the calculation of Ldn, and also included the HC recommended adjustment of +10 dBA to the Ldn levels to account for the Project location being in a quiet rural area.</p> <p>Appendix 6-E will be updated to include discussion of ISO 1996-1 adjustments and rationale for inapplicability to sources identified. The noted time-of-day and rural adjustments are already discussed in the draft EIS and applied in the assessment.</p>	<p>Appendix 6-E will be updated, per the paragraph outlined in the response to IR-49, which is expected to resolve the comment about tonal and impulse noise.</p> <p>The comment regarding the adjustment to account for the Project being in a quiet rural area was already accounted for in the draft EIS as outlined in Section 6.2.1.2.1.</p>

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				adjustment is applicable (e.g., impulsive or tonal), only the higher of the adjustments is used. However, all time-of-day adjustments and the quiet rural area adjustment are to be added to the highest of the applicable source adjustments.			
IR-51	CNSC	Geology and Groundwater	Section 7, Figure 7.8-1  Appendix 7-C	<p><b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.</p> <p><b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?</p>	<p>Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).</p> <p>Please clarify how the establishment of a continuous freeze wall will be monitored.</p>	<p>1: The information in the legend of Figure 7.8-1 will be updated to indicate that 2 well clusters target the Lower Sandstone Aquifer and the Intermediate Sandstone Aquitard. The target hydrostratigraphic units for the 4 well clusters are the Lower Sandstone Aquifer, the Intermediate Sandstone Aquitard, the Upper Sandstone Aquifer, and the overburden aquifer.</p> <p>2: The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.</p>	<p>1: Figure 7-8.1 has been provided in Attachment IR-51 and will be updated in the final EIS to provide information in the legend on the hydrostratigraphic units being monitored in each well cluster.</p> <p>2: The following text will appear in Section 2 (2.2.1.5 Monitoring Well Network) regarding monitoring to demonstrate a continuous freeze wall.</p> <p>The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground. There will be sufficient operational controls in place to verify that the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on opposite sides (inside and outside) of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues include: lowering the temperature of the freeze system to draw more heat out; increasing the freeze coolant flow rates in freeze wells nearer to active ISR cells; and/or to adaptively manage the lixiviant injection and recovery rates in cells located nearest to the freeze wall.</p>
IR-52	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater  Appendix 7	<p><b>Context:</b> According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid, hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.</p> <p>Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the centre surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long”.</p> <p>As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.</p> <p><b>Rationale:</b> The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.</p>	<p>1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells was not presented.</p> <p>2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.</p>	<p>Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the hydrogeologic assessment in the EA. The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and groundwater quality of the mining zone following remediation.</p> <p>During the operation phase, and under normal operational conditions there is no interaction between the mining zone and surface or down gradient environment, and the assessment focuses on post removal of the freeze wall, once the groundwater flow returns to pre mining conditions.</p> <p>The injection and recovery wells will be set up such that they are within the confines of the ore itself. Migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall are minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. If significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice and would be contained therein limiting any excursion outside of the mining horizon.</p> <p>Additionally, continuous 3D modelling has been conducted for the purposes of mining operations beginning in 2019 through 2023, which has successfully demonstrated control of the mining solutions and recovered uranium bearing solution to the ore zone depth and not beyond the mining zone within the confines of the freeze wall. Furthermore, modelling had demonstrated that mining solutions will be maintained within the deposit area laterally and not contact the freeze wall, which is located at a 25 m stand-off distance.</p> <p>For more information on how Denison’s extensive field testing and lab informed the design of the ISR mine and the mining zone remediation objectives please see the response to IR-6.</p>	No updates to the EIS in response to this IR.
IR-53	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<p><b>Context:</b> The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.</p> <p>However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper</p>	Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).	The calibrated hydraulic conductivity values are consistent with observed data. The calibrated K value for the intermediate aquitard was $1 \times 10^{-8}$ m/s, which is in the middle of the range of values reported from point testing within this unit (Range: $10^{-10}$ to $3.8 \times 10^{-6}$ m/s), and similar to the geomean value ( $8.4 \times 10^{-9}$ m/s). Thus, the calibrated K value is within a factor of 1.2 of, and higher than, the geomean value. The hydraulic conductivity value for the Intermediate Aquitard is similar to that applied by AECL at Cigar Lake ( $5 \times 10^{-8}$ m/s). Similarly, the K values applied for the Upper and Lower Sandstone Aquifer units are consistent with the field measured values, particularly for this fractured rock environment. The high end of the	No updates to the EIS in response to this IR.



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				<p>and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p><b>Rationale:</b> It is not clear how representative the calibrated K values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>		<p>packer tested range of K values varied by 2 orders of magnitude between the aquifer and aquitard units, which is consistent with the definition of aquifer / aquitard differentiation. The interpretation of an aquifer-aquitard-aquifer sequence is consistent with the AECL interpretation of the Athabasca Sandstone at the Cigar Lake mine.</p> <p>When packer testing in fractured rock, the hydraulic conductivity associated with any test depends on whether the packed zone contains a continuous fracture set. However, for the unit as a whole, it is important that the model represent the hydraulic conductivity (or transmissivity) representative of the interconnected fracture network. Thus, it is appropriate that the applied hydraulic conductivity values within the aquifers are consistent with the higher end of tested conductivity values within those units. Within aquitard units, having singular higher conductivity fracture values from packer tests that test local fractures only, does not necessarily indicate large-scale transmissivity.</p> <p>A fault feature is suspected along the western perimeter of the Lower Sandstone Aquifer near Kratchkowsky and Williams Lake, located 1.5 km west of the mine site (also as depicted on the Hydrogeological Conceptual Site Model). This feature was interpreted to exist based on the similarity in groundwater levels between deep and shallow aquifers in that particular area (c.f., water levels along the creek south of Williams Lake and within GWR-029, as well as water levels recorded in open boreholes near Kratchkowsky Lake), as well as geochemistry in GWR-029. The geochemistry and water levels show in the vicinity of GWR-029 are different, however, than conditions within the Lower Sandstone aquifer further east of this area, above and east of the Phoenix deposit.</p> <p>The effect of the fault feature along the western edge of the Lower Sandstone aquifer was incorporated within the numerical model both through enhanced hydraulic conductivity parameters, as required to match observed water levels, and boundary conditions applied to introduce as much inflowing water to the Lower Sandstone Aquifer as the water level data suggest is reasonable.</p>	
IR-54	CNSC	Geology and Groundwater	Section 7.3.1	<p><b>Context:</b> EIS states: “The most important associated topographic features in the region are the northwest to southeast trending drumlins and eskers....” This is not the trend shown on the provided maps, nor described elsewhere in the report, e.g., Section 7.3.2.1</p> <p><b>Rationale:</b> Inaccurate information in the EIS</p>	Please update the EIS where required to accurately describe the topographical features.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS.	<p>In Section 7.3.1. the text will be updated to say the following:</p> <p>“The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...”</p>
IR-55	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;  Appendix 7-C, section 2.8	<p><b>Context:</b> According to the proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the proponent concludes that the connectivity between the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p><b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated</p>	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.	<p>Denison acknowledges the IR from the review and based on feedback from the assessment team who conducted the hydrogeological modelling for the EA the following is provided in response.</p> <p>The viewpoint from the third-party assessment team does not align with the conceptual model proposed by the reviewer; however, an alternative calibrated groundwater flow model with a hydraulic conductivity of 1.0E-7 for the Intermediate Sandstone unit has been developed. This higher hydraulic conductivity scenario allows more water to flow laterally through the Intermediate Sandstone unit. Specified head values applied at the model boundaries are employed, such that the amount of water entering / leaving the domain is only limited by the simulated transmissivity and hydraulic gradients. Under this revised calibration, the simulated flow to Whitefish Lake from the Lower Sandstone aquifer would be 0.57% (i.e., &lt; 1%, similar to the model presented in the draft EIS) of the discharge to Whitefish Lake, and the simulated travel time from the ore zone to Whitefish Lake is approximately 250 years. The results of this revised calibrated scenario, with a hydraulic conductivity of 1.E-07 within the Intermediate Sandstone unit, are very similar to those obtained in the base calibrated model. This is the case because the higher flow through the Intermediate Sandstone unit migrates laterally until it reaches the desilicified zone, where it merges with flow from the Lower Sandstone Aquifer travelling upward toward Whitefish Lake. The additional flow contribution through the ISS contemplated by the reviewer would enhance dilution within the desilicified zone and thereby reduce concentrations reaching Whitefish Lake.</p>	No updates to the EIS in response to this IR.

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				in the proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).			
IR-56	CNSC	Geology and Groundwater	Section 7.3.3.2	<p><b>Context:</b> It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p><b>Rationale:</b> It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?	<p>All historic exploration boreholes drilled to date containing a mineralized intersection, with grades higher than 1% U3O8, have been grouted a minimum 25 m above and below the mineralized intersection. The addition of grout to these depths is within the defined depths of the hydrogeologically modelled areas from operational mining scenarios conducted to date. The extent of the mining solution migration (i.e. the mining area) for the purpose on the EA extends 50 meters above the ore zone depth.</p> <p>During Operation, select exploration boreholes will be re-utilized for narrow diameter injection wells that will be developed with monitoring devices for the determination of excursions and water levels. Exploration boreholes not selected for the use of narrow injection wells will be grouted to surface to seal off any remaining conduit. Many of the exploration boreholes previously installed through the desilicified zone that overlies the deposit have collapsed, sealing the zone and acting akin to previous and natural state of the desilicified zone itself.</p> <p>The potential impact of the open, unplugged boreholes was evaluated as part of the numerical model sensitivity simulations performed and presented in Appendix 7-C. In general, while these open boreholes have the potential to create preferential flow paths, they were not found to create a meaningful differences in the groundwater flow paths, or mass transport conditions. This is partially because the simulated groundwater gradients are downward above the ore zone where the open coreholes are most prevalent. Further east, within the desilicified zone, unplugged coreholes are interpreted to have collapsed, such that they do not represent preferential transport pathways in the future</p>	No updates to the EIS in response to this IR.
IR-57	NRCan	Fish and fish habitat	Section 7.3.3.2  Appendix 7-A, sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).	Please see response in Attachment IR-57.	In the final EIS, Section 2.5.2 of Appendix 7-C will be updated to include information provided in Attachment IR-57.
IR-58	ECCC	Fish and fish habitat	Section 7.3.2.4, Ore Deposit	<p><b>Context:</b> The Proponent states that the Phoenix ore bodies are long and narrow (approximately 25 to 50 m wide) and are located within or near a graphitic pelite unit. Hydrothermal alteration associated with the ore zone is a discontinuous envelope of clay alteration and a sulphide-cemented rock zone that extends into the overlying sandstone and the underlying basement (Figure 7.3-3). This black, clay-rich zone is approximately 3 m thick on average and locally hydraulically isolates the ore zone from the overlying sandstones and underlying weathered basement rock.</p> <p><b>Rationale:</b> As indicated by the Proponent, a 3 m black clay rich zone isolates the ore zone from the overlying sandstones and underlying weathered basement rock. It is, however, unclear whether this discontinuous clay layer will prevent downward migration of uranium-bearing solution into the Paleo-weathered basement rock or horizontal flow along the unconformity surface to escape into the</p>	<p>1. Verify that there will be no downward migration of mining solution into the paleo- weathered basement rock or that there is no flow along the unconformity surface.</p> <p>2. If downward migration of the mining solution occurs, explain how it will be mitigated.</p>	<p>1. A portion of the paleoweathered zone is comprised of high grade mineralization of the deposit and will be subject to mining activities controlled by the inward hydraulic gradient induced by pumping. As is discussed in Section 4.1 of Appendix 7-C, potential exists for downward migration of the solubility enhancing fluids used during mining operation and the UBS because of the density and specific gravity of these fluids (greater than that of sea water). However, the downward migration will be limited by the competent unaltered basement rocks below the paleoweathered zone, which is characterized as having very low hydraulic conductivity (Section 2.3 of Appendix 7-C).</p> <p>2. As discussed above, some migration of mining fluids in the paleoweathered zone is expected and groundwater quality in this zone remediated post-mining. The entire thickness of the paleoweathered zone beneath the ore zone was included in the numerical model (Appendix 7-C) as having water quality represented by the "Restored Solution" (Figure 4-1 of Appendix 7-C). That assumption is inherent in the conservative source zone applied to all mass transport simulations. Further conservatism within the numerical model was exclusion of low permeability natural barrier zones (i.e., clays) identified in the geological model for the</p>	No updates to the EIS in response to this IR.

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				environment. Escape of uranium-bearing solution into the environment will have a negative effect on the receiving environment.		ore zone - meaning, it was not assumed that these zones would serve to mitigate against migration of mining fluids into the paleoweathered zone. If downward migration of the mining solution were to occur this would be under an upset condition where monitoring wells placed below the mining horizon would collect these solutions via installed groundwater pumps preventing further migration away from the mining horizon.	
IR-59	CNSC	Fish and fish habitat	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)	<b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.  <b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.	Acknowledged. Figure 7-4.2 in the EIS and Figure 2-18 of Appendix 7-C will be replaced for clarity.	The updated figure provided in Attachment IR-59 will replace Figure 7-4.2 in the final EIS and Figure 2-18 of Appendix 7-C.
IR-60	NRCan	Fish and fish habitat	Section 7.4.2.1  Appendix 7-C, section 5.2.1, Appendix B	<b>Context:</b> In the discussion of the limitations of the numerical groundwater flow model (Appendix 7-C, sec. 5.2.1), the proponent invokes the well known modeling principles of "Occam's razor" and "Parsimony" which guided the parametrization of hydraulic conductivity in model layers. The proponent states that hydrogeologic property values were applied uniformly for, among other units, the Lower Sandstone aquifer beyond the immediate area of desilicified materials. However, in the layer parametrization for the Lower Sandstone aquifer (Appendix 7-C, Appendix B, Figure B-5), NRCan notes a large zone of enhanced conductivity (1 E-05 m/s) extending south from Kratchkowsky Lake, which contrasts with the value (2 E-07 m/s) assigned elsewhere outside the desilicified zone. NRCan also notes the extremely detailed parametrization of hydraulic conductivity in the clay cap overlying the ore zone where borehole control is dense (Appendix 7-C, Appendix B, Figure B-6).  <b>Rationale:</b> In NRCan's opinion, these model features appear to violate the principle of "Parsimony" and require greater justification supported by field observations.	NRCan requests that the proponent provide justification based on field evidence for the multiple hydraulic conductivity zones assigned to the Lower Sandstone aquifer and the clay cap above the ore zone.	We reaffirm that the hydraulic conductivity zones applied are consistent with the principles of parsimony and Occam's Razor. The hydraulic conductivity along the western portion of the model area within the Lower Sandstone Aquifer reflects the identified fault zone discussed in IR-53. This zone was added to better represent observed water levels within that portion of the model area. Further, this high hydraulic conductivity zone permits additional water inflow into the Lower Sandstone Aquifer than would otherwise exist if a lower hydraulic conductivity zone were applied here, resulting in conservative modelling predictions of flow through the Lower Sandstone Aquifer (which is consistent with the requests in IR-55).  The high-resolution representation of the clay cap zones is consistent with other contemporaneous work within the ore zone completed by Petrotek (2020) and subsequently by Denison. This resolution of parameter values is consistent with the high data density contained at the Phoenix ore body. Extensive hydrogeologic core logging and permeameter sampling were conducted on over 3,000 mineralized and lower sandstone drill cores to demonstrate and identify the spatial distribution of the various hydrogeologic units contained within the ore zone itself, for purposes of optimizing mining scenarios and flow pathways for recovery. Each hydrogeological unit has specific hydraulic conductivity values based on this extensive test work in addition to various field packer and pump/injection test work.	No updates to the EIS in response to this IR.
IR-61	CNSC	Geology and Groundwater	Section 7.4.2	<b>Context:</b> There is no discussion of potential induced seismicity from mining processes.  <b>Rationale:</b> Induced seismicity may lead to a loss of process as identified for natural seismicity.	Please provide information on the potential mining-induced seismicity.	Natural seismic activity in Northern Saskatchewan is quite rare with no significant events in recorded history (refer to draft EIS Section 15.2 Seismic Events).  Compared to conventional mining techniques, the potential for mining-induced seismicity from ISR mining is quite low. Potential for mining-induced events for the Project could be postulated to occur as the result of a few sources: 1. collapse of cavity voids from leaching, 2. hydraulic fracturing, and, 3. use of permeability enhancement techniques, and each is discussed further below.  <ol style="list-style-type: none"><li><b>Collapse of cavity voids.</b> To clarify, the portion of the deposit being mined is never truly a void (as in a large empty underground cavern); rather, what remains will be a honeycomb textured environment with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses. In terms of void space creation and collapse of the overlying strata, modelling has demonstrated that only 0.05% by volume of desilicified material immediately overlies the ore zone and would be subject to collapse (RESPEC 2023; included here as Attachment IR-21). This low volume and percentage is determined to not be of significant seismic concern.</li><li><b>Hydraulic fracturing.</b> Draft EIS Section 2.2.1.4.2 Wellfield Operation provides a comparison of ISR mining pressures to conventional fracking pressures used in the oil and gas industry. Conventional fracking pressures used in the oil and gas industry can vary; however, common pressures to induce fracturing can range up to 15,000 psi and require injection of fracking fluids of up to 16,000 liter per minute over periods of three to four days. Fracking fluids are comprised of a slurry of water, proppant (generally silica sand), and chemical additives to support and maintain the open fracture system after fracking is conducted. Conversely, ISR mining for the Project is planned at nominal pressures of 100 psi, intermittent pressures of up to 250 psi, and average flow rates of 30 liters per minute within a recovery well. The ISR mining method proposed for the Project is markedly different than fracking. For example, looking at intermittent pressures alone, ISR pressures are anticipated to be 60 times lower than fracking pressures.</li><li><b>Permeability enhancement techniques.</b> Draft EIS Section 2.2.1.4.3 Permeability Enhancement outlines the three types of techniques being considered for the Project: mechanical, Propellant, and hydraulic options. Propellants are classified as a low hazard explosive (S.1 special-purpose explosives, low hazard explosives, per Explosive Regulations, section 36). Propellants technically do not explode (like classic mine explosives which detonate) but rather burn through a process called deflagration. Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds. Neither ISR mining or permeability enhancement is expected to produce mining-induced seismicity.</li></ol>	No updates to the EIS in response to this IR.



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IR-62	ECCC	Fish and fish habitat	Section 7.4.2, Potential Project-related Effects	<p><b>Context:</b> The Proponent indicates that the mining area includes:</p> <ul style="list-style-type: none"> <li>the ‘active mining area’, which is the target ore zone;</li> <li>a zone extending between 11 and 13 m above the active mining area that represents the maximum vertical height over which the injected mining fluids will migrate upwards from the ore zone during active mining; and</li> <li>a zone extending 50 m vertically upwards from the active mining area (that incorporates the active mining area and the 11 to 13 m zone defined in the previous bullet) that was selected to account for potential upset conditions.</li> </ul> <p><b>Rationale:</b> It is not clear to ECCC how the Proponent would be able to limit the mining solution migration within 11 &amp; 13 m above active mining as the maximum vertical height over which the injected mining fluid will migrate. As the mining fluid will be injected under pressure into zones with possible presence of fractures, the pressure may also cause additional fractures and given that the solution is warm/hot will possibly dissolve the other cementing material in the sandstone above, making it difficult to accurately predict where the solution will migrate to.</p>	<p>1. Explain plans to limit the upward migration of mining solution into the overlying layer to 11 and 13m above the ore zone.</p> <p>2. Explain what impacts will occur if the mining solution migrates beyond the predicted height.</p>	<p>1. More detail on engineered controls for containment of mining solution is provided in the draft EIS, Section 2.2.1.4.2 Wellfield Operation; see also the response to IR-08. Continuous monitoring of pump and injection wells will confirm containment of mining solutions to the lower 11 to 13 m above the ore zone during active operations.</p> <p>2. Additional monitoring wells located above this elevation will be installed to make sure this depth is achieved. These monitoring wells can be retrofitted to be pumping wells if needed to provide additional control of mining solutions. Denison has established a conservative mining area of 50 m above the ore zone in the EIS, which will be remediated to acceptable criteria post mining. Additionally, the freeze wall will be in place throughout Operations and will provide horizontal containment of solutions.</p>	No updates to the EIS in response to this IR.
IR-63	CNSC	Geology and groundwater	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning  Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.	See response in Attachment IR-63.	The information provided in Attachment IR-63 will be attached to Appendix 7-C in the final EIS.
IR-64	ECCC CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation  Appendix 7-A, Appendix K (p. 12)	<p><b>Context:</b> The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.</p> <p><b>Rationale:</b> ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.</p> <p>It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.</p>	<p>Explain:</p> <ul style="list-style-type: none"> <li>Will this be revisited with updated data based on extraction feasibility results?</li> <li>How will the surface expression of a subsidence will be limited to 7.5 cm and localized?</li> </ul> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.</p>	Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including subunits within the altered zone (RESPEC 2023; included as Attachment IR-21) and the surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm. Denison is not anticipating the need for remediation measures with the surface subsidence being negligible within the context of changes in terrain as it relates to decommissioning objectives.	No updates to the EIS in response to this IR.
IR-65	CNSC	Geology and Groundwater	Section 7.4.2.2	<p><b>Context:</b> It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?</p> <p><b>Rationale:</b> Surface facilities and wells may be impacted if there is unaccounted for subsidence.</p>	Please provide additional details for any dewatering/pumping induced subsidence.	<p>No pumping and/or dewatering subsidence is anticipated to occur as the fluid balance will remain relatively stable during Operation with no additional stresses placed on the mining horizon. Refer also to response to IR-07.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains after mining will be a honeycomb texture with water-filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake, where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No updates to the EIS in response to this IR.

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						<p>Although the above provides context on the absence of true, air-filled voids remaining post-mining, the risk of subsidence has been assessed appropriately (included in the draft EIS as Appendix K to Appendix 7-C; see also draft EIS Section 7 Geology Valued Component - Terrain Morphology and Stability Key Indicator and draft EIS Section 9 Terrain Valued Component - Terrain Morphology Key Indicator and Terrain Stability Key Indicator). The analysis shows there is negligible risk of subsistence and the magnitude of subsistence, if it were to occur, is the range of 7.5 cm at surface.</p> <p>Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21).</p>	
IR-66	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<p><b>Context:</b> Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.</p> <p><b>Rationale:</b> Subsidence may impact wells and surface infrastructure.</p>	<p>Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.</p>	<p>Please see response to IR-64 for an updated analysis of surface subsidence (2.4 to 2.8 mm at surface; RESPEC 2023 included as Attachment IR-21). The predicted changes at surface related to subsidence is beyond the range of current Lidar technology with resolution at 10 cm. As such, Denison believes the level of risk for subsidence is negligible and that monitoring and contingency plans are commensurate with this low level of risk.</p> <p>Injection and recovery wells will be collared at surface and surveyed regularly to monitor for any changes in collar height over time. This monitoring will be added to Section 7 of final EIS for the Geology VC.</p>	<p>Update to Table 7.5-1 in Section 7 of the final EIS to note that subsidence estimates are in the mm range and mitigation measures are not required. Injection and recovery well collar height monitoring will also be added to Section 7 of the final EIS.</p>
IR-67	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<p><b>Context:</b> Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.</p> <p><b>Rationale:</b> The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).</p>	<p>1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.</p> <p>2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.</p> <p>3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-68	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7	<p><b>Context:</b> Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone.</p> <p><b>Rationale:</b> In NRCan's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCan notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCan's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.</p>	<p>NRCan requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.</p>	<p>Please see response in Attachment IR-68, IR-94, IR-97.</p>	<p>No updates to the EIS in response to this IR.</p>
IR-69	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCan's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the</p>	<p>NRCan requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.</p>	<p>Please see response to Attachment IR-20, IR-67, IR-69.</p>	<p>No updates to the EIS in response to this IR.</p>

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				choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This Information is important when considering source terms in reactive transport modeling.			
IR-70	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p><b>Context:</b> The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p><b>Rationale:</b> A hydraulic conductivity (K) value of 5x10<sup>-6</sup> m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.	<p>Based on coreflood and column tests performed in the laboratory, a modest increase in the flow rate through the core was observed post-leaching. This is described in more detail in the response to IR-69. Based on the available information, the hydraulic conductivity in the ore zone was raised to be a uniform value of 2E-07 m/s to be represent the effective dissolution of any clay cap materials.</p> <p>However, the post-mining conductivity of the ore zone is not important to the fate and transport of the COPCs in the restored solution towards Whitefish Lake, as it represents a small portion of the flow path. Key parameters controlling transport rates to Whitefish Lake were the hydraulic conductivity of the lower sediments and the desilicified zone. Scenarios 5, 6, and 7 of the parameter uncertainty assessment presented in Section 4.7, Appendix 7-C, systematically explore the highest parameter values consistent with the observed data used for model calibration. As indicated by these scenarios, the geochemical assimilation capacity outweighs the uncertainty in hydraulic conductivity values.</p>	No updates to the EIS in response to this IR.
IR-71	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	<p><b>Context:</b> The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p> <p><b>Rationale:</b> It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.</p>	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.	<p>The experience of the Project team regarding studies of climate change and the impacts on groundwater at other sites generally shows a range of potential positive and offsetting negative impacts. While warmer temperatures will lead to extended periods of summer drought conditions extending into early fall, warmer winters are predicted as well, resulting in less snowpack accumulation, more frequent snowmelt events, and more frequent rainfall during periods when evapotranspiration is negligible. These warmer winter conditions are often simulated to produce enhanced groundwater recharge during late fall, winter, and early spring conditions. In particular, the lack of enhanced snowpack is simulated to result in less severe spring run-off conditions, indicating that more of the winter precipitation that falls will infiltrate. Overall, this is anticipated to result in enhanced groundwater recharge in the mid- to late-century periods.</p> <p>If, however, lower groundwater recharge was to result from climate change, it would reduce the groundwater driving force for mass transport of mining related fluids, and reduce mass loading to receiving water bodies such as Whitefish Lake. In other words, lower groundwater recharge resulting from higher evapotranspiration would result in slower mass transport to the receiving water bodies, reducing the risk of exposure.</p>	No updates to the EIS in response to this IR
IR-72	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<p><b>Context:</b> Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.</p> <p><b>Rationale:</b> It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?</p>	Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.	<p>Loss of freezing to the freeze wall is considered an accident and malfunction, and highly unlikely, although if it occurs, will be signaled earlier by operational monitoring than through monitoring of groundwater quality. Details of the monitoring of the integrity of the freeze wall are provided in IR-51 and include ground temperature monitoring achieved through a series of continuous fiberoptic temperature and pressure wells from surface to the depth of impermeable basement rock below the unconformity. Such monitoring wells/systems will be installed on both the ore (inside) and non-ore (outside) sides of the freeze wall to confirm the thickness of frozen ground and will provide early detection of any upset conditions can be identified and addressed.</p> <p>For more information on the freeze wall integrity see attached technical response IR-10</p> <p>The groundwater monitoring network and plan, as presented in the draft EIS, was designed primarily to detect excursions of mining fluids, but also considers upset conditions related to the freeze wall. The parameters being measured in groundwater include electrical conductivity (EC) and chloride, which is a key indicator of freeze wall brine (CaCl<sub>2</sub>), but is not expected to be a key indicator of migration of mining fluids. It is acknowledged that there was an oversight in the description of groundwater monitoring in Section 7.8.2 in not including chloride as a key performance indicator related to freeze wall upset conditions and brine migration; it has, however, been included in the Groundwater Monitoring Plan being developed for Licensing. Groundwater monitoring in wells and well clusters detailed in Figure 7-8.1 of the draft EIS (see IR-51 for updates to Figure 7-8.1) will include sampling for chloride and other key indicator parameters as well as continuous monitoring of EC (and pressure) at target hydrostratigraphic depths. The number of wells targeting the Lower Sandstone Aquifer is highest, with one monitoring well placed every 125 to 150 m distance along the freeze wall. The higher frequency of wells in this hydrostratigraphic unit reflects this as the unit where an upset condition with the freeze wall has the highest potential to allow migration of chemical constituents associated with the mining fluids laterally from the mining zone. Monitoring of</p>	No updates to the EIS in response to this IR.  The groundwater monitoring plan that will be submitted for licensing includes chloride and EC as key indicator parameters for demonstrating freeze wall integrity and, under upset conditions, delineating migration of brine in groundwater.



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						these key parameters will also occur in wells in the overlying hydrostratigraphic units (Intermediate Sandstone Aquitard, Upper Sandstone Aquifer and Overburden Aquifer). The groundwater monitoring network serves as secondary means to demonstrate freeze wall integrity and, under upset conditions, delineate migration of brine in groundwater. In addition, changes in pressure and temperature will be monitored continuously in vibrating wire piezometers (VWPs) surrounding the freeze wall, again every 125 to 150 m along the freeze wall, and changes would be evaluated in terms of potential to signal a freeze wall upset condition.	
IR-73	CNSC	Geology and groundwater	Section 7.8.2.2, In Situ Recovery Mining Area  Appendix 7-A, Appendix C	<b>Context:</b> The EIS recommends that a follow-up study be carried out to supplement available data on hydraulic conductivity in the Desilicified Zone (DSZ).  <b>Rationale:</b> Appendix C (Summary of Hydraulic Testing Data and Conductivity Values) of Appendix 7A indicates that only n = 6 hydraulic conductivity values are available for the DSZ, one of which appears unreliable due to a problem with packer sealing. This is relatively few values compared to the Intermediate and Lower Sandstones. Additionally, limited hydraulic head data from boreholes screened in the DSZ is available (GWR-037, GWR-012 and GWR-014; See Figures 16/17 in Appendix 7-A) – most information appears to originate from open core holes. The information presented in its current form is insufficient considering the importance of this zone as a preferential pathway for contaminants following remediation activities, and the heterogeneity of the unit due to intense hydrothermal alteration and fracturing. Further information regarding hydrogeological properties and groundwater flow would aid greatly in validating and refining the numerical groundwater model.	As per the EIS recommendations, please provide additional information to supplement available data on hydraulic conductivity in the DSZ. Please provide the following information as part of the follow-up study: <ol style="list-style-type: none"><li>1. identification of the vertical conductivity (KV) as there is an upward flow component (isotropy was assumed in DSZ for numerical model, this assumption must be verified)</li><li>2. quantification of the horizontal and vertical flow gradients in the DSZ; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fracture/fault zones.</li></ol>	The specific information being asked for will be included in the final EIS. The detailed Groundwater Monitoring Plan will be provided to support licensing.  The need for additional data within the desilicified zone is recognized and Denison has committed to gathering that data during Construction. In the absence of such data, reasonable and conservative assumptions were made regarding the continuity, hydraulic conductivity, porosity and nature of the geochemically reactive solids of the desilicified zone. Conservatism on multiples levels provides confidence that conditions are likely more favourable than simulated within the draft EIS.	Section 7.8.2.2.1 of the final EIS will be updated to include these follow-up commitments related to the desilicified zone: <ol style="list-style-type: none"><li>1. identification of vertical conductivity;</li><li>2. quantification of horizontal and vertical flow gradients; and</li><li>3. identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fractures/fault zones.</li></ol>
IR-74	CNSC	Geology and Groundwater	Section 7.8.2.3	<b>Context:</b> It is stated in Section 7.8.2.3 (p. 7-113, main EIS report) that, at the Post-Decommissioning Stage, “Excursion are signaled by a change in water quality that is outside of that bounded by modelling predictions”, and “The model predictions spatiotemporally bound COPC concentrations in the subsurface that do not pose a risk to the receiving environment. Water quality that is outside of this bounding is defined as representing a material increase over a meaningful period compared to the predicted values either in rate of change or magnitude of change of COPC concentrations.”  <b>Rationale:</b> It is not clear in which locations (e.g., is it in the mining area, or downstream of the mining area, or anywhere else?) the water quality is used to compare with the model predictions to determine if excursion occurs.	Please clarify in which locations the water quality data is used to compare with the model predictions to determine if excursion occurs.	These comparisons refer to conditions at the proposed monitoring well locations.	No updates to the EIS in response to this IR.
IR-75	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<b>Context:</b> The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.  <b>Rationale:</b> By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.	Additional conservative modelling scenarios were undertaken to address this (and other IRs). The modelling results show that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable (1.0 < factor of safety [FS] < 1.25), and no-failure conditions are apparent. The predicted surface displacement remains approximately 2.4 to 2.8 mm (RESPEC 2023; included here as Attachment IR-21).  For desilicified sandstone properties, failure conditions are predicted in 12.6% of the modeled desilicified sandstone volume, which is located within 20 to 35 m of the ore zone. Notable observations from modelling include that, based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone. The vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm, and quickly reduces to the range between 0 and 7 cm at a distance of 4 – 5 meters from the low-grade ore zone (RESPEC 2023).	No updates to the EIS in response to this IR.
IR-76	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<b>Context:</b> Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.  <b>Rationale:</b> Failure of steel casing may result in process loss or alter groundwater flow and quality.	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.	The well designs and operational monitoring of the wellfield will mitigate accidental release of mining solution or UBS in the sandstone above the mining area. Each well will have double containment: mining solution will travel inside an inner casing with the outer casing acting as secondary containment for the mining fluids. Wells will be continually monitored for operational parameters such as injection pressures, injection flow rates, and recovery flow rates. This data will be transmitted to the processing plant for remote monitoring through a master control system. Through the master control system, operators will be capable of controlling pumphouse production lines remotely. Wellfield monitoring will facilitate detection of any issues with the injection and recovery wells.  Specific to the steel casing for the injection and recovery wells, the conservative estimate of vertical strain in the steel casing passing through the altered sandstone provided in Appendix 7-A of the draft EIS is approaching the tensile and compressive yield limits; however, these estimates are likely an over-estimate of the actual casing strains because of the simplified, conservative assumptions used in the analysis. Altered sandstone within 25 m from the boundary of the mined excavation experiences tensile vertical strain greater than the yield limit (0.0018 strain) such that the vertical strain is relatively higher because of the presence	No updates to the EIS in response to this IR.

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						<p>of upper clay above the ore zone. The altered sandstone around the mined cavity similarly experiences compressive vertical strain greater than the yield limit (–0.0018 strain) for the radial span of 25 m. Where tensile strain exceeds the yield limit there is potential for well failure. These isolated areas that have been identified from the geomechanical study will need further assessment of well designs should a well be placed in these specific sub locations within the deposit area.</p> <p>A network of monitoring wells installed within the freeze wall area will be equipped with pressure instrumentation for the determination of the vertical strain/stresses placed on the formation to do mining zone space creation. This monitoring network is designed to detect if these strains may be approaching their acceptable levels prior to failure. The injection and recovery wells will also be equipped with devices for pressure and temperature that can detect a breach in the well casing if one were to occur. As a preventative measure, annual mechanical integrity testing is conducted on the wells to ensure their containment and compliancy.</p> <p>Active monitoring will allow for operational shutdown if a scenario is approaching a failure mode.</p>	
IR-77	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 1)	<p><b>Context:</b> It is reported in the appendix K report, within Appendix 7-A, that both phase I scoping analysis and phase II detailed strip model were investigated by numerical modelling. The analysis discussed influence on host rock stability as a result of incremental increase in volumetric extraction and graded conservative treatment of material properties.</p> <p><b>Rationale:</b> As critical components of a numerical geomechanical simulation, initial and boundary conditions are crucially important to the confidence and reliability of the modelling results. However, this information is absent from the current report. In-situ principal stresses largely affects the stability of the excavated host rock, and the vertical strain and surface subsidence. This information is also absent in current form.</p>	Please provide details on the boundary and initial conditions applied on stress loading and strain for the numerical analysis. In particular, the in-situ principal stresses, which are critical to correct understanding of the excavation disturbance to the host rock, should be provided and justified as appropriate.	<p>Several numerical models were conducted for material properties for altered sandstone. Presuming that the entire altered sandstone to be unconsolidated and desilicified.</p> <p>» For 0.0 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.1 MPa cohesion value, the numerical model reached equilibrium for friction angle greater than and equal to 27 degree.</p> <p>» For 0.5 MPa cohesion value, the numerical model reached equilibrium for friction angle of 20 degree.</p>	No updates to the EIS in response to this IR.
IR-78	CNSC ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity  Appendix 7-C, Section 2.3.2.1, Porosity Values	<p><b>Context:</b> This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p><b>Rationale:</b> The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given the that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A, and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests, were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.</p>	<p>Effective porosity values applied in the numerical modelling are thoroughly discussed in section 2.3.2.1 and clearly presented in Table 2-4 of Appendix 7-C.</p> <p>Effective porosity values cannot be derived from packer tests, slug tests, or pumping tests. They can be inferred from core, although core is generally a very small sample of the subsurface and is generally limited to total porosity as opposed to the interconnected pore space. In fractured rock environments, the effective porosity is a combination of the fracture porosity and the portion of the total porosity interconnected with the fractures; thus, the effective porosity tends more toward the value of the fracture porosity. Effective porosity is rigorously determined using a successful tracer test; however, the success of a field based tracer test is not easily achieved as much of the tracer volume is often not intersected by downgradient wells. Consequently, most mass transport assessments use literature values for effective porosity (Anderson, Woessner and Hunt, 2015; pg 332). Further, the tracer test performed within a small portion (i.e., 10 m) of the ore zone, was not considered to be informative of the effective porosity values needed for the entire flow path between the ore zone and Whitefish Lake.</p> <p>For this study the effective porosity values applied in the Cigar Lake 3D model were used as a guide. Literature values suggested by Anderson, Woessner and Hunt (2015) would suggest higher values of effective porosity, which would be less conservative (i.e., result in slower groundwater velocities) than applied within this study.</p> <p>Reference: Anderson. M., W. Woessner, and R. Hunt. 2015. Applied Groundwater Modelling. Elsevier Inc.</p>	No update to the EIS in response to this IR.
IR-79	CNSC	Geology and groundwater	Appendix 7-A, Section 4, Groundwater Chemistry	<p><b>Context:</b> Table 4-1 in Section 4 of Appendix 7-A provides groundwater monitoring results from sampling activities carried out at 26 monitoring wells in 2019, 2020, and 2021. The majority of these wells were only sampled once (n = 8) or twice (n = 17). In some cases (Lower Sandstone Aquifer/Intermediate Sandstone Aquitard), the variability of results between sampling events is quite high. Data for the Paleoweathered Zone is sparse.</p> <p><b>Rationale:</b> Insufficient information is presented in the EIS and associated Appendices to concretely define baseline groundwater chemistry for the different hydrostratigraphic units. As defined in the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>: “Based on the scope of the project, the EIS will present sufficiently detailed baseline information to determine the effects the project could have on the VCs and analyze those effects”. This is particularly important given certain features of the study area (i.e., presence of zones of thermal alteration/desilicification, as well as hydraulically active fractures/faults), and the need to adequately characterize baseline</p>	Please provide the statistical basis (number of samples and variability) by which “baseline” is defined and the justification that the current information is sufficient to adequately characterize groundwater quality. In order to ensure sufficient baseline information is collected, further iterations of sample collection for groundwater monitoring wells in all defined hydrostratigraphic units may be required. In addition, groundwater quality downgradient from the proposed mining area should be further characterized to assess spatial influence of alteration and hydraulically active features,	<p>The statistical basis by which baseline groundwater data has been characterized, that is sample numbers included per hydrostratigraphic unit, median, maximum and minimum values, that describe the variability of the groundwater quality data were presented as Table 4-2 of Appendix 7A and Table 3-4 of Appendix 7C to the EIS. The primary purpose of the groundwater data collected as part of the baseline program is to provide a basis for evaluating the incremental change in groundwater quality with mining activities. The magnitude of any incremental changes in groundwater quality associated with the remediated groundwater, which was the focus of the modelling, was such that deviation in water quality from baseline conditions was possible to identify.</p> <p>Supplemental groundwater monitoring will be ongoing during all phases of the Project. Denison is committed to installing additional wells, with a focus on characterizing pre-mining conditions and monitoring through and post-mining immediately surrounding the freeze wall and downgradient of the mining zone, and will be re-initiating routine sampling that captures seasonal variability in 2024. A N288.7-compliant Groundwater Monitoring Plan is being developed to support permitting and licensing and will guide the aforementioned sampling.</p>	No updates to the EIS in response to this IR.

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				conditions in the Desilicified Zone downgradient from the proposed mining area. As an example, the US Nuclear Regulatory Commission (NRC) typically requires a minimum of four (4) quarterly samples from (i) surficial aquifers, (ii) production aquifers, (iii) overlying aquifers, and (iv) underlying aquifers to characterize preoperational groundwater quality (E. Striz, pers. comm.).			
IR-80	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model.</p> <p><b>Rationale:</b> The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO<sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO<sub>3</sub> or Ca-SO<sub>4</sub>/Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.</p>	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.	Please see response in Attachment IR-80.	Figure 26 of Appendix 7-A of the draft EIS will be separated into Figures 26 and 27, and the Figure numbering updated accordingly in that Appendix. Also, the text on pages 4.17-4.18 and 4.20 of Appendix 7-A of the draft EIS will be updated. These revised figures and text are outlined in Attachment IR-80.
IR-81	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p><b>Rationale:</b> Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., <sup>δ2</sup> H, <sup>δ18</sup> O) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.	Please see response in Attachment IR-81.	No updates to the EIS in response to this IR.
IR-82	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit  Appendix 7-C, Section 3.5	<p><b>Context:</b> A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p><b>Rationale:</b> A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p><b>Reference:</b></p>	<ol style="list-style-type: none"><li>1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2] below provide an example of simplified framework for characterizing redox conditions in aquifers.</li><li>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</li><li>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</li></ol> <p><b>Reference:</b> [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>	Please see response in Attachment IR-82.	No updates to the EIS in response to this IR.



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				[1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnvisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.			
IR-83	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p><b>Context:</b> Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p> <p><b>Rationale:</b> Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.</p>	Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.	Information requested here with respect to details of how the desilicified zone is considered in the geomechanical modelling is addressed in IR-75. Details linking the geochemical model with the geological model including core delineation of the desilicified zone above the mining zone is provided in RESPEC (2023), included here as Attachment IR-21.	No updates to the EIS in response to this IR.
IR-84	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.</p> <p><b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.</p>	1) Please clarify in Figure 2-10 where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. 2) Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.	1) As noted in Table 2-7 of Appendix 7-C of the EIS, under the heading "Surface Water Stations", the surface water stations used to evaluate baseflow to Whitefish Lake are stations SA-6 and SA-2. Both of these stations are demarked in Figure 2-10 of Appendix 7-C, illustrating the portion of Whitefish Lake that is monitored by these stations.  2) Stations SA-6 and SA-7 monitor upstream and downstream hydrologic conditions of the portion of Whitefish Lake adjacent to the Project. The difference in baseflow monitored between these stations is interpreted to be the contribution of groundwater to the portion of Whitefish Lake of interest. Within the report, the discharge between these stations has been referred to as "discharge to Whitefish Lake" although it is acknowledged that this refers strictly to the portion of Whitefish Lake adjacent to the Project.	No updates to the EIS in response to this IR.
IR-85	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C.</p> <p><b>Rationale:</b> It is not clear where Well A, Well B and Well C are located.</p>	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.	These three wells (referred within Appendix 7-C as "A", "B", and "C") are proposed wells to supply water to the mining operations. They are not yet constructed but are planned to be screened within the Upper Sandstone Aquifer. These wells were demarcated as "Freshwater wells" in Figure 2.2-1 of Section 2 of the EIS but were not labelled. Well A is located 200m northwest of the Phase 5 ISR injection area, Well B is located approximately 600 m south of the Phase 5 ISR injection area, while Well C is located 200 m northwest of the Phase 3 ISR injection area.	Figure 2.2-1 has been updated to label the “Freshwater wells” as “A”, “B”, and “C”. The updated figure is included in Attachment IR-85 and will replace the existing Figure 2.2-1 in the final EIS.
IR-86	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.</p> <p><b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.</p>	Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.	As stated in draft EIS Appendix 7-C, Section 2.7.2 (page 2.41) the calibrated, steady-state model was used as the basis for the transient model used to evaluate drawdown during operations. Only conditions immediately within the mining zone were altered within the transient model to reflect the proposed changes during mine operations. All boundary conditions that drive regional groundwater flow were unchanged for the transient model, and all hydrogeologic properties outside of the mining area were left unchanged. Changes made to the hydrogeologic properties were implemented transiently to represent the phased implementation of the freeze wall. Groundwater recharge was changed to reflect alterations to surficial land use and the implication of that land use change to groundwater recharge; transient pumping boundary conditions were incorporated to simulate the planned pumping demand for camp and ISR water requirements. The transient version of the model was used to evaluate changes to the groundwater discharge occurring at Whitefish Lake as documented in Appendix 7-C Section 2.7.	No updates to the EIS in response to this IR.
IR-87	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> In Section 2.8 (p. 2.45, Appendix 7-C) Parameter uncertainty assessment, only parameters for certain zones (part of each specific hydro-stratigraphic unit as shown in Figure 2-19, p. 2.46, Appendix 7-C) related to the pathway from the ore zone toward Whitefish Lake were allowed to vary in order to find combinations of parameter values that met statistical calibration criteria. If each hydro-stratigraphic units within the whole model domain were treated as parameter zones that can have varied hydraulic conductivity values, a different combination of parameter values could be obtained that</p>	It is recommended that the parameter zones in the Parameter uncertainty assessment include hydro-stratigraphic units in the whole model domain to investigate the possible combination of parameter values that could make the groundwater in the mined-out zone more active hydraulically.	As per the reviewer’s request, PEST++IES was applied to generate 50 calibrated realizations wherein all hydraulic conductivity parameter zones were allowed to vary. Of the 50 scenarios generated, the average contribution to Whitefish Lake from the Lower Sandstone Aquifer was 0.73%, with 48 of the 50 scenarios (96%) confirming the calibrated conceptualization. One of those scenarios is documented in the response to IR-55. It is noted that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, but as shown in the literature (Bradbury and Muldoon, 1990), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic	No updates to the EIS in response to this IR.

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				<p>meet statistical calibration criteria too.</p> <p><b>Rationale:</b> The parameter values for parameter zones between the mining area and Whitefish Lake is important in determining the hydraulic connection between the mining area and Whitefish Lake. Parameter values in other parameter zones could also be important. For example, if the K values for the intermediate sandstone aquitard are significantly larger than in the current calibration results, the interaction between the upper sandstone aquifer and the lower sandstone aquifer could be more active, and the mined-out zone could be more active hydraulically and groundwater in the minded-out zone could have a shorter residence time than in the current calibrated model.</p> <p>Additionally, it is noted that Figure 2.19 (p. 2.46, Appendix 7-C) illustrates the parameter zone for the intermediate sandstone aquitard. However, Figure 2.20 (p. 2.49, Appendix 7-C) did not include the intermediate sandstone aquitard in the results.</p>		<p>conductivities are best determined using long-term pumping tests, or a model and calibrating to observed water level trends.</p> <p>Please note that only parameter sets which are consistent with field observations (i.e., observed water level, baseflow, or geochemical observations) are considered relevant for prediction uncertainty analyses.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	
IR-88	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p> <p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in</p>	<p>It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active:</p> <ol style="list-style-type: none"><li>1. Determine the groundwater residence time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</li><li>2. Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</li><li>3. Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</li></ol>	<p>1) Denison believes that the best way to determine residence time as part of the EA is with the modelling approached used in the draft EIS. It is unclear how it would be possible to "determine the groundwater residence time within the Lower Sandstone Aquifer" other than by using a model. Available data (e.g., geochemistry) provide an indication of residence time, but not timing that can be compared to modelled results. The groundwater residence time within the Lower Sandstone Aquifer, downgradient of the ore zone, is simulated using the model to be 150 years or greater. Simulated residence time within the Lower Sandstone Aquifer upgradient of the ore zone is approximately 500 years.</p> <p>2) Particle tracking from the "mined-out" ore zone was incorporated within the EIS, as illustrated on Figure 4-4 of Appendix 7-C. The particle traces presented illustrate groundwater migration flow paths, path lengths, travel times, and velocities for water migrating from the mined-out ore zone. Reverse particle tracking indicates flow through the Lower Sandstone Aquifer flowing from upgradient areas flowing into the ore zone.</p> <p>3) The prediction uncertainty analysis (i.e., "sensitivity analysis") presented in Appendix 7-C included an evaluation of the change in the model prediction (i.e., plume migration) with respect to changes in the conductivity of materials along the flow path to the receptor, Whitefish Lake (i.e., Scenarios 4, 5, and 6) as well as regarding the hydraulic conductivity of the mined-out ore zone. As such we feel that the work requested by the reviewer has already been completed and reported upon within the draft EIS. In addition, the uncertainty of the Intermediate Sandstone Aquifer was evaluated (see IR55), where higher hydraulic conductivity within the Intermediate Sandstone Aquifer were found to reduce the proportion of water from the ore zone reaching Whitefish Lake, which would have the effect of further reducing (i.e., diluting) concentrations simulated and presented in the EIS documentation. As such, the conditions documented in the draft EIS are already conservative with respect to the uncertainty in these parameters.</p>	No updates to the EIS in response to this IR.

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				<p>the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be if the mined-out zones collapse.</p>			
IR-89	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p> <p><b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REDox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.</p> <p>See also related: IR-96.</p>	<p>1) Application of 5E-6 as the value for hydraulic conductivity within the desilicified zone is appropriate; the values of 5E-6 and 6E-6 are essentially the same number, particularly at the scale over which it is applied. We agree that the hydraulic conductivity of the desilicified zone is an important parameter to the fate and transport of dissolved minerals from the ore zone toward Whitefish Lake; that is why scenarios 4, 5, and 6 were designed to evaluate the prediction uncertainty related to the uncertainty of the desilicified zone, along with other hydraulic conductivity values along the transport migration pathway. Further, we recognize that packer tests provide a small-scale sample indication of the representative hydraulic conductivity, and as shown in the literature (Bradbury and Muldoon, 2000), such local tests are rarely representative of large-scale (i.e., macro) hydraulic conductivities. Macro-scale hydraulic conductivities are best determined using a large-scale pumping test or a model calibrated to observed water levels, which is the approach we completed; the value of 5E-6 for the desilicified zone hydraulic conductivity provides an excellent match to observed water levels and baseflow discharge. In addition, packer tests in fractured rock tend to bias the hydraulic conductivity to be higher than is representative on the large scale, as testing is generally targeted on observed fracture zones. Given all this, we reaffirm that the applied hydraulic conductivity of 5E-6 is representative for the conductivity of the desilicified zone.</p> <p>2) Calibration-constrained uncertainty analyses were performed (i.e., the state of the practice) to evaluate the range of potential hydraulic conductivity values that could exist within the desilicified zone while still maintaining calibration. That analysis is presented in section 2.8 of Appendix 7-C. The most conservative of the parameter scenarios that are consistent with the field observational data were used for the prediction uncertainty analyses presented in Appendix 7-C, section 4.7. Scenarios 4, 5, and 6 explore higher hydraulic conductivity values which are supported by the observation data (i.e., calibration-constrained uncertainty analysis). The range of desilicified-zone hydraulic conductivity incorporated within those scenarios (Figure 2-21) is 1.6 to 3.2 m/d (i.e., 1.8E-5 to 3.7E-5 m/s); 3.2 m/d was the highest conductivity value for the desilicified zone (referred to as the Altered Zone within the Intermediate Aquitard on Figure 2-21) for all 50 calibrated realizations generated using PEST. As such, the EIS presented the prediction uncertainty with the highest hydraulic conductivity values supported by the observation data. It would not be appropriate to test scenarios with even higher values of hydraulic conductivity which would not be supported by the field observed groundwater levels. Thus, we do not feel it is appropriate to test scenarios where the hydraulic conductivity of the desilicified zone is orders of magnitude greater than suggested by field observations.</p> <p>References: Bradbury K. R., and M.A. Muldoon. 1990. "Hydraulic Conductivity Determinations in Unlithified Glacial and Fluvial Materials." Groundwater and Vadose Zone Monitoring. ASTM STP 1053. D.M. Nielsen and A. I. Johnson Editors., American Society for Testing and Materials. Philadelphia, 1990. pp. 138-151.</p>	No EIS updates are anticipated to address this IR.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
IR-90	ECCC	Fish and fish habitat	Appendix 7-C, Section 2.4 and 2.6	<p><b>Context:</b> Hydraulic conductivities and hydraulic gradients play an important role in groundwater flow, geochemical modeling, and contaminant transport for the PHREEQC and FEFLOW models. Although there is an important vertical component to the contaminant transport, there is no distinction made between lateral and vertical hydraulic conductivities of hydraulic gradients.</p> <p><b>Rationale:</b> According to the conceptual model, there is an important vertical aspect to the groundwater flow thus incorporating any vertical hydraulic gradient or hydraulic conductivity information into the calibration would increase confidence in the results.</p> <p>Providing a distinct value for vertical hydraulic conductivity will improve the accuracy of the model in regards to the transport of contaminants to Whitefish Lake through the Desilicified zone, which is important to understand potential impacts to aquatic life.</p>	<ol style="list-style-type: none"><li>1. Explain if the vertical and lateral hydraulic gradients and hydraulic conductivities are assumed to be equivalent.</li><li>2. Provide a rationale for not distinguishing between vertical and lateral hydraulic gradients.</li><li>3. Alternatively, provide both lateral and vertical hydraulic gradient estimates and the implications on contaminant transport.</li></ol>	<ol style="list-style-type: none"><li>1. Lateral and vertical hydraulic conductivity values are assigned for every model element within the numerical modelling domain. In most areas, the vertical hydraulic conductivity is assumed to be 1/10th of the lateral hydraulic conductivity due to variability in the depositional environment (i.e., intermittent periods of quiet water deposits, and higher-energy water deposits) and fracturing (typically bedding plane fractures are more prevalent than vertical joints).</li><li>2. In the case of the desilicified zone the thermal alteration was conservatively assumed to have resulted in equivalent hydraulic conductivity values in the lateral and vertical directions. This conservative assumption within the desilicified zone is designed to over-predict mass transport potential to surface receptors.</li><li>3. The gradients applied are considered reasonable and defensible. By calibrating to 3D point observations of groundwater levels, and using surface water levels for hydrogeologic boundary conditions, the model has been inherently calibrated to 3-dimensional hydraulic gradients. Thus, lateral and vertical hydraulic gradients are incorporated within the analysis presented.</li></ol>	No updates to the EIS in response to this IR.
IR-91	NRCan	Fish and fish habitat	Appendix 7-C, section 2.5.2	<p><b>Context:</b> The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p><b>Rationale:</b> As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.	<p>The scales on Figure 2-13 of Appendix 7 have been corrected and included in Attachment IR-91.</p> <p>From a regional perspective, the available groundwater levels are clustered around the Phoenix deposit. However, Denison advanced monitoring well clusters to support hydrogeologic (and hydrochemical) characterization upgradient, downgradient, and cross-gradient to the deposit. Data from all of these wells were used to calibrate the numerical model. It is acknowledged that the hydrogeologic conditions are extrapolated from the available data; this is consistent with the state of the practice.</p>	The corrected Figure 2-13, which will be included in the final EIS, is appended as Attachment IR-91.
IR-92	CNSC	Geology and groundwater	Appendix 7-C, Section 3.2.1, Mineralogical Composition	<p><b>Context:</b> Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p><b>Rationale:</b> Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported.</p> <p>The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>	<ol style="list-style-type: none"><li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li><li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. dichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).</li></ol>	Please see response in Attachment IR-92.	<p>The updated version of Table 3-2 (provided in Attachment IR-92) will be included in the final EIS Appendix 7-C.</p> <p>To reflect the discussion in Attachment IR-92 and updates to Table 3-2 of Appendix 7-C, the following text will be included on page 3.29-3.20 of Appendix 7-C in the final EIS:</p> <p>Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.</p>
IR-93	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-10: Properties of	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical</p>	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport	Please see response in Attachment IR-93.	The updates to Table 3-10 of Appendix 7-C are detailed in Attachment IR-93 and will be included in the final EIS.

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			Adsorbing Mineral Phases	<p>reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Geothite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m2/g, this equals to 1600/6E4 mol/m2, or 0.0266 mol/m2, 1.6e4 sites/nm2.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm2. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters.</p> <p>The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>	modelling should be re-run to update the contents presented in the EIS report.		
IR-94	CNSC	Geology and Groundwater	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H+ sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.</p>	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-95	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-11	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated.</p> <p><b>Rationale:</b> It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these Kd analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients.</p> <p>In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of Kd value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.	Please see response in Attachment IR-95.	The updated version of Table 3-11 (provided in Attachment IR-95) will be included in the final EIS Appendix 7-C.
IR-96	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, "Transport parameters were specified for diffusion (1x10-9 m2/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)". The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the</p>	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89.</p>	Please see response in Attachment IR-96.	No updates to the EIS in response to this IR.

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				model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.  Further guidance on solute transport modelling can be found in BC MOE (2012) [1].  <b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.			
IR-97	ECCC	Fish and fish habitat	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b	<b>Context:</b> Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.  It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.  <b>Rationale:</b> The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.	1. Explain and clarify if mining operations will mobilize contaminants beyond operations?  2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?  3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.	Please see response in Attachment IR-68, IR-94, IR-97.	No updates to the EIS in response to this IR.
IR-98	CNSC	Change to an environmental component due to hazardous contaminants	Section 8, Aquatic Environment	<b>Context:</b> It states in EIS in Section 8.3.7.1 (p. 8-151) that "Cameco's Key Lake Operation will overlap spatially and temporally with the Project".  <b>Rationale:</b> It is not clear whether there is the possibility that planned Denison discharges would eventually flow into and influence a background reference lake used by Key Lake operation.	Please provide supporting information to demonstrate whether discharges from the proposed operation will not eventually flow into a reference lake used by another existing operation.	Denison understands that Alpha Lake and McGowan Lake are used as reference lakes for a Cameco operation within the area of Denison's proposed project. Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.  Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan Lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.	No EIS updates are anticipated to address this IR.
IR-99	CNSC	Aquatic environment	Section 8, Water Quality, Table 8.2-13	<b>Context:</b> Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.  <b>Rationale:</b> It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.	The values provided in Table 8.2-13 for radiological COPCs are presented as Bq/L and the units provided in the sub-title (mg/L) are not consistent with the data provided. Table 8.2-13 is consistent with the data provided in Appendix 10-A (Environmental Risk Assessment), which specifies the concentrations as having been measured in Bq/L. Subsequent updates of the EIS will correct this inconsistency. Denison will review the final EIS to ensure this error is not repeated in other tables.	Table 8.2-13 will be revised to ensure the units for radiological parameters are expressed in Bq/L. The revised table is provided in Attachment IR-99.
IR-100	HC	Indigenous Peoples' health / Socio-economic conditions	Section 8, (p. 8-195)  Section 8.5.3, Table 8.5-2, (p. 8-226)	Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.  <b>Context:</b> Section 8 states "Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.  However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment" (p. 8-195).  Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.  In Section 8.5.3, fish tissue concentrations are compared to Health Canada's human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.  <b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.  Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day ( <a href="#">Health Canada, 2007</a> ) is a more	1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.  2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada's pTDI for methylmercury ( <a href="#">Health Canada, 2007</a> ).  3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.  See also related Advice to the Proponent: AD-31.	1. The intent is not to include mercury (and methylmercury) as a COPC for the assessment. As indicated in EIS Section 8.4.6.1, Residual Effects Characterization, mercury is not associated with the local geology and is not expected to be released in the effluent at measurable levels and was therefore not identified as a COPC. Denison notes that there is potential for increased methylmercury production in the receiving environment under a certain combination of factors to which the Project may contribute, such as increased nutrient levels in the environment; however, prediction of methylmercury production is not practical. Denison commits to monitoring mercury and methylmercury in the aquatic environment over the life of the Project to determine the potential changes in mercury concentrations in fish tissue over time. 2. As the Project advances and operational monitoring is underway, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight. This is a human health risk-based maximum permissible concentration. 3. Mercury data presented throughout the draft EIS represents total mercury. Denison agrees to included methylmercury as part of the constituents monitored in fish throughout all project phases.	A commitment will be added to Section 8 of the final EIS that as the Project advances, Denison will assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight.  It will be clarified in the final EIS that mercury data presented is total mercury.



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				<p>appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing foetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>			
IR-101	ECCC	Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>Responses are numbered as listed in the IR. Figures associated with this IR are provided in Attachment IR-101.</p> <p>1) Below indicates the information that is presented in the draft EIS regarding wetland characteristics. This information was housed within the terrestrial environment component and potential impacts to wetlands as a valued component is further assessed under Section 9.2 of the draft EIS, and specifically Section 9.2.6.4. The following list indicates what information was provided in the draft EIS specific to information request #1. As such, repackaging the available information in Section 8 would be redundant and therefore in Denison’s view unnecessary.</p> <p>a) <i>Locations of Wetlands</i> <b>Section 9, Figure 9.2-8</b> on page 9-83 of the draft EIS presents a map of the RSA and LSA detailing the locations of various wetland features including bogs and fens.</p> <p>b) <i>Wetland Types</i> <b>Section 9, Figure 9.2-8</b> on page 9-83, and <b>Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS provides the geographical distribution and listing of the following wetland types within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – Black spruce treed bog</li><li>ii. BS18 – Labrador tea shrubby bog</li><li>iii. BS19 – Graminoid bog</li><li>iv. BS19/24 – Graminoid bog/Graminoid fen</li><li>v. BS20 – Open bog</li><li>vi. BS21 – Tamarack treed fen</li><li>vii. BS23 – Willow shrubby rich fen</li><li>viii. BS24 – Graminoid fen</li><li>ix. BS25 – Open fen</li><li>x. BS27 – Sedge rocky shore (shallow open water)</li></ul> <p>c) <i>Wetland Size</i> <b>Section 9, Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS lists the following wetland types and the cumulative area they encompass within the LSA:</p> <ul style="list-style-type: none"><li>i. BS17 – 18.2 ha</li><li>ii. BS18 – 23.3 ha</li><li>iii. BS19 – 2.8 ha</li><li>iv. BS19/24 – 0.8 ha</li><li>v. BS20 – 0.6 ha</li><li>vi. BS21 – 1.9 ha</li><li>vii. BS23 – 0.6 ha</li><li>viii. BS25 – 0.4 ha</li><li>ix. BS27 – 4.2 ha</li></ul> <p>d) <i>Wetland Water Surface Elevation</i> Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 <b>Figure 1 Elevations of wetland features in the LSA.</b></p> <ul style="list-style-type: none"><li>• Wetlands 1.5 km west of the SSA range from 526-524 masl</li><li>• Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl</li><li>• Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl</li><li>• Wetlands north of the SSA and in the vicinity of the proposed air strip range from 514-508 masl.</li><li>• Wetlands situated further north of the SSA in the LSA were at an elevation of approximately 526 masl</li><li>• Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl</li><li>• Most wetland evaluated south of the SSA had elevations ranging from 491-488 masl</li></ul> <p>e) <i>Wetland Depth</i> – information associated with wetland depth for those in the LSA is not available.</p>	No EIS updates are required for this response.

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						<p>f) <i>Wetland Flow Pathways</i> - Nearly all wetlands are connected or adjacent to rivers and tributaries, and thus flow pathways are discernable in <b>Figure 9.2-8</b> of the draft EIS.</p> <p>g) <i>Presence of Fish and Fish Habitat</i> For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA.</p> <p>2) As noted in other parts of this IR response, the wetlands within the Project footprint are limited to two areas (i.e., stream crossings along the access road to the airstrip and powerline connection SE of Highway 914 [See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution in Attachment IR-101]) and these wetland areas can be avoided through design and construction mitigations. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>In regard to baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint:</p> <p>a) <i>Surface water quality in wetlands</i> – surface water quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, surface water quality was sampled and assessed at stream and lake stations situated upstream and downstream of wetland areas. These stations were selected for sampling as they were identified as providing repeatability (i.e., relative water depth) and informative with respect to desired segments of the system. For example, water quality was sampled at SA-4, SA-5, LA-6, SA-6 and LA-5 following the flow path from upstream to downstream, respectively. The water quality at these nodes was inclusive of upstream wetland influences. For further reference to surface water sampling station during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>b) <i>Sediment quality in wetlands</i> - sediment quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, sediment quality was sampled and assessed at depositional lake stations situated upstream and downstream of wetland areas. The sediment quality at these nodes would be inclusive of upstream wetland surface water and sediment influences. For further reference to sediment sampling stations during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>3) For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA</p> <p>However, when further scrutinizing the potential overprinting of wetland features as a result of the Project it is evident that even this loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and powerline connections are proposed (<b>See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution (Attachment IR-101)</b>).</p> <p>Wetlands associated with stream crossings have been identified to have mitigative designs (clear-span) to ensure no impacts to fish and fish habitat. The hydro-line as shown in Figure 1 will be constructed to avoid direct impacts to fish and fish habitat following best installation practices. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>As discussed in Section 8.1.6.1 of the EIS, water levels in the ponds and lakes in the vicinity of the of the Project are expected to experience negligible effects, with magnitudes of changes in water levels predicted to be in the sub-centimeter range. As natural fluctuations in lake water levels were approximately 0.4 m from 2011 to 2019, Project-related changes are not expected to be of a magnitude to compromise the Surface Water Quantity VC. It can then be considered a reasonable assumption that any changes to wetland features will have similar sub-centimeter impacts to water levels due to changes in surface flow and/or groundwater and therefore do not pose an indirect effect to water quantity or fish and fish habitat associated with these wetland features.</p> <p>4) As no impact is expected due to overprinting or due to draw down effects by the ISR, additional mitigation measures are not warranted. Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project. However, such changes are expected to be less than measurable.</p>	
IR-102	ECCC	Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including	<b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data	1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.	Please note: Figures and tables associated with this IR response as noted below are provided in Attachment IR-102. See also response IR-236.	Wording errors in Appendix 8-C, Appendix II, Table 1 will be updated in the final EIS as follows: - SA-2 extension method = Unit Area Runoff with Scaling and Offset

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			Appendix II, Table 1 (p. 2)	<p>from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>	<p>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</p> <p>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</p>	<p>1. As mentioned by ECCC and discussed in the draft EIS, baseline hydrometric datasets are available for the Project at various nodes throughout the watershed and these datasets are extended to cover a broader period of record to the Wheeler River station (06DA005) operated by Water Survey Canada. Datasets for local stations measured at the Project cover a range from 2010 to 2019, though the date records are not continuous over this period. There is value in the hydrometric data collected at the Project site and these data should inform the long-term estimates of flow at Project nodes. As such, relationships are established to link 06DA005 first to SA-1 via correlation, than SA-1 to the other stations at the Project via correlation, unit area runoff relationships and unit area runoff relationships with scaled and/or offset influences.</p> <p>The use of 06DA005 solely to extend the record at the Project is reasonable given that it is a direct receiver from the Project watersheds and has a watershed area approximately one order of magnitude larger the SA-1 which is the largest watershed monitored at the Project. Further, trends in the datasets for coincident dates are generally similar and correlated are sufficiently in agreement. 06DA005 is not a perfect proxy for long-term record extension; in particular a flow event in October 2016 results in proportionally greater flow rates than were observed at 06DA005. That said, it is the best available station and incorporates locally and regionally measured data which is standard practice.</p> <p>A wording error in Table 1 of Appendix II of Appendix 8-C indicates that for Assessment Nodes SA-2 and SA-3 the extension method is listed as Unit Area Runoff with Offset. Rather, SA-2 should be listed as Unit Area Runoff with Scaling and Offset and SA-3 should be listed as Unit Area Runoff with Scaling. Also, the source station for SA-5 should be noted as SA-6. These corrections will be made in the final EIS.</p> <p>All record extension methods follow the same equation format (presented below) where the variable Q represents discharge. Correlations may have influence over all five variables while Unit Area Runoff methods may only use one or two. The variable A through E are adjusted to define the fit of the extension method. The fit of the extension method is determined as the summation of the differences between the observed and estimated daily average discharge (or instantaneous measured discharge if the station did not have an installed datalogger) for coincident days in the datasets. Variables A through E are adjusted through a solver algorithm such that the summation of the differences is as near to zero as possible.</p> $Q_{Assessment\ Node} = A \cdot [B + C \cdot (Q_{Source\ Station} + D)^E]$ <p>Table 1 in Attachment IR-102 presents the variable used for each assessment node and indicates the source station for the calculation. In Attachment IR-102 following Table 1, figures 1 to 7 are presented for each assessment node show the estimated hydrograph for the station as well as measured discharges and reported hydrographs as daily average discharge. Figures are not presented for nodes LA-1 and LA-5 as there are no measured discharges immediately at the outlet of those lakes.</p> <p>2. Simple unit runoff relationships from larger watersheds are a reasonable approach when no other data are available for use at a Project. In this approach larger watersheds tend to have attenuation which impacts the timing and magnitude of runoff events When local data are available it is a better approach to understand the relationship of local flow rates within the broader context. As an example, at SA-3 if the unit area relationship is used from 06DA005 direct to that watershed it results in a dramatic under prediction; the measured data indicate that that watershed is capable of generating larger flow rates than would be expected simply based on a unit runoff.</p> <p>Regarding the comment on the use of constructing records based on constructed records, the same methodology is incorporated into developing hydrographs at the Project as is used to estimate flows at 06DA005. The long-term extension of the Project data simply relates the datasets in a manner which is acceptable to the Proponent’s technical experts.</p> <p>Using the record extension methodologies presented in Table 1 of Attachment IR1-2, ensures the data provide a better fit ultimately to 06DA005 as understood within the regional context.</p> <p>3. The proponent is of the professional opinion that the baseline water quantity metrics do not need to be revised and the information presented in the draft EIS and supporting documents is suitable for the intended purpose. As noted in the draft EIS, Section 8.1.6.2, “The confidence in the assessment of predicted effects on hydrology is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that water withdrawal and discharge scenarios presented herein represent the bounding case and hydrogeological modelling projections are not changed.”</p>	<p>- SA-3 extension method = Unit Area Runoff with Scaling - Source station for SA-5 = SA-6</p>
IR-103	ECCC	Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<p><b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.</p> <p>The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.</p> <p><b>Rationale:</b> IDF trends exhibit random behavior at some locations and</p>	<p>Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>ECCC correctly notes that the tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations. The closest gauged location to the Project is located 35 km_south southwest at the Key Lake Mine (KLM) and the IDF values at KLM for historical and future scenarios (Tables 1 and 2 below) are substantially lower than those predicted for the Project. The IDF-CC Tool estimated 1:100-year, 24-hour return period events of 79.9 and 88.6 mm during the current and predicted future values, respectively. As per Tables 1 and 2 those values are substantially larger, and more conservative than, the coincident values of 56.4 and 62.0 mm for KLM.</p> <p>The predicted values for the Project are likely strongly influenced by Cree Lake (4061861; 85 km west southwest) and Collins Bay SK (4061620; 130 km northeast). The interpolation may also be influenced by Stony Rapids A (4067PR5; 196 km north). The Cree Lake, Collins Bay SK and Stony Rapids A stations are all substantially higher than KLM; however, the</p>	No EIS updates are anticipated to address this IR.



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				correlated behavior at other locations. The choice of gauged locations will infer the statistics for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.		<p>geography, and likely the climate of KLM, is more similar to those of the Project than from the more distant stations.</p> <p>Despite the potential for the IDF_CC Tool to use weighting factors, the estimates provided by the tool for the purposes of assessing impacts of the project on the surface water hydrology are robust and conservative including in consideration of flooding or extreme weather events.</p> <p><u>IR-103 Table 1: Key Lake (4063753) – Historical IDF</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.39</td><td>6.66</td><td>7.11</td><td>7.37</td><td>7.43</td><td>7.56</td><td>7.65</td></tr><tr><td>10 min</td><td>7.46</td><td>10.11</td><td>11.40</td><td>12.39</td><td>12.66</td><td>13.37</td><td>13.94</td></tr><tr><td>15 min</td><td>9.22</td><td>12.44</td><td>13.97</td><td>15.12</td><td>15.42</td><td>16.23</td><td>16.86</td></tr><tr><td>30 min</td><td>11.50</td><td>16.59</td><td>19.20</td><td>21.24</td><td>21.81</td><td>23.36</td><td>24.63</td></tr><tr><td>1 h</td><td>13.72</td><td>18.91</td><td>21.28</td><td>23.00</td><td>23.45</td><td>24.61</td><td>25.49</td></tr><tr><td>2 h</td><td>15.71</td><td>22.25</td><td>26.04</td><td>29.31</td><td>30.29</td><td>33.09</td><td>35.61</td></tr><tr><td>6 h</td><td>21.93</td><td>27.85</td><td>30.92</td><td>33.36</td><td>34.05</td><td>35.92</td><td>37.48</td></tr><tr><td>12 h</td><td>26.57</td><td>33.31</td><td>36.50</td><td>38.87</td><td>39.50</td><td>41.17</td><td>42.46</td></tr><tr><td>24 h</td><td>35.57</td><td>44.63</td><td>48.82</td><td>51.86</td><td>52.67</td><td>54.76</td><td>56.35</td></tr></table> <p><u>IR-103 Table 2: Key Lake (4063753) – 2020 – 2050 Predicted IDF using CMIP6 Raw GCMs and SSP5.85</u></p> <table><tr><th>T (years)</th><th>2</th><th>5</th><th>10</th><th>20</th><th>25</th><th>50</th><th>100</th></tr><tr><td>5 min</td><td>5.80</td><td>7.21</td><td>7.72</td><td>8.03</td><td>8.10</td><td>8.29</td><td>8.41</td></tr><tr><td>10 min</td><td>8.06</td><td>10.96</td><td>12.42</td><td>13.45</td><td>13.78</td><td>14.70</td><td>15.55</td></tr><tr><td>15 min</td><td>9.95</td><td>13.49</td><td>15.21</td><td>16.43</td><td>16.80</td><td>18.04</td><td>18.82</td></tr><tr><td>30 min</td><td>12.47</td><td>17.99</td><td>20.90</td><td>23.10</td><td>23.78</td><td>26.00</td><td>27.69</td></tr><tr><td>1 h</td><td>14.88</td><td>20.51</td><td>23.16</td><td>25.08</td><td>25.68</td><td>27.36</td><td>28.61</td></tr><tr><td>2 h</td><td>16.85</td><td>24.13</td><td>28.27</td><td>31.65</td><td>32.77</td><td>36.06</td><td>39.23</td></tr><tr><td>6 h</td><td>23.50</td><td>30.23</td><td>33.64</td><td>36.05</td><td>36.88</td><td>39.24</td><td>41.27</td></tr><tr><td>12 h</td><td>28.59</td><td>36.18</td><td>39.67</td><td>42.08</td><td>42.85</td><td>44.99</td><td>46.74</td></tr><tr><td>24 h</td><td>38.26</td><td>48.47</td><td>53.03</td><td>56.20</td><td>57.14</td><td>59.86</td><td>62.03</td></tr></table>	T (years)	2	5	10	20	25	50	100	5 min	5.39	6.66	7.11	7.37	7.43	7.56	7.65	10 min	7.46	10.11	11.40	12.39	12.66	13.37	13.94	15 min	9.22	12.44	13.97	15.12	15.42	16.23	16.86	30 min	11.50	16.59	19.20	21.24	21.81	23.36	24.63	1 h	13.72	18.91	21.28	23.00	23.45	24.61	25.49	2 h	15.71	22.25	26.04	29.31	30.29	33.09	35.61	6 h	21.93	27.85	30.92	33.36	34.05	35.92	37.48	12 h	26.57	33.31	36.50	38.87	39.50	41.17	42.46	24 h	35.57	44.63	48.82	51.86	52.67	54.76	56.35	T (years)	2	5	10	20	25	50	100	5 min	5.80	7.21	7.72	8.03	8.10	8.29	8.41	10 min	8.06	10.96	12.42	13.45	13.78	14.70	15.55	15 min	9.95	13.49	15.21	16.43	16.80	18.04	18.82	30 min	12.47	17.99	20.90	23.10	23.78	26.00	27.69	1 h	14.88	20.51	23.16	25.08	25.68	27.36	28.61	2 h	16.85	24.13	28.27	31.65	32.77	36.06	39.23	6 h	23.50	30.23	33.64	36.05	36.88	39.24	41.27	12 h	28.59	36.18	39.67	42.08	42.85	44.99	46.74	24 h	38.26	48.47	53.03	56.20	57.14	59.86	62.03	
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10 min	8.06	10.96	12.42	13.45	13.78	14.70	15.55																																																																																																																																																																
15 min	9.95	13.49	15.21	16.43	16.80	18.04	18.82																																																																																																																																																																
30 min	12.47	17.99	20.90	23.10	23.78	26.00	27.69																																																																																																																																																																
1 h	14.88	20.51	23.16	25.08	25.68	27.36	28.61																																																																																																																																																																
2 h	16.85	24.13	28.27	31.65	32.77	36.06	39.23																																																																																																																																																																
6 h	23.50	30.23	33.64	36.05	36.88	39.24	41.27																																																																																																																																																																
12 h	28.59	36.18	39.67	42.08	42.85	44.99	46.74																																																																																																																																																																
24 h	38.26	48.47	53.03	56.20	57.14	59.86	62.03																																																																																																																																																																
IR-104	ECCC	Fish and fish habitat	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>Please see response to IR-15, IR-236 and AD-15. Although there are a variety of methods available to derive a PMP, Denison’s selected PMP for engineering design (i.e., 493 mm; see response to IR-15; based on Canadian Climate Program [1994]) is over 5 times higher than observed and predicted 24 hour precipitation events (both 1 in 100 year, 24 hour return precipitation events and 24-hour maximum precipitation events; see response to AD-15), and as such, Denison is confident that the Project water management infrastructure will be appropriately designed. The PMP included in Section 8 of the draft EIS was 489.3 mm from a more recent publication (Atmospheric Environment Branch [1999]). Denison retained the higher of the two PMP values (i.e., 493 mm) for design purposes.</p> <p>The proponent will address the information requirements in reverse order of the way they are presented.</p> <p>2. The World Meteorological Organization (WMO) issued Manual on Estimation of Probable Maximum Precipitation (PMP) in 2009 (WMO-No. 1045), the third edition of this manual. This document presents several methodologies for estimation of PMP and is preceded by the similar second edition 1986 document titled “Manual for Estimation of Probable Maximum Precipitation (WMO No. 332)”. The 1986 document served as part of the foundation for analyses presented by Atmospheric Environment Branch (1999). WMO indicates that the 2009 document “keeps a majority of the content from the second edition” and newly added content since 1986 is for “directly estimating PMP for the requirements of a given project in a design watershed on probable maximum flood (PMF) in China, the United States of America, Australia and India.” As such, the proponent believes the Atmospheric Environment Branch (1999) analysis remains current within the context of the Project.</p> <p>Atmospheric Environmental Branch (1999) builds upon a similar document produced in 1994 (Canadian Climate Program, 1994). The 1994 text discusses methodology and results of analyses for northern Saskatchewan. Though the author is confident in their assessment, the author does indicate that values estimated through northern Saskatchewan may be “spurious” due to the scarcity of climatological data in the region. The use of the term “spurious” seems to be in reference to predicted PMP values which are substantially higher than those where data are available.</p> <p>Additional analyses would be possible for this assessment; however, climatological data remain scarce in northern Saskatchewan. Though there is uncertainty as to the result of</p>	No changes to the EIS are required.																																																																																																																																																																

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						<p>reassessment of PMP values in the vicinity of the Project, others have completed their own reassessment of PMP values based on locally monitored data which yielded a much smaller result for the PMP. In that situation the proponent opted to stay with a value of 489.3 mm as estimated by Atmospheric Environment Branch (1999) even though it was substantially larger than their reassessed value (NexGen Energy Ltd., 2022).</p> <p>1. Though it is presumed that methodologies have not changed appreciably to justify a reassessment of the PMP, the data scarcity component would also influence the potential for accurate estimation of the design storm. No new stations have been added in northern Saskatchewan with sufficient data record to improve regional observations which play a role in Hopkinson's analyses.</p> <p>Anecdotaly speaking, the estimates of 489.3 mm across the northern Saskatchewan region are considered very high by other practitioners in the industry. This seems to be supported by additional analyses completed for NexGen Energy Ltd. (2022). The acceptance of 489.3 mm or 493 mm as the PMP for the Project falls in line with magnitudes used by existing operators in the area and is likely a conservative estimate.</p> <p>References:</p> <p>Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.</p> <p>Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.</p> <p>NexGen Energy Ltd. 2022. Rook I Draft Environmental Impact Statement. June 2022.</p>	
IR-105	Directorate of Fisheries and Oceans (DFO)	Fish and fish habitat	<p>Section 8.1.4.1, Potential interactions between project and valued component/key indicators Surface Water Quantity</p> <p>Section 8.1.4.2.2, Surface Water Taking</p> <p>8.3.4.1, Potential interactions between project and valued component/key indicators</p>	<p><b>Context:</b> Table 8.1-8 and Table 8.3-6 in the EIS indicates a potential for freeze wall operation to influence groundwater interactions and surface water quantity and as a result, impact fish and fish habitat. Section 8.1.4.2.2 references Section 7 Geology and Groundwater for details on potential impacts. In addition, IR-63 notes the groundwater model does not describe the pathway in which groundwater would pass around the freeze wall during operation and any resulting potential effects on groundwater discharge to Whitefish Lake.</p> <p><b>Rationale:</b> As per IR-63, the groundwater model analysis is insufficient to make conclusions on the potential effects of the freeze wall on groundwater discharge into Whitefish Lake. DFO requires this information to fully understand if altered groundwater regimes will result in changes to Whitefish Lake water levels and any potential impacts to fish and fish habitat as a result of changing water levels.</p>	<p>1. Provide a more fulsome analysis of the potential impact of freeze wall operations on local and semi-regional groundwater regimes, and subsequently to fish and fish habitat within Whitefish Lake. The analysis should provide a rationale of how the scope of the groundwater model is relevant to and able to detect changes at the scale of fish and fish habitat.</p> <p>2. If impacts to fish and fish habitat in Whitefish Lake are predicted to occur due to changes in the groundwater regime, describe any mitigation measures that could be used to avoid these impacts.</p> <p>3. If impacts are predicted that cannot be avoided, characterize residual effects on fish and fish habitat.</p>	<p>Please refer to the disposition for IR-63 for a fulsome explanation of the minor impact that the freeze wall will have on the area and regional groundwater flows. It was concluded that the freeze-walled area is a relatively small disruption to the regional groundwater flow system.</p> <p>Potential indirect impact to the surface water hydrology at Whitefish Lake as a result of project induced changes to the hydrogeology of the area was considered as part of Section 8.1 and discussed in Appendix 8-C. The project impacts were inclusive of changes in groundwater contributions to LA-5 as listed in Table 4-1 of Appendix 8-C. The analysis included the most up to date information during the preparation of the EIS and which indicated a potential loss in contribution of 4-6 L/s of groundwater reporting to LA-5 through the operation and decommissioning phase. This input is anticipated to return to pre-disturbance conditions for Post-Decommissioning. More recent calculations of the potential loss of groundwater contribution to Whitefish Lake as 9.9 L/s. This change is within the same magnitude of that previously modelled and therefore is not likely to constitute a change in the assessment of significant effects for the aquatic environment.</p> <p>Recent modelling using a loss of 9.9 L/S indicates that the majority of this change is due to dewatering of the ISR area and not due to the freeze wall itself. As indicated in Attachment IR-63, the groundwater flow contours will locally deviate from their original paths due to the installation of the freeze wall and the pumping, yet this will not impact the larger spatial migration of groundwater to the lake. Furthermore, groundwater discharge distribution (i.e., seeps and upwellings) will continue to occur in a similar pattern during pumping as to pre-pumping. This indicates that while the overall groundwater discharge rate is reduced, the areas of primary groundwater discharge will remain unchanged. As such, fish which utilize LA-5 for critical life-history periods (namely Northern Pike) will not be impacted due to changes in groundwater interactions directly, or indirectly due to reductions in surface water levels or flow. As such, additional mitigation measures outside that currently proposed in the draft EIS are not suggested.</p>	Based on the response no revisions to the EIS are needed.
IR-106	CNSC	Change to an environmental component due to hazardous contaminants	Section 8.1.4.2.3, Surface Water Discharge	<p><b>Context:</b> It is stated in this section under construction that all site contact water will be held in the Clean Waste Rock Pond.</p> <p><b>Rationale:</b> It is unclear from this section what will happen to the contact water held in the Clean Waste Rock Pond, and whether it will be removed from site or released at a later time. What is the contingency plan if more contact water is produced during construction than the Clean Waste Rock Pond has capacity for.</p>	<p>Please indicate what will happen to the contact water stored in the Clean Waste Rock Pond during construction activities, will it be released after the wastewater treatment plant is installed? Further, please describe the contingency plan if contact water produced exceeds estimates and will exceed the volume of the clean waste rock pond?</p>	<p>During Construction, no effluent is expected to be released to the aquatic environment. Contact water stored in the Clean Waste Rock Pond during Construction will be held onsite until the Industrial Wastewater Treatment Plant (IWWTP) is commissioned. At that time the water from the pond would be conveyed to the IWWTP, treated, and released to Whitefish Lake per permit / license requirements.</p> <p>The sequence for Construction activities will occur in a logical manner based on Project execution plans. For example, construction of the wellfield runoff pond will be prioritized during the early part of Construction and it will able to hold 38,200 m<sup>3</sup> of water. This will provide contingency and additional water storage capacity if contact water produced exceeds estimates or the volume available in the Clean Waste Rock Pond.</p> <p>Other secondary contingency measures are also available should the volume of water requiring management exceed site infrastructure storage volume. This could include use a hydrovac for offsite disposal.</p>	No changes to the EIS are required.
IR-107	CNSC ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality</p>	<p>Please clarify what data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p>	<p>Surface water quality was sampled through 2016, 2018, and 2019 on a monthly basis which is generally consistent with federal requirements for assessing potential impacts through EA. Hydrological assessment has occurred from 2011 to 2019. Mean Annual Discharge (MAD) (m<sup>3</sup>/s) as measured at the Water Survey Canada (WSC) Wheeler River Watershed Station (06DA005) during 2016, 2018 and 2019 was 17.07, 17.34 and 19.23, respectively, all of which were slightly above the 43 year (1977 to 2019) average of 16.82. The MAD in 2016 and 2018 can be considered near average, with 2019 being considered an average-high flow year, but well below the maximum observed for the timeseries (27.62 m<sup>3</sup>/s). Since this period, there</p>	No changes to the EIS are required.

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				<p>characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”</p> <p>In addition, the “applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”</p>	<b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline	<p>have been no land use changes within the area that would constitute a major change in water quality.</p> <p>Baseline water quality samples were collected during years of average to average-high flows in the Wheeler River system and therefore representative of background conditions for assessment of potential impacts in the EIS. Additional conservatism was included in the impact assessment by using the 95<sup>th</sup> percentile values for baseline parameter concentrations when modelling potential effluent effects. As such, the surface water quality data collected are suitable for the intended purpose of assessing potential impacts and the additional conservativisms that were included as part of the assessment were precautionary.</p> <p>Given the above, Denison feels strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>Denison commits to the collection of additional surface water quality baseline data prior to project development starting to ensure updated baseline information is available for identification of any changes that might influence estimates of Project impacts. These data will be used to support permitting and licensing through updates to the ERA.</p>	
IR-108	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>	Please see Attachment IR-108.	Tables 8.2-2 and 8.2-3 will be updated in the final EIS, per Attachment IR-108.
IR-109	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. from the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.	Section 2 Project Description, Section 2.2.3.9 Treated Effluent Monitoring and Release Ponds of the draft EIS outlines Denison's commitment to test effluent prior to discharge to Whitefish Lake, to ensure it meets federal and provincial discharge limits. Any pond not meeting the criteria will be recycled back to the Industrial Wastewater Treatment Plant via the process water pond.	No EIS updates are anticipated to address this IR.
IR-110	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment  Appendix 8-E, Section 2.1	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0 of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p>	<p>Provide confirmation of the diffuser depth and location.</p> <p>ECCC requests the opportunity to review the finalized diffuser design once it is available.</p>	The diffuser will be placed at a depth between 2.5 and 3 m. The mapping provided in the draft EIS and Appendix 8-E is based on coarse bathymetric information, which will be supplemented with more robust bathymetric surveys to support final siting and design associated with permitting and licensing.	No EIS updates are anticipated to address this IR.



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IR-111	CNSC	Fish and fish habitat	Section 8.2.4.2.2, Controlled Discharge	<p><b>Context:</b> This section of the EIS indicated that the scenario was assessed using a conservative assumption of a continuous freshwater withdrawal rate of 40.5 m3/hr, and a continuous effluent discharge rate of 81.0 m3/hr.</p> <p><b>Rationale:</b> The withdrawal rate assessed is half of the effluent rate, it is unclear from the text where the other half of the volume of effluent is coming from, if not drawn from the lake.</p>	Please clarify where the other half of the total volume of effluent discharged is from in the water balance between water intake and effluent.	Process water will be drawn from both groundwater and surface water (when required). The 81.0 m³/hr discharge rate conservatively assumes withdrawal from both sources at the maximum proposed rates. Please refer to Section 2.2.3 and specifically Figures 2.2-14, 2.2-15 and 2.2-16 of the draft EIS which depict the water balance for the Project for each of Construction, Operation and Decommissioning phases.	No EIS updates are anticipated to address this IR.																																																																																																												
IR-112	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.2, Aquatic Environment  Appendix 8-E, Section 1.2.1  Appendix 10-A (ERA), Section 3.1	<p><b>Context:</b> This section of the EIS states that, “for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of 81.0 m³/hr.” (p. 8-21)</p> <p>However, several sentences later it is stated that, “The approach to assessing Project-related effects on the Surface Water Quality VC was conservative for the following reasons: The assessment was based on a continuous (year-round) discharge rate at an expected average effluent discharge of 0.0101 m3/s (or 36.5 m3/hr) throughout Construction, Operation, and Decommissioning...”</p> <p>This is a continuous theme throughout Section 8, Aquatic Environment, where the discharge rate for the surface water quality assessment changes between 36.5 m3/hr and 81.0 m3/hr. However, in Appendix 10-A (ERA) the 36.5 m3/hr discharge rate is the only value used for the near and far-field modelling.</p> <p>It should be made clear in the main body of the draft EIS that the average effluent discharge rate of 36.5 m3/hr has been used as the input for the near- and far-field modelling for effluent, surface water and sediment quality predictions. The maximum upper bound discharge rate is 81 m3/hr; however, modelling for effluent, surface water and sediment quality was not completed for this discharge rate.</p> <p><b>Rationale:</b> It remains unclear throughout the draft EIS that all predictions of COPC concentrations in effluent, and receiving environment surface water and sediment are based upon the effluent discharge rate of 36.5 m3/hr, and not the maximum upper bound discharge rate of 81 m3/hr. All conclusions about risk to the environment and aquatic and terrestrial biota must make this clear. If the Proponent wishes to make conclusions based on the maximum upper bound discharge rate of 81 m3/hr, modelling needs to be conducted using this rate of discharge.</p>	<p>1. Confirm that the surface water quantity, quality, and aquatic biota risk assessments and modelling, were conducted using the discharge rate for 36.5 m3/hr within the draft EIS.</p> <p>2. Revise any statements or conclusions in the draft EIS to improve clarity about the usage of the maximum upper bound discharge rate of 81 m3/hr. Remove statements regarding use of the discharge rate of 81 m3/hr during modelling and risk assessments to the receiving environment as needed.</p>	<p>1. Denison confirms that the surface water quantity, quality, and aquatic biota risk assessments presented in the draft EIS and ERA (Appendix 10A) were conducted using the discharge rate for 36.5 m³/hr.</p> <p>2. Denison provides the following summary to clarify effluent discharge rates and identify updates to the final EIS:</p> <ul style="list-style-type: none"><li>Section 8.2.4.2.2 of the EIS will be modified (see details in EIS Updates column).</li><li>Appendix 8-E used an effluent discharge rate of 36.5 m³/hr, which is correct. No changes required.</li><li>Appendix 10-A used an effluent discharge rate of 36.5 m³/hr in the modelling and ERA results; however, in Section 6.2 of the ERA in Appendix 10-A, a sensitivity analysis was conducted to assess the effects on surface water and sediment when the effluent discharge rate is increased to the upper bound discharge rate of 81 m³/hr. No changes required.</li></ul>	<p>The sentence in Section 8.2.4.2.2 will be updated in the final EIS as follows:</p> <p>Denison does not intend to include constant freshwater withdrawal or effluent discharge throughout Operation; however, for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of <del>81.0</del> <b>36.5</b> m³/hr.</p>																																																																																																												
IR-113	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>Section 8.1.3.4 (and Appendix 8-C) provides a quantitative assessment of the potential changes in surface water quantity due to climate change. The 1:100 year, 24-hour return period rainfall events for the baseline and climate change influenced IDF curves are 79.9 mm and 88.6 mm, respectively. The PMP for the Project is estimated to be 493 mm (refer to IR-15 and AD-15) which is well above both 24-hour maximum precipitation and 1:100, 24 hour return precipitation events. The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change). The potential impacts of climate change to precipitation and therefore flows was summarized in Appendix 6-C, Table 10 with the total annual precipitation and the maximum 1-day events being variable over the next four decades (Table 1). Regardless, the climate change scenario indicates a potential increase in event based assimilative capacity in the receiving environment.</p> <p>TABLE 1- Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)</p> <table><tr><th>Year</th><th colspan="4">Total Annual (mm)</th><th colspan="4">Maximum 1-day (mm)</th></tr><tr><td></td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td><td>Measure d</td><td>RCP 2.6</td><td>RCP 4.5</td><td>RCP 8.5</td></tr><tr><td>2011-2020</td><td>455</td><td>518</td><td>509</td><td>508</td><td>48</td><td>29</td><td>27</td><td>27</td></tr><tr><td>2030</td><td></td><td>528</td><td>503</td><td>537</td><td></td><td>27</td><td>24</td><td>26</td></tr><tr><td>2040</td><td></td><td>487</td><td>498</td><td>514</td><td></td><td>28</td><td>29</td><td>24</td></tr><tr><td>2050</td><td></td><td>504</td><td>524</td><td>520</td><td></td><td>26</td><td>29</td><td>33</td></tr><tr><td>2060</td><td></td><td>513</td><td>515</td><td>523</td><td></td><td>26</td><td>33</td><td>26</td></tr><tr><td>2070</td><td></td><td>527</td><td>534</td><td>568</td><td></td><td>29</td><td>31</td><td>28</td></tr><tr><td>2080</td><td></td><td>539</td><td>551</td><td>547</td><td></td><td>30</td><td>33</td><td>28</td></tr><tr><td>2090</td><td></td><td>543</td><td>545</td><td>548</td><td></td><td>31</td><td>32</td><td>35</td></tr><tr><td>2100</td><td></td><td>546</td><td>535</td><td>559</td><td></td><td>23</td><td>25</td><td>28</td></tr><tr><td colspan="2">Overall Increase:</td><td>28</td><td>26</td><td>51</td><td></td><td>-6</td><td>-2</td><td>1</td></tr></table> <p>To mitigate the potential for unplanned release of deleterious substances into the surface water environment even during the next 40 years of climate change, the PMP of 493 mm was</p>	Year	Total Annual (mm)				Maximum 1-day (mm)					Measure d	RCP 2.6	RCP 4.5	RCP 8.5	Measure d	RCP 2.6	RCP 4.5	RCP 8.5	2011-2020	455	518	509	508	48	29	27	27	2030		528	503	537		27	24	26	2040		487	498	514		28	29	24	2050		504	524	520		26	29	33	2060		513	515	523		26	33	26	2070		527	534	568		29	31	28	2080		539	551	547		30	33	28	2090		543	545	548		31	32	35	2100		546	535	559		23	25	28	Overall Increase:		28	26	51		-6	-2	1	No EIS updates are anticipated to address this IR.
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						used for water management engineering designs. During a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m <sup>3</sup> (excluding a freeboard of 1 meter). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.” As such, the project has been designed to manage water during PMP and greater, and therefore mitigation of potential impacts to water quality due to climate change has been initially included as part of the EIS. As a result, it is Denison's opinion that a quantitative assessment of potential impacts to surface water quality is not warranted as it is likely to indicate improved results from the conservative assessment of potential water quality changes during operation and decommissioning phases. Continued monitoring of background, effluent and receiver water quality will be undertaken and provide the ability for adaptive management throughout the life of the mine in association with potential climatic changes to the local and regional area.	
IR-114	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>	<ol style="list-style-type: none"><li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li><li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li><li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li></ol>	See response in Attachment IR-114.	Tables 8.2-9, 8.2-10, and 8.2-13 will be updated in the final EIS. The updated tables are provided in Attachment IR-114.
IR-115	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<p><b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p><b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be</p>	<ol style="list-style-type: none"><li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li><li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li></ol>	<ol style="list-style-type: none"><li>1. Table 8.2-8 has been updated and provided in Attachment IR-115</li><li>2. Denison believes that the water quality thresholds used in the assessment (Section 8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) were appropriate and reflect levels that are protective of aquatic life. The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is a reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.</li></ol>	Table 8.2-8 of the draft EIS will be replaced per the IR response as indicated.

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				derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.		<p>3. Denison has selected the Saskatchewan specific guideline for molybdenum of 31 mg/L to be the most appropriate for the Project. It was derived from recent data following the CCME (2007) protocol. The molybdenum water quality objective based on the 5th percentile (HC5) of the species sensitivity distribution (SSD) according to the CCME protocol; 18 data points for 12 different species were used, mainly EC10 data (WSA, 2017). The CCME guideline is identified as an interim guideline and was based on multiplying the lowest chronic toxicity value, the 28-d LC50 of 0.73 mg/L for rainbow trout (O. mykiss), by a safety factor of 0.1. This original study by Birge (1978) has not been reproducible, either using the original methods or using standard methods (Davies et al. 2005). No changes to the EIS are proposed in this regard.</p> <p><u>References:</u> Birge, W.J. 1978. Aquatic Toxicology of Trace Elements of Coal and Fly Ash. Special Collections, USDA National Agricultural Library. Accessed February 16, 2023, <a href="https://www.nal.usda.gov/exhibits/speccoll/items/show/5224">https://www.nal.usda.gov/exhibits/speccoll/items/show/5224</a>.</p> <p>CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life.</p> <p>Davies, T.D., J. Pickard and K.J. Hall. 2005. Acute molybdenum toxicity to rainbow trout and other fish. Journal of Environmental Engineering &amp; Science 4: 481-485.</p> <p>WSA (Saskatchewan Water Security Agency). 2017. Saskatchewan Water Quality Objective for the Protection of Aquatic Life – Molybdenum. Fact Sheet. Report No. WSA 514.</p>	
IR-116	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3	<p><b>Context:</b> Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p><b>Rationale:</b> It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>	<p>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</p> <p>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</p>	See response in Attachment IR-116.	The EIS will be updated with the information provided in Attachment IR-116. Specifically, Table 8.2-14 and Table 8.4.9 of the EIS will be replaced by Table 1 of Attachment IR-116 and Table 8.5.5 will be replaced by Table 2 of Attachment IR-116..
IR-117	CNSC	Human health with respect to hazardous contaminants	Section 8.2.4, Table 8.2-9	<p><b>Context:</b> CNSC staff note that some of the effluent quality predictions in the EIS are quite high for a uranium mine and mill facility compared to the existing facilities.</p> <p>For example, the upper bound effluent quality of molybdenum is 2.5 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.213 mg/L.</p> <p>Also, the upper bound effluent quality of copper is 0.022 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.002 mg/L.</p> <p><b>Rationale:</b> Surface water quality models should be based on the anticipated effluent quality. From discussions with Denison, it appears that the effluent quality predictions may change based on the results of more bench scale tests that are still being conducted and continued optimization of the design of the water treatment plant.</p>	<p>Please provide the anticipated effluent quality of the constituents of potential concern during normal operations.</p> <p>Once Denison has refined the effluent quality predictions, Denison is expected to update the inputs into the surface water quality model.</p>	<p>The anticipated effluent quality of constituents of potential concern during normal operations presented in the draft EIS is based primarily on lab tests conducted by Denison with a safety factor of three added. Section 3.1.1.2 of the ERA (Appendix 10-A) states: "The reasonable upper bound treated effluent was derived using a combination of information available from lab tests conducted by Denison as well as derived effluent quality based on not exceeding water and sediment quality guidelines in the middle part of Whitefish Lake. Effluent treatment feed solution was prepared by leaching drill core material from the Phoenix deposit, and further processing that solution through two steps (process precipitate removal and yellowcake precipitation) prior to effluent treatment testing. Effluent treatment tests incorporated three stages: low pH, high pH, and neutralization. A combination of reagents (iron sulphate, barium chloride, lime, and sulphuric acid) was used to facilitate precipitation of constituents. After each stage, solid-liquid separation was conducted by mixing flocculant with solution to settle solids to the bottom of the test vessel. The supernatant liquid was used for the following stage. The solids were washed, filtered, and dried to determine solids mass generation for mass balance purposes. For each stage, the liquids and solids were assayed for various COPCs. The reasonable upper bound effluent was usually an expected effluent quality from Denison multiplied by a safety factor of three." The derived effluent quality based on not exceeding a water and sediment quality guideline was only used for a handful of constituents. The ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. In addition, Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>Denison intends to continue to refine effluent quality predictions as part of the BATEA assessment and licensing phase of the Project. The effluent quality predictions provided in the EIS will continue to bound the assessment and provide a conservative representation of risk to human health and the environment. No changes to the EIS are proposed in this regard. See also responses to IR-16 and IR-18.</p>	Revisions to the draft EIS and ERA (Appendix 10-A) will be made per the IR response as indicated below.
IR-118	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.6.1, Section 8.4.6.1 and Section 8.5.6.1, Aquatic Environment	<p><b>Context:</b> It is unclear if Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. No information regarding the future centuries scenario has been provided in the rationale summary for ratings.</p> <p><b>Rationale:</b> Groundwater seepage of COPCs may have future impacts to surface water quality, sediment quality and aquatic receptors; however, the extent of residual effects is unclear without further information.</p>	Provide further information regarding how groundwater seep. of COPCs may have future impacts to surface water quality, sediment quality, and aquatic receptors, and any residual effects that may persist.	It can be confirmed that Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 did take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. Ground water contributions to surface water as a result of excursions or migration from the shallow groundwater aquifer to Whitefish Lake was well documented in Section 7 and Appendix 7-C. For the COPCs identified in the effluent, the predicted mass flux from groundwater into Whitefish Lake Middle starting 200 years after the Project phases, during the future centuries, was input to the IMPACT model to predict the water and sediment concentrations over time at the exposed locations. The COPCs in groundwater will be released to Whitefish Lake Middle at a predicted mass flux as shown in Table 3-4 (Appendix 7-C) The results of the predictive modelling were then used to support	No EIS updates are anticipated to address this IR.



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						the environmental risk assessment to assess potential impacts and risks to surface water, sediment and aquatic biota. The IMPACT model scenario for the future centuries was undertaken specifically to investigate the potential for groundwater migration to Whitefish Lake in future centuries to impact the aquatic environment of Whitefish Lake. For each medium or receptor (i.e., surface water, sediment or aquatic biota) no risk was identified during the future centuries period (Appendix 10-A). Additional information concerning potential impacts of groundwater interactions with Whitefish Lake are provided in IR-116.	
IR-119	CNSC	Fish and fish habitat	Section 8.3.1.2, Table 8.3-1, Sediment quality	<p><b>Context:</b> Sediment quality isn't considered a key indicator for fish and fish habitat, but the accumulation of contaminants in sediment porewater without habitat alteration is similar to the key indicator 'change in surface water quality from baseline conditions' that is considered.</p> <p><b>Rationale:</b> It is not clear whether sediment was just considered for physical disturbance, and why chemical changes are missing from key indicator list for fish and fish habitat.</p>	Please provide the rationale for exclusion of sediment quality from the key indicator list for fish and fish habitat.	<p>Sediment quality was not included as an indicator for the Fish and Fish Habitat VC, rather Sediment Quality and Benthic Invertebrates were elevated to VCs within the EIS (Section 8.4). In the draft EIS Section 8.4.1.1, Sediment Quality VC was identified as having interrelations or linkages to Benthic Invertebrates (VC) as their medium of support to life-cycles as well as the Fish and Fish Health VC. Specifically, the sediment that benthic invertebrates inhabit as the medium responsible for their ability to carry out their life processes. Benthic invertebrates provide an important forage base for fish species. Aquatic sediments and benthic invertebrates (food supply) are inferred as part of the definition of fish habitat under subsection 2(1) of the Fisheries Act, 1985 (Government of Canada 2019).</p> <p>Alterations to Sediment Quality in an aquatic environment can directly affect Fish and Fish Habitat and this was taken into consideration both with respect to physical and chemical changes. Under Section 8.4.1.2 and Table 8.4.1, key indicators and measurable parameters for sediment quality were provided and included:</p> <ul style="list-style-type: none"><li>- Sediment quantity and physical quality (particle size) from baseline conditions</li><li>- Change in sediment quality (chemical) from baseline concentrations</li></ul> <p>The results of the assessment of potential effects and significance of those effects for sediment quality as a VC are directly translatable to Fish and Fish Habitat as identified in Sections 8.3.1.1 and 8.4.1.1. As such, providing the same assessment within both sections is considered redundant.</p>	No EIS updates are anticipated to address this IR.
IR-120	CNSC	Aquatic species	Section 8.3.3 and 8.5, Aquatic Environment	<p><b>Context:</b> Although downstream impacts are not predicted by Denison it is important from an ecosystem perspective to establish baseline locations to monitor for potential cumulative effects to the aquatic environment due to the Key Lake and Wheeler River Operations to ensure the aquatic environment is being protected from cumulative impacts.</p> <p>Denison should consider adding a far-field exposure location and collecting baseline aquatic ecosystem baseline data in Russell Lake including:</p> <ul style="list-style-type: none"><li>• Water quality/chemistry</li><li>• Sediment chemistry/quality</li><li>• Benthic invertebrate chemistry /community</li><li>• Large-bodied fish tissue/chemistry</li></ul> <p><b>Rationale:</b> Russell Lake is identified as part of the RSA for the aquatic environment, but it appears that no detailed aquatic baseline data was completed in far-field location in Russell Lake. In addition, several Indigenous Nations and communities and local resource users have indicated that Russell Lake is an important body of water both culturally for traditional use and was once used as commercial fishery.</p>	<p>If Denison has not collected baseline aquatic studies in the far-field downstream receiving environment of Russell Lake, please provide a rationale for why.</p> <p>If a far-field Russell Lake location was sampled as part of baseline data collection, more information about the process and results with regards to sampling at Russell Lake should be included in the EIS. This information would be valuable to help determine potential cumulative effects downstream in the Russell Lake drainage system (due to the Key Lake Operation) which has been identified as a key concern and area of interest by several Indigenous Nations and communities.</p>	<p>Aquatic baseline surveys were conducted at two stations (LAB-1 and LAB-2) in Russell Lake and were considered 'far-field' stations in relation to the proposed mining plan for the Wheeler River Project. Data collection methods and results are presented in the draft EIS throughout the applicable subsections of <b>Section 8</b>.</p> <ul style="list-style-type: none"><li>• <b>Section 8.2</b> details the Surface Water Quality methods and results,</li><li>• <b>Sections 8.3</b> and <b>8.5</b> detail fish habitat, community, and health methods and results; and</li><li>• <b>Section 8.4</b> details sediment quality and benthic invertebrate community and chemistry methods and results.</li></ul> <p>A breakdown of where specific processes and results are located for each of these components is presented below:</p> <p><b><u>Surface Water Quality/Chemistry:</u></b> Surface Water Quality was sampled in Russell Lake. Methods and metrics are presented in <b>Section 8.2.3.1</b>. Water was sampled in Russell Lake and presented in <b>Table 8.2-2</b> (Pages 8-60 to 8-62) of <b>Section 8.2.3.3</b> of the EIS report, and summarized in <b>Table 8.2-4</b>. Surface Water predicted maximum Constituents of Potential Concern for the Russell Lake Inlet (LAB-1) are presented in <b>Table 8.2-13</b> of <b>Section 8.2.4.2.4</b>. Cumulative effects are also assessed in <b>Section 8.2.7</b>. Detailed baseline summary data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-3</b>.</p> <p><b><u>Sediment Quality/Chemistry:</u></b> Sediment was sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Sediment grain size results are summarized in <b>Table 8.4-2</b> in <b>Section 8.4.3.2.1</b>, and full data is presented in <b>Appendix 8-D, Table 3-4</b>. Sediment chemistry was summarized in <b>Table 8.4-3</b>, and full data is in <b>Appendix 8-D, Table 3-5</b>.</p> <p><b><u>Fish Habitat, Tissue Chemistry, and Community:</u></b> Russell lake is not clearly indicated in the initial list of sample areas presented in <b>Section 8.3.3</b> or <b>Section 8.5.3</b>; however, habitat information is presented in the Fish Habitat table (<b>Table 8.3-4</b>) of <b>Section 8.3.3.2</b>, and both Russell Lake sample locations (LAB-1 and LAB-2) and their associated fish community data are presented in the fish community map (<b>Figure 8.3-6</b>). Fish community and information is also presented in <b>Table 8.3-4</b>. Baseline fish community information is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-9</b>. Fish chemistry summary data (Mean, Max, Min) for Northern Pike and White Sucker bone and tissue samples is presented in <b>Table 8.5-2</b> of <b>Section 8.5.3</b> of the Draft EIS. Detailed fish tissue data summary is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-10</b>.</p> <p><b><u>Benthic Invertebrate Chemistry and Community:</u></b> Benthic invertebrates were sampled in Russell Lake, and the sample methodology is presented in <b>Section 8.4.3.1</b>. Benthic invertebrate endpoints are summarized in <b>Table 8.4-4</b> of <b>Section 8.4.3.2.4</b>, and benthic invertebrate chemistry is summarized in <b>Table 8.4-5</b>. Detailed baseline benthic invertebrate community and chemistry data is presented in <b>Appendix 8-D</b> of the report in <b>Table 3-8</b>, and community data in <b>Tables 3-7A to 3-7D</b>.</p> <p>Also, refer to Cumulative Effects sections (Section 8.X.7) within each part of the Aquatic Environment assessment in the draft EIS for a discussion of potential cumulative effects in Russell Lake. (i.e., Section 8.2.7 for surface water quality; Section 8.3.7 for fish and fish habitat, 8.4.7 for sediment quality and benthic invertebrates, and 8.5.7 for fish health).</p>	No updates to the draft EIS are needed based on this IR response.
IR-121	CNSC	Fish and fish habitat	Section 8.3.3.1, Methodology and Metrics	<p><b>Context:</b> In the description of methodology for fish communities and spawning surveys, there's no mention that could be found for an any evaluation of fish condition, other than sexual condition.</p>	Please provide reference to where fish condition is considered or provide a justification for its exclusion.	Field work was conducted by aquatic biologists that are familiar with the identification of fish condition and abnormalities as it pertains to fish sampling protocols and the MDMER EEM guidance and protocols. As such, the lack of record of such gross abnormalities is reflective of fish populations of good condition. Any supplemental baseline surveys or future	No updates to the draft EIS are needed based on this IR response.

Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				<b>Rationale:</b> Exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.		environmental effects monitoring will include documentation of fish condition and abnormalities.	
IR-122	CNSC	Fish and fish habitat	Section 8.3.8, Monitoring and Follow-up	<b>Context:</b> Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development."  <b>Rationale:</b> Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.	Please include reference lakes, and if it is provided, please reference where in the EIS these are discussed. If there are no reference lakes, these should be included in the monitoring program.	The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed prior to the commencement of ISR operations that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.	No updates to the draft EIS are needed based on this IR response.
IR-123	ECCC	Change to an environmental component due to radiological contaminants	Section 8.4.3.2.3, Aquatic Environment  Appendix 8-D, Table 3-5	<b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.  <b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.	1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.  2. Provide data on baseline concentrations of mercury in sediment.  3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.	1) Please see Attachment IR-123, Table 1, for a summary of baseline sediment concentrations and their respective screening criteria. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.  2) Mercury was not analyzed specific to sediments within the LSA during the initial baseline data collection period. Analysis of mercury at a low-level in sediment was not considered necessary for two reasons: 1. mercury is not associated with the uranium mining and milling process and 2. water quality sampling within the LSA indicated levels of mercury below detection at an acceptable level of detection (i.e., 0.00001 to 0.0000001 mg/L). Denison will collect background information pertaining to sediment total and methyl mercury from LSA lakes and streams prior to site development.  3) Please see Table 1 of Attachment IR-123 for a summary of baseline sediment concentrations and their respective screening criteria. One sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equaled to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria.  References:  Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.  Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.	No updates to the draft EIS are needed based on this IR response.
IR-124	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment	<b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated: <ol style="list-style-type: none"><li>COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</li><li>COPCs that exceed water quality guidelines in effluent, and,</li><li>COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</li></ol> <b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.	1. Provide the information on baseline exceedances of COPCs in sediment.  2. Provide an assessment of risk for any COPCs that have baseline exceedances of sediment quality thresholds in the receiving environment.  3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.	1) The information on the baseline exceedance of COPCs in sediment are provided as part of Attachment IR-123. The table indicates that only the maximum concentration of cadmium exceeded the CCME ISQG on one occasion when assessing all sediment samples over the course of baseline surveys in the LSA.  2) Only one sample concentration for Cadmium of 0.7 µg/g (LAB-2-3) at Russell Lake exceeded the CCME ISQG of 0.6 within the RSA. Another value of 0.6 µg/g (LAB-2-CORE) at Russell Lake equals to the CCME ISQG of 0.6. All other samples had cadmium concentrations below any screening criteria. Cadmium was included as one of the constituents identified as a COPC under the non-radiological Ecological Risk Assessment (Appendix 10-A). No significant adverse effect on either aquatic or terrestrial populations or communities, as a result of releases from the Project, are predicted during the Project phases or during the future centuries. All estimated total HQs for all COPCs (arsenic, cadmium, chromium, cobalt, copper, molybdenum, selenium, uranium, zinc, chloride, and sulphate) for all ecological receptors are predicted to remain below the HQ benchmark of 1.  3) Denison has provided an analysis of the parameters that are identified under MDMER Schedule 4 and therefore have specified effluent discharge criteria. Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.	Changes suggested for Table 8.2-13 as consistent with IR-114.
IR-125	CNSC	Fish and fish habitat	Section 8.5, Aquatic Environment and Fish health	<b>Context:</b> Indigenous Knowledge studies and information collected in relation to the Project clearly identified the importance of water quality and fish health to local Indigenous peoples and is discussed throughout the Draft EIS. For example: <ul style="list-style-type: none"><li>“Russell is one lake where I commercially fish. How will this effluent impact the water quality, fish health? Will I be able to sell fish from here? If there is going to water” pollution, I just want to know” (19-LK-ERFNTrip-134.255) ”</li><li>“How are you going to protect the water quality? We are concerned about mercury in fish, other animals, etc. Is there mercury or arsenic in the uranium solution?” (p. 8-53)</li></ul>	One of the many mitigation measures mentioned throughout the aquatic environment section states:  “Denison will work with the associated communities to develop and implement the Project-specific monitoring programs and a framework to share the results for the purpose of assessing the performance of the water management system.” (p.10-32)  Has Denison considered the collection of additional baseline fish tissue species that are of importance to Indigenous Nations and communities and local cabin owners from	Fish tissue chemistry (bone and muscle) was collected for Northern Pike and White Sucker and presented in Table 8.5-2 of Section 8.5.3. Tissue was not collected for Walleye or Lake Whitefish, however, the tissue analysis of Northern Pike and White Sucker would be key indicators for the fish community in Russel Lake. Northern Pike is a piscivorous top predator much like Walleye, which would address concerns of bioaccumulation of mercury and other metals of concern. White Sucker is a generalist bottom feeding species that is often used to assess metal concentrations at a lower trophic level of the food chain. This information provides an initial baseline understanding of the tissue metal concentrations for the fish of Russell Lake.  The outcomes of the impact assessment demonstrated there will be no expected impact to Russell Lake with respect to water quality, sediment quality or fish and fish habitat. As	No updates to the draft EIS are needed based on this IR response.



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				<b>Rationale:</b> Several Indigenous Nations and communities and local resources users have indicated Russell Lake is an important body of water both culturally for traditional use and was used as commercial fishery in the past and from an aquatic ecosystem perspective.	Russell Lake? Assuming the species would be walleye (commercially and recreationally) and lake white whitefish that is traditionally an important species consumed.  Please provide more information on the engagement to date on the development of the Surface Water Management Program and Monitoring program that Denison is developing and engagement to date with interested Indigenous Nations and communities in the region on fish and fish health.	discussed in the response to IR-120 and this IR, historic information from Russell Lake is available, but may require supplementation prior to project development to monitor potential changes to the aquatic environment in the lake. Engagement on licensing requirements, such as the development of the environmental monitoring program and the associated surface water quality and monitoring regime will occur in later in 2023 and 2024.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on monitoring regimes, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.							
IR-126	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	Denison is aware of the ECCC Federal Environmental Quality Guideline for selenium in fish. The ECCC FEQG is for fish tissue egg-ovary and whole-body. Denison selected the US EPA guideline over the ECCC guideline since US EPA provides guidelines for fish tissue muscle as well. The fish assessed in the ERA were large-bodied fish including northern pike and white sucker. A fish tissue muscle TRV is appropriate for assessment of large-bodied fish; therefore, the US EPA selenium fish tissue muscle benchmark was preferred over the whole body value from ECCC.	No updates to the draft EIS are needed based on this IR response.						
IR-127	CNSC	Aquatic environment	Appendix 8-E, Section 1.2.1, Hydrological Inputs	<b>Context:</b> Within this section it states that the 7Q10 low flow rate used in the mixing assessment “was provided verbally to Ecometrix by NewFields Canada during a project meeting on 26 April 2022”  <b>Rationale:</b> The statement that this value was provided verbally is not an infallible method of communicating data, as the value could have been misheard, misremembered, or recorded improperly.	Please verify that the 7Q10 value used in the assessment is the correct value determined by NewFields.	The value used in the assessment (0.616 m³/s) is the correct value determined by NewFields. The value was calculated by NewFields as the inflow from SA-6 to Whitefish Lake and therefore considered representative of the flow in the northern basin of LA-5. This value will be specifically updated in Appendix 8-C (Table 3-3: 7Q10 Estimated Discharge) and Appendix 8-E (Section 1.2.1 to be changed to reference Appendix 8-C, Table 3-3) for clarity.	Appendix 8-C Table 3-3:7Q10 Estimated Discharge will be updated as shown below.  <b>TABLE 3-3: 7Q10 ESTIMATED DISCHARGE</b> <table><tr><th>Assessment Node</th><th>7Q10 Flow Rate (m³/s)</th></tr><tr><td>LA-1</td><td>0.874</td></tr><tr><td>LA-5</td><td>0.616</td></tr></table> <small>Note: m³/s = cubic meters per second</small>	Assessment Node	7Q10 Flow Rate (m³/s)	LA-1	0.874	LA-5	0.616
Assessment Node	7Q10 Flow Rate (m³/s)												
LA-1	0.874												
LA-5	0.616												
IR-128	CNSC	Current use of lands and resources for traditional purposes	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use Section 12 Section 14	<b>Context:</b> The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting with Indigenous Nations and communities and are presented in the EIS.  <b>Rationale:</b> The increased traffic and therefore dispersal of game (moose, woodland caribou) due to increased traffic has been raised as a concern with respect to increased mortality on wildlife and decreased ability to practice traditional rights.	How have the potential residual impacts with respect to increased traffic and noise (due to current and future operations) been communicated to Indigenous Nations and communities who use the road #914 for cultural and traditional activities (such as moose harvesting, berry picking and small game and birds)?  Please provide any additional information on the engagement that has taken place to date with Indigenous Nations and communities with respect to concerns and potential impacts on current use of lands and resources due to increased road traffic, and any mitigation measures proposed by Indigenous Nations and communities to minimize the potential impacts.	The potential residual impacts with respect to increased traffic and noise were communicated to ERFN and KML during engagment and through pre review of the EIS and have documented their regular use of the road. Proposed mitigation measures in relation to vehicle traffic were also communicated. Please see draft EIS, Section 4 record of consultation (ROC) 618, 619 and 620.  The findings in relation to the potential for residual impacts as a result of change in traffic will be shared again in future engagement activities, expected in late September and early October 2023. Any additional input will be integrated into the final EIS, as part of the commitment made under IR-28.  As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has collaborated with ERFN and KML to develop additional mitigation measures specific to these Communities. These include: 1) Assisting ERFN to provide clear highway identification for the location for the Mawdsley Reserve, where many cultural camp activities occur 2) The same is offered to KML; however, the current km 67 Culture Camp for KML was burned in the May 2023 forest fires, and so this will be executed in the future at such time as KML selects a new location. 3) The commitment by Denison to slow truck traffic down for a minimum of 2.5 km on either side of the culture camp(s) to 40 km/hr, during the months of September and October. 4) To communicate this new slowing protocol to Denison's contractors and other operators in the area, to inspire best practice for other operators in the area.	The EIS will be updated to reflect the additional mitigations to which Denison has committed, per the IR response. Specifically, the following will be added to the text of Section 11.1.5.3 and 12.3.5 within the context of traffic mitigation  <u>Traffic</u> <ul style="list-style-type: none"><li>Assist ERFN to provide clear highway identification for the location for the Mawdsley Reserve.</li><li>If requested, assist KML to provide clear highway identification at the km 67 Culture Camp or other selected location.</li><li>Require Denison truck traffic to slow to 40km/hr for a minimum of 2.5 km on either side of the culture camp(s), during the months of September and October.</li><li>Communicate the slowing protocol to Denison's contractors and other operators in the area, to encourage best practice for other operators in the area.</li></ul>						
IR-129	CNSC	Current use of lands and resources for traditional purposes	Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<b>Context:</b> ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).  Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)  <b>Rationale:</b> The <a href="#">Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012</a> notes: “The views of affected Aboriginal groups on mitigation be considered and included in the EIS. This could assist in ensuring that the environmental effects on the current use of land and resources for traditional purposes are at an acceptable level for the community.”  Sources for indirect moose mortality (e.g., increased hunter access, changes to health due to sensory disturbances, changes to predator-prey dynamics) may result in mortality outside the Wildlife LSA. The	Please provide additional information on the discussions Denison has had with Indigenous Nations and communities on how to mitigate any residual project impacts on their traditional harvesting activities of large game such as moose.  More information is required to determine if Denison has engaged directly with ERFN/KML and other Indigenous Nations who utilize the area to harvest moose to determine current baseline harvest numbers that provide subsistence, continued cultural identity and community well-being, as well as discussions on how the project could potentially impact moose populations and the harvesting of moose for traditional practices.	Potential project related changes to moose are detailed in Section 9 of the EIS, and include potential changes associated with vegetation removal and/or ground disturbance (i.e., loss of habitat), sensory disturbances, and vehicular collisions. Mitigations to minimize these potential effects include minimizing the extent of the Project area and associated disturbances to the extent practicable, standard mitigation measures to minimize air emissions, dust, light and noise, exclusion fencing around waste pads and ponds, and measure to minimize direct mortality through vehicular collisions through driver training and safety practices.  Baseline harvest information was shared by the Indigenous Communities of Interest through Indigenous and traditional knowledge studies which were considered by all discipline leads in the assessment process. Information on moose is specifically documented in: <ul style="list-style-type: none"><li>Wheeler River Project - Summary of Traditional Knowledge Study Results (ERFN and SVS 2022b)</li><li>English River First Nation Country Foods Study Final Report (CanNorth 2017a)</li><li>Land use and occupancy maps shared with Denison by the Kineepik Metis local</li><li>Kineepik Valued Ecosystem Components – KML Pre-statement for Denison (KML 2022)</li></ul> Although Denison understands these documents are not representative of the complete extent of Indigenous moose harvest, recorded harvests proximal to the Project are document	No updates to the draft EIS are needed based on this IR response.						



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				<p>residual effect of change in moose mortality is likely to occur. Although mitigation measures are expected to reduce, but not fully eliminate, the residual effect on moose.</p> <p>The potential residual impact on the moose and other large game populations in the broader regional study area may potentially impact Indigenous treaty rights, culture, and community well-being if the harvesting of moose and large game declines due to increased traffic, noise, and vehicle mortality or increased outside hunting pressure.</p>		<p>in Section 11.1.4.3.1 of the EIS, and further harvest in the local and regional study areas are noted in each. Moose is central to the traditional diets of these communities, and as noted in the English River First Nation Country Foods Study Final Report (CanNorth 2017) were the most commonly consumed species by ERFN citizens. Interest and concerns about the Project’s potential interactions with moose populations are also noted in the engagement record, for example the engagement record notes that, for ERFN, moose is a [hunting and food] mainstay and there is concern for how moose would be impacted.</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e., moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring programing, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.</p>	
JSIR-130	CNSC	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>	<p>Vibration is a sensory disturbance that may affect some species and is inherently accounted for in the effects assessment by way of consideration of the sensory disturbance buffers that are recognized as areas of altered habitat (i.e., zone of influence) that may not be used as a result of the Project.</p> <p>Consideration of Project-related vibrations are considered in the responses to IR-46 within the context of vibrations generated by Low Frequency Noise (LFN). Unlike a conventional mining operation, vibration derived from LFN by the proposed operation is not expected. By extension, vibration related sensory disturbance outside the sensory disturbance buffer for habitat alteration already considered in the assessment would not be expected. Nevertheless, in response to the IR, specific mention of vibration will be added in the EIS where sensory disturbance is defined to provide further context to the assessment.</p> <p>Reptiles were not identified as a VC as part of the initial community consultations when the VCs were selected, and their ranges do not typically extend into northern Saskatchewan, and therefore, were not included in the effects assessment. Also, the potential for occurrence of reptiles within the Project footprint is expected to be low.</p>	<p>In the final EIS, discussion of habitat alteration in Sections 9.3 and 9.4 will be updated to include consideration of vibrations.</p> <p>For example: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, <b>vibrations</b>, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA.”</p>
IR-131	CNSC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): <i>The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</i></p> <p>As per the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> pursuant to the Canadian Environmental Assessment Act, 2012: <i>“The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan”.</i></p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>	<p>Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.</p>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to the IR further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-132	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> ECCC has identified that three species at risk arthropods (yellow banded bumble bee, transverse lady beetle, and nine-spotted lady beetle) have ranges overlapping the Project area and these were not mentioned in the draft EIS.</p>	<p>1. Conduct an effects assessment for arthropod species at risk.</p> <p>2. Explain what mitigation measures will be used to minimize potential effects.</p>	<p>Consideration of the three arthropod species at risk are included in Attachment IR-131.</p>	<p>A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.</p>
IR-133	ECCC		Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> There is potential for some species at risk (e.g., myotis species, barn or bank swallows, common nighthawk) to be attracted to and use mine infrastructure (buildings, roads etc.) once constructed for nesting, roosting, or foraging.</p> <p>Details on mitigation measures and adaptive management with respect to attraction to Project components should be identified to assess residual and cumulative impacts to species at risk.</p>	<p>For all Project phases, describe the mitigation measures and adaptive management to prevent and minimize effects on species at risk that may utilize mine infrastructure.</p>	<p>Specific exclusion measures will be added to the mitigation measures in Sections 9.3.5 and 9.4.5 of the EIS. These measures will be designed and appropriately applied to prevent or reduce access to Project infrastructure for roosting, nesting, and foraging, and are expected to address adverse Project-related effects on myotis species, barn and bank swallows, and common nighthawk.</p> <p>If bird nests (or tree cavities) should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>The results of mitigation measures implemented, and any associated wildlife observations will be considered in an adaptive management process to determine if/when/where additional mitigation measures may be required.</p>	<p>The below exclusion measures will be added to Sections 9.3.5.2.5 and 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>

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IR-134	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The draft EIS states in multiple places that vegetation clearing may occur year-round.</p> <p>In order to correspond with the timing of emergence from hibernation, tree clearing should not be conducted during the bat roosting period. If maternity roost trees are removed after pregnant females have established a roost area, there is a higher likelihood of abortion than there would be otherwise.</p> <p>Species-specific mitigations are required to protect bat SAR.</p>	Provide important roosting dates for bat species at risk in the Project area.	<p>Maternity roosts are used by pregnant females in late spring (April/May) either alone or in small groups. Females and their offspring roost in groups in nursery colonies in late summer/early fall prior to hibernation. Denison will adjust the activity timing windows to include the April/May maternity roosting period and the July/August nursery roosting period, to the extent practicable. Pre-construction surveys will identify all sensitive wildlife habitat features, including potential roosting trees (e.g., hollow trees, trees with defects, trees with cavities, and tree stumps). Should potential roosting trees be detected, consultations with the regulators will be initiated, and appropriate mitigation measures will be designed and implemented.</p> <p>This information above is provided in Attachment IR-131. This new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS.</p>	A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-135	ECCC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The mitigation measures for birds and wildlife presented in the draft EIS are very general. Additional detail is required for a complete assessment of residual and cumulative Project effects to birds and wildlife.</p> <p>The Proponent has committed to providing a number of plans including, a Decommissioning Plan, a Spill Response Plan, a Waste Management Plan, a Surface Water Monitoring Plan, a Remediation and Closure Plan, a Radiation Protection Plan, a Soil and Vegetation Monitoring Plan, a Wildlife Monitoring Plan, and a Woodland Caribou Management Plan. In order to assess potential affects to migratory birds and wildlife from Project related activities, ECCC requires details on species-specific mitigation measures, and monitoring plans.</p>	<p>The following information should be included in the various plans and should be provided for review during the environmental assessment:</p> <ol style="list-style-type: none"> <li>For all Project phases, describe the species-specific mitigation measures and responses to prevent and minimize effects on migratory birds or species at risk (SAR) birds and mammals that may utilize mine infrastructure.</li> <li>Explain how light pollution will be managed and what specific mitigation measures will be used to minimize effects to migratory birds and SAR birds and mammals.</li> <li>Provide details on what methods will be used for erosion control and how they will prevent sediment from entering waters frequented by migratory birds or SAR. Explain what actions will be taken if the erosion control measures are not successful.</li> <li>Provide details on noise and other sensory disturbance monitoring and mitigations if noise levels surpass thresholds.</li> <li>Describe time windows and species- specific mitigations related to maintenance activities such as vegetation management, road or building repair and stream crossing replacements.</li> </ol>	<p>As noted in the draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through a sequential EA and licensing process. The IR refers to “plans” and that these plans should be provided in the environmental assessment for review. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed to, it is Denison’s opinion that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response to the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed and provided during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes that this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p> <ol style="list-style-type: none"> <li>The mitigation measures referenced to in Part 1 of the IR are considered in the response to IR-133 and the reviewer is referred there for additional information. Specific exclusion measures will be added to Sections 9.3.5 and 9.4.5 to prevent or reduce access to Project infrastructure, as noted in the response to IR-133 (and in the adjacent column).</li> <li>Means to manage light pollution and specific mitigation measures to minimize the potential for adverse effects on migratory birds and SAR birds and mammals will be added to Section 9.4.5.2.5 of the EIS as noted in the adjacent column.</li> <li>Erosion control measures have been identified in Section 8, Aquatic Environment, of the draft EIS. These same proven mitigation measures will be effective at mitigating adverse effects on waters frequented by migratory birds or SAR. For completeness, the erosion control measures from Section 8, Aquatic Environment, of the draft EIS will be added to Sections 9.3.5 and 9.4.5 of the draft EIS, as highlighted in the adjacent column.</li> <li>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the draft EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat, and include the following: <ul style="list-style-type: none"> <li>not using the concrete batching plant and crusher during nighttime hours, where possible;</li> <li>locating the concrete batching operation as far away from sensitive wildlife features as possible;</li> <li>directing the generator discharge openings away from sensitive features;</li> <li>making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings); and</li> <li>collecting sound level measurements from the identified sources once they are operating and determining whether the actual effect is lower than that which was modelled.</li> </ul> </li> </ol> <p>Regarding monitoring, as outlined in Section 6.2.8 of the draft EIS, an EMS will be implemented and include noise monitoring plans to confirm that the Project is compliant with the federal and provincial guidelines. Sound levels will be monitored on a continuous basis using calibrated Class 1 sound level meters and data loggers, calibrated to a National Institute of Standards and Technology traceable standard within one year of its use in the program, and field calibrated using a Class 1 acoustic calibrator. Where possible, the sound level meters will utilize the same monitoring locations as were used in the baseline program to allow direct comparison and may be expanded to include the location of the nearest sensitive receptor where access is granted. Should monitoring show noise levels surpass modelled sound levels, Denison will implement corrective action to identify noise sources and reduce sound levels. Details of noise monitoring and an adaptive management process for the Project will be developed to support Project permitting and licensing.</p> <p>5. Information related to timing windows and species as it concerns Project activities has been provided in response to IR-134. As noted in the response to IR-134, Denison will schedule Project activity timing windows to appropriately consider all Valued Components and SAR requirements/sensitivities. For reference, additional information that will be added to the final EIS is described in the response to IR-134.</p>	<p>EIS updates in response to IR-135, part 1 are outlined in EIS Updates for IR-133.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 2 as follows:</p> <p>Proposed mitigation measures related to light pollution will be added to Section 9.4.5.2.5. This includes using low lighting and/or task lighting (e.g., downturned shaded fixtures to prevent sky-lighting or bird disorientation), putting building lighting on sensors or timers, and potentially using a higher lumen/watt ratio on all new buildings or building expansions.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 3 as follows:</p> <p>Erosion control measures that are designed to prevent sediment from entering waters frequented by migratory birds or SAR include (but not limited to) the installation of silt fence, straw wattles, and/or erosion control blankets to prevent erosion and limit sediment transport. Additionally, vegetated barriers will be maintained between Project components and wetland features, as much as practical. Further information on erosion and sediment control measures will be provided in the applicable management plans which will be developed to support Project permitting and licensing. Routine inspections and management would be completed to document the effectiveness of the erosion control measures, and any required /replacement of these structures would be completed as required.</p> <p>Section 9 of the final EIS will be updated to address the response to IR-135, part 4 as follows:</p> <p>Proposed mitigation measures related to noise and sensory disturbance outlined in Section 6.2.5 of the EIS are considered to be adequate and appropriate to limit/localize potential adverse effects on wildlife and wildlife habitat.</p> <p>The proposed monitoring related to noise and sensory disturbance outlines in Section 6.2.8 of the EIS are considered to be adequate and appropriate to monitor changes in sound levels.</p> <p>EIS updates in response to IR-135, part 5 are outlined in EIS Updates for IR-134.</p>
IR-136	CNSC	Soil Salvage Monitoring	Section 9.1.8.2	<p><b>Context:</b> The proponent plans to salvage and stockpile soil and organic matter/peat in order to use it in reclamation activities during decommissioning. Periodic monitoring of the stockpiles is proposed to be conducted to verify that soil and organic matter/peat are delineated, stripped, handled, and stockpiled as recommended, and to evaluate the stability of salvaged soil, e.g., in relation to potential erosion and/or degradation. It is unclear whether monitoring includes soil quality in terms of concentrations of COPCs.</p>	Please clarify if COPC concentrations monitoring is planned to be performed for stockpiled soil and organic matter/peat.	Per the Residual Effects Characterization: "Predicted changes in concentrations of COPCs (i.e., soil quality) associated with open-source dust, process-source dust and process emissions are expected to be within acceptable health and safety guidelines; no threshold exceedances are predicted." Monitoring of COPCs in soil stockpiles during the life of the Project is not presently being considered, but the need for such monitoring could be revisited within the context of monitoring of sources that could contribute to COPCs to stockpiled soil and organic matter/peat. For example, if source monitoring data exceed predictions	No updates to the draft EIS are needed based on this IR response.



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				<p><b>Rationale:</b> It is expected that project-related activities (road and airport traffic, drilling) can result in open-source (i.e., fugitive) dust and process-source dust (incl. radionuclides), which can accumulate and result in changes in soil quality of the stockpiled soil and organic matter/peat as described in Sections 9.1.4.2.2 and 9.1.4.2.3).</p>		<p>presented in the EA that may provide rationale for sampling and analysis of COCPs in stockpiled materials.</p> <p>A soil salvage monitoring program/protocol (or equivalent) is expected to verify soil salvage volumes and reclamation suitability. Denison is proposing to support reclamation trials/research at the Project to inform and refine the revegetation strategy. It is understood that reclamation trials/research will include investigations into soil conditions, preparation techniques and amendment strategies (to the standard of the day). These ancillary investigations may include analysis of COCPs, although this is not expected at this time, but as highlighted above would be considered as may be warranted.</p>	
IR-137	ECCC	Migratory birds, Wildlife and Wildlife Habitat, Vegetation and Wetlands	<p>Section 9.2.1.3, Spatial and Temporal Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA:</u> The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects. For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p> <p><u>RSA:</u> The Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul>	<p>Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:</p> <ul style="list-style-type: none"><li>• Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>• Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>• Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>• Re-do the assessment with the RSA at the scale of the range</li></ul> <p>See also related IRs: IR-154 and IR-156.</p>	<p>The Project Area was delineated to capture all direct, and most indirect, likely adverse effects on caribou; as this is the zone of influence most likely to affect caribou in the vicinity of the Project (i.e., in the vicinity of human activity, equipment use and vehicle use). The Project Area (169.6 ha) is the direct footprint of proposed Project infrastructure (74.8 ha) with a buffer applied, thereby representing the area of maximum physical disturbance. The Project Area is not VC-specific, but consistent throughout the EIS.</p> <p>The Wildlife LSA was designed to capture the majority of the Project effects. The LSA extends beyond Project Area of the site to include a reasonable estimation of where sensory disturbance from Project-related activities would extend and where effects on wildlife including caribou are most likely to occur. That is the primary rationale for selection of the spatial extent of the LSA – Denison believes this is an appropriate spatial scale that applies broadly to the wildlife VCs as a whole given the perceived mechanism of VC-Project interaction.</p> <p>Importantly, as noted in draft EIS Section 9.3.6.4, in the caribou assessment, the Project Area had a 500 m buffer applied to account for indirect effects/habitat alteration; this area is within the wildlife LSA (refer to Figure 9.3-14 for a map showing the spatial areas). The 500 m buffer for habitat alteration for caribou was selected in accordance with ECCC’s (2020) assessment of disturbed areas, which buffered (500 m) anthropogenic disturbances to evaluate woodland caribou habitat. The alteration of available woodland caribou habitat is quantified in this EIS by applying a buffer of 500 m around the Project Area in which Project effects in the form of sensory disturbance are likely to affect available woodland caribou habitat and make it functionally unavailable for use.</p> <p>Boreal caribou occur as one continuous population across the SK1 range, including within the Terrestrial RSA. It was decided to not use the entire SK1 range as an assessment area (e.g., due to the dilution factor) and instead use the Terrestrial RSA to appropriately and adequately assess residual and cumulative effects in proportion to the Project. It was deemed to be not feasible to use a large area like the SK1 range to assess residual Project effects because this would provide inappropriate context or "dilute" the adverse effects of the Project on the caribou that have a home range that overlaps with the RSA.</p> <p>The cumulative effect assessment of the draft EIS compares the Project-specific habitat effects (i.e., the Project Area plus a 500 m buffer to account for sensory disturbance) at the scale of the SK1 range (as the applicable management unit for portion of the woodland caribou population that uses the Terrestrial RSA). The result showed that the Project is expected to add 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (Section 9.3.7.3.3 of the EIS).</p> <p>References: Environment and Climate Change Canada (ECCC). 2020. Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.</p>	No updates to the draft EIS are needed based on this IR response.

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				<p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada.</p> <p><b>Reference:</b> [1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011).</p>			
IR-138	CNSC	COPC in Lichen	Section 9.2.4.2.2  Appendix 10-A (ERA)	<p><b>Context:</b> A quantitative assessment using modelling dispersion and uptake of COPCs in the environment was completed for the Project as part of the ERA, to support conclusions drawn in the EIS. In Appendix 10-A (ERA), COPCs in plant tissue was estimated for lichen. Table 5-5 of the ERA (p. 5.24) named “Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model” lists the exposure pathway for lichen as direct contact on soil.</p> <p><b>Rationale:</b> Airborne COPC can deposition on lichen and subsequently enter the food chain; therefore, the “contact with air” pathway should be considered. In fact, lichen species are frequently used to monitor the deposition and accumulation of airborne contaminants (e.g., dust, metals). It is also noted that based on sampling results of the 2017 baseline studies, lichen frequently contain higher concentrations of COPC than blueberry (compare Table 9.2-6 and Table 9.2-7 in the EIS), especially at sampling sites with elevated concentrations (e.g., RSV9 and RSV10).</p>	<p>Please include the exposure pathway of direct deposition (dry and wet) of airborne contaminants on lichen in the quantitative ERA, or justify why this exposure pathway was not considered.</p> <p>See also related: IR-189.</p>	<p>Denison agrees that the air to lichen pathway is the primary exposure route for lichen. The ERA (Appendix 10-A) modelled the deposition of air to lichen as an exposure pathway and considered the uptake from soil to lichen as negligible. This will be clarified in Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model. In the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>	<p>Minor change. In Table 5-5 of Appendix 10-A, the column "Environmental media" for lichen, "On soil" will be replaced by "air". Additionally, the conceptual site model shown in Figure 5-1 of the ERA will be updated to include a pathway arrow from air to lichen.</p>
IR-139	ECCC	Change to an environmental component due to hazardous contaminants	Section 9.2.5.2.7, Waste and Hazardous Materials Management	<p><b>Context:</b> In this section, the Proponent outlines various measures to mitigate air emissions, including implementation of the air quality programs within the Environmental Management System, regular maintenance and inspection of equipment, and elimination of unnecessary idling of equipment. However, the intention to use industry-standard emission control systems has not been substantiated.</p> <p><b>Rationale:</b> For the protection of air quality, it is important to specify the emission standards that equipment will have (e.g., Tier 3 or Tier 4 engines). Vehicles and equipment with Tier 4 engines have much lower emissions of contaminants than those with Tier 3 engines. If non-Tier 4 engines are used, ECCC recommends that best management practices are followed, including proper maintenance of the engine and anti-idling measures.</p>	<p>Confirm if vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>Denison confirms that vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-140	CNSC	Change in the Areal Extent of Wetlands	Section 9.2.6.4	<p><b>Context:</b> Predicted residual effects on the areal extent of wetlands include the direct effect of loss of wetlands and several indirect effects of alteration of wetlands. As stated in the EIS, wetlands can exhibit low resilience and high susceptibility to disturbance. At the same time, wetlands tend to support a high species diversity, and are considered to have a moderate to high potential to support listed plant species. Lastly, wetlands are rare on the landscape compared to terrestrial ecosites (see Table 9.2-5).</p> <p><b>Rationale:</b> Several wetland ecosites (BS19/24, BS25, BS27) occur only in small areas (&lt; 30 ha) in the RSA but are predicted to experience disturbance of 6-64%, most notably the ecosite BS19/24 where 0.8 of 1.2 ha are predicted to be disturbed. It is noted that wetlands are scattered throughout the landscape as shown in Figure 9.2-8. More information is requested regarding the ecological impact of this disturbance.</p>	<p>1. Please provide a discussion on the ecological impact of disturbance to rare wetland ecosites.</p> <p>2. Please provide information on whether adequate other habitat is available for species impacted in these disturbed sites in close proximity, taking into account the home ranges of susceptible species.</p> <p>3. Please provide additional information on whether wetland connectivity is maintained through the landscape within the LSA/RSA.</p> <p>See also related: IR-141.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison conduct monitoring of species present in wetlands before and after disturbance, with a focus on listed plant species.</p>	<p>1. As described in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not a unique ecosystem and is instead an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. No direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (further described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No listed plant species have historically been observed to be associated with ecosites BS19/24 (graminoid bog/fen), BS25 (open fen), or BS27 (sedge rocky shore). As described in Table 2.4.4 of Appendix 9-B of the EIS, populations of the listed plant Alaskan clubmoss were observed to be associated with open Jack pine stands and transitional areas between upland and wetland/riparian areas. As stated in Section 2.2.2 of Appendix 9-B of the EIS the listed plants angle-leaved sundew and neat spike-rush were not observed in ecosites BS19/24, BS25 or BS27 either (see also the response to IR-175). With regard to wildlife, ecosites BS19/24, BS25, and BS27 are not limiting habitats for ungulates, furbearers, woodland caribou, raptors, or migratory breeding birds (as described in Sections 9.3 and 9.4 of the EIS) in the Terrestrial RSA. In fact, these ecosites were observed to exhibit low species richness and species diversity for breeding and migratory songbirds (Section 9.4.3.2.3). For bird species at risk, ecosites BS19/24 and BS25 are considered to provide suitable habitat for Short-eared Owl, Yellow Rail, and Rusty Blackbird; however, these ecosites are not anticipated to be limiting. Up to 2.9% of available Short-eared Owl habitat and up to 2.4% of Yellow Rail and Rusty</p>	<p>1. Section 9.2.6.4.1 will be updated to include the following: As noted in footnote 3 of Table 9.2-8 and table 9.2-16 of the draft EIS, the ecosite BS19/24 is not considered a unique ecosystem and is instead an artifact of mapping uncertainty, as it was not possible to distinguish between BS19 (graminoid bog) and BS24 (graminoid fen) ecosites within these areas during the wetland mapping process due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). If all BS19, BS24 and BS19/24 were combined into a single combined "graminoid peatland" category, only 2.1% (3.6 ha of 170.7 ha) would be expected to be indirectly disturbed. However, no direct disturbance on wetland ecosites BS19/24, BS25, or BS27 is anticipated. Indirect disturbance associated with the potential to adversely affect these ecosites includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing water bodies, alteration of water quantity would be expected to have the highest potential to</p>



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						<p>Blackbird habitat within the Terrestrial RSA may be altered or lost as a result of the Project during all Project phases (Section 9.4.6.4.1).</p> <p>3. Surface drainage continuity and hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity. This post-construction surface water management monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change.</p>	<p>cause an adverse effect, and thus maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.</p> <p>2. No updates to EIS required.</p> <p>3. Section 9.2.5.2.3 will be updated to include the following: Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and facility sites. A post-construction surface monitoring program will be developed to document the performance of surface water management structures adjacent to wetlands to evaluate areas (if any) where additional surface water management is considered to be necessary to maintain natural drainage. The monitoring program is expected to verify the presence and condition of surface water management structures, including any areas of water impoundment (e.g., upgradient of a road), erosion, or dead or dying vegetation. The monitoring program is expected to identify issues (if any) in a timely manner and allow the adaptive management process, in consideration of the vegetation monitoring results, as vegetation species composition can be a lagging indicator of hydrologic change. Culverts will be regularly inspected to identify where maintenance, repair, upgrade, and/or replacement is necessary to maintain natural surface drainage and the resultant wetland connectivity.</p>
IR-141	ECCC	Wetlands	Section 9.2.6.4.1	<p><b>Context and Rationale:</b> The Proponent states that: “Direct loss of wetlands has been mitigated by reducing the size of the Project Area to the extent practicable during Project design.</p> <p>However, up to 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA are anticipated to be removed from the Project Area during Construction (Table 9.2-16).”</p> <p>Information is not provided on whether wetlands in the terrestrial RSA are considered ecologically, economically or socially important to the region. Information on the regional importance of the wetlands that will be lost is needed in order to assess effects, including a wetland compensation plan if the wetlands are considered regionally important.</p>	<p>1. Provide information that accounts for whether wetlands are considered ecologically, economically and socially important to the region.</p> <p>2. If the above is affirmative provide a wetland compensation plan to offset the loss. Consistent with the Operational Framework For Use of Conservation Allowance [1] a minimum ratio of 2:1 should be the starting point when determining the amount to be offset.</p> <p>[1] Available at : <a href="https://publications.gc.ca/site/eng/9.696852/publication.html">https://publications.gc.ca/site/eng/9.696852/publication.html</a></p> <p>See also related: IR-138.</p>	<p>During engagement activities, no specific comments or concerns were raised that would suggest wetlands near the Project are considered to be particularly ecologically, economically, and socially important to the region. Drainage in the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion is very weakly developed, and with numerous poorly drained wetland areas in lower landscape positions (Acton et al. 1998). This pattern is reflected in the Terrestrial RSA, where wetlands and water bodies are commonly scattered, comprising 16.6% of all mapped ecosystems (Section 9.2.3.3; Figure 9.2-8 of the draft EIS). Wetlands in this region provide ecological, economic, and social functions and values, and Denison has appropriately considered this during Project planning (i.e., avoidance to the extent practical). The Project Area has been reduced to the extent practicable, and the Project footprint has been sited to avoid wetlands to the extent feasible (Figure 9.2-8). Where wetland avoidance was not feasible, mitigation measures have been designed to reduce disturbance and maintain surface water connectivity (Section 9.2.5; see also response to IR-140 and IR-101). A small area of direct wetland disturbance is anticipated (0.5 ha; less than 0.1% of all wetlands within the Terrestrial RSA), predominantly associated with access road development. This area includes 0.4 ha of BS17 (black spruce treed bog), &lt;0.1 ha of BS18 (Labrador tea shrubby bog), and &lt;0.1 ha of BS23 (willow shrubby rich fen). These areas of direct wetland disturbance are small and located adjacent to existing access routes, and mitigation measures to maintain surface water connectivity across access roads will be implemented and monitored (see response to IR-140). The re-establishment of appropriate hydrologic conditions during Decommissioning is expected to lead to the re-establishment of wetland ecosystems within these directly disturbed areas. As such, it is Denison's opinion that a wetland compensation plan is not warranted.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>
IR-142	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.3.2.1 Scientific Literature Review – Wolverine Section 9.3.5 Mitigation Measures Section 9.3.6 Residual Effects Evaluation	<p><b>Context:</b> The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens.</p> <p>In Section 9.3.3.2.1, the Proponent states: “Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success. ”</p> <p>In Section 9.3.6, the Proponent states: “In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction.”</p> <p>The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost</p>	<p>1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges.</p> <p>2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project.</p> <p>3. Assess the need for pre- construction/pre-clearing surveys to identify any wolverine denning sites.</p> <p>4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.</p>	<p>1. While wolverine were not observed during baseline studies for the Project, it is assumed that the Project (Project Area, LSA) may overlap with wolverine home ranges. As described in the EIS, wolverine occur in low densities across all forest stand and vegetation types but are generally absent from areas of human development and activities.</p> <p>2. No wolverine dens were identified during any of the baseline studies. It is not anticipated that wolverine denning sites will be lost and/or altered because there are no specific landscape features typically used by wolverine as potential denning sites located in the Project footprint. Further, much of the proposed Project footprint will be developed within previously disturbed areas, including roads and cutlines.</p> <p>3. Pre-construction surveys will be completed to identify all sensitive wildlife habitat features, including wolverine denning sites.</p> <p>4. Most of the Project footprint is already disturbed through previous exploration activities. The total expected direct habitat loss of 169.6 ha includes the already disturbed areas. In the Terrestrial RSA, 8.2% of available wolverine habitat may be altered or lost; this includes 0.5% that will be cleared within the Project Area during Construction, and an additional 7.7% that may be altered through indirect effects (sensory disturbance). The magnitude of this effect was characterized as being "moderate" and the residual effect is not expected to result in a</p>	<p>1. No updates to the draft EIS are needed based on this IR response.</p> <p>2. No updates to the draft EIS are needed based on this IR response.</p> <p>3. Section 9.3.5.2.4 Work Timing Windows (third bullet will be updated to include): Pre-construction wildlife clearance surveys will be conducted within the Project Area in accordance with a wildlife monitoring plan and the draft Caribou Mitigation Plan. This would include surveying for important wildlife features that would include wolverine den sites.</p> <p>4. No updates to the draft EIS are needed based on this IR response.</p>

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				(Table 9.3-20).  <b>Rationale:</b> As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens.  Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features.		change that will alter wolverine habitat integrity to the point where it would not be able to sustain the regional populations of wolverine. This considers that no wolverine were observed during the baseline investigations, the small Project footprint, and the typically large size of a wolverine home range.	
IR-143	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.  Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.	Provide details on the baseline caribou data including: <ul style="list-style-type: none"><li>Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>Description of seasonal use of the LSA, RSA and caribou range.</li><li>Description of Project areas used by caribou.</li><li>Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul> Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).  See also related: IR-152.	The baseline data collection program was not specifically designed to collect seasonal caribou habitat use but to document caribou presence in the Project Area, Wildlife LSA and Terrestrial RSA. Based on this information, the EIS assumed caribou to be present in the study areas throughout all seasons and life stages. It should be noted that discrete calving areas have not been documented for the SK1 range. As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from IK was included in the EIS, including potential calving areas in the Terrestrial RSA.  Additional wildlife camera data have been obtained and analyzed to further describe seasonal use of the Project study areas. Updated Figure 9.3-8 (included in Attachment IR-143) provides the caribou sightings from baseline studies and updated to reflect seasonality of all sightings, where such data are available. There is insufficient information to provide further explanation on how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering)); however, the EA appropriately addressed direct and indirect effects on caribou and their habitat.  Denison’s intent is to develop the specific details related to environmental monitoring in general, and Caribou specifically, as part of licensing. A conceptual framework for monitoring and follow up was presented for each technical EIS discipline in the respective draft EIS section (see Section 9.3.9 for terrestrial wildlife). Environmental monitoring and follow up will fall within the scope of the Environmental Management System (EMS) for which document preparation is ongoing as indicated will be fulfilled during licensing. As noted elsewhere in the IR responses the EMS hierarchy will follow a three-tiered system comprising Program, Plan and Procedure level documentation, with detail associates with each becoming more granular and prescriptive at each successive tier.  At this time no aerial surveys are planned. Denison approached the Province with proposals for aerial surveying for the purpose of the baseline program in 2016/2017 but the Province would not provide Denison with permits for aerial surveys. Based on recent discussion with the Province this position has not changed, nor is it Denison’s understanding that it is likely to.	Applicable sections of Section 9.3.3.3 will be updated in the final EIS to include a description of seasonal use of the RSA. This would include:  Wildlife Camera Study Wildlife camera locations were spread across three categories of linear features in mature and regenerating forest types: road (a maintained or seasonally accessible road supporting traffic), trail/rough road (a cleared disturbance over 2 m in width), and hand-cut line (a cleared disturbance under 2 m in width) (Appendix 9-B). Trails/rough roads and roads had the highest frequency of wildlife detection, with woodland caribou being the second most commonly photographed species (after snowshoe hare).  Of the 34 caribou observations that were recorded, most were documented in the winter, with one observation from the spring and one in the summer. Seven data points had no date associated with the observations. Of the winter observations that were documented, seven occurrences were located in the northern portion of the RSA and the remainder located in the eastern portion of the RSA (Figure 9.3-8).  Figure 9.3-8 included in Attachment IR-143 has been updated to include additional camera data on caribou presence and seasonal use and will replace Figure 9.3-8 in the draft EIS  The Conceptual Caribou Mitigation Plan is included with the IR response package (Attachment IR-149). This Plan includes description of ongoing studies to assess linear feature use by caribou and will be included in the final EIS as new Appendix 9-E.
IR-144	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i>  <i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i>	Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.	Refer to the Attachment IR-143 for the updated version of Figure 9.3-8.  Denison acquired data from the Province of Saskatchewan which has been included in Attachment IR-145. As shown in the figure, the data is not available in a format that can be imported for analysis and incorporated into a spatial map. The data does not specify seasonality of the observations. Regardless, this data relates to the information provided by McLoughlin (2019 and 2021) and confirms caribou have been previously documented within the RSA, particularly in the eastern portion.  References:  McLoughlin, P. D. 2021. Associate Professor, University of Saskatchewan, Saskatoon, SK. Personal Communication. January 2021.  McLoughlin, P. D., C. Superbie, K. Stewart, P. Tomchuk, B. Neufeld, D. Barks, T. Perry, R. Greuel, C. Regan, A. Truchon-Savard, S. Hart, J. Henkelman, and J. F. Johnstone. 2019. Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. Final Report. Department of Biology, University of Saskatchewan, Saskatoon. 238 pp.	No updates to the draft EIS are needed based on this IR response.
IR-145	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Woodland Caribou	<b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).  The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.	1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada: <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul>	Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and	The map included in Attachment IR-145 along with supporting text will be added to Section 9.3.3.3 of the final EIS.



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				<p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>	<p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.</p>	<p>species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>The EIS uses "available caribou habitat" as a basis to assess the Project effects. Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.</p> <p>Subsequent to filing of the draft EIS and as committed to ECCC during an April 20, 2023 meeting between Denison and ECCC, Figure 9.3-8 has been updated (included in Attachment IR-143) to address seasonal use by caribou within the terrestrial study areas.</p> <p>In May 2023, Denison received caribou data from the Province of Saskatchewan that included both incidental observations and telemetry point data within the terrestrial study areas. These data were provided to Denison as a figure, and this figure has been included herein as Attachment IR-145. The information made available to Denison by the Province was not broken down to reflect the timing (seasonality) of the reported data and therefore does not specifically contribute to the description of seasonal use of the Project study areas by caribou.</p> <p>For reference, and based on the data that have been made available, the conservative assessment approach utilized in the draft EIS of assuming caribou presence in the terrestrial study areas throughout all seasons will not be changed.</p>	
IR-146	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3.1, Woodland Caribou, Scientific Literature Review - Predation	<p><b>Context and Rationale:</b> The information on impacts of predation and apparent competition for caribou in relation to the proposed Project are insufficient.</p> <p>In the section on caribou predators (9.3.3.3.1), the Proponent provided details on densities of wolves and their overlap with caribou and speaks of apparent competition. The Proponent did not examine other predators, such as black bear.</p> <p>The analysis on impacts of predation and apparent competition is insufficient since known predators have been omitted without explanation from the assessment of effects. ECCC is not able to verify the Proponent’s effects assessment since important species have not been considered in the assessment.</p>	<p>Provide further information and analyses on all potential predators of caribou, including impacts from apparent competition.</p>	<p>Effects from predation as a factor contributing to indirect mortality are discussed and qualitatively assessed in the EIS. Section 9.3.3.3 describes current knowledge of caribou mortality in or around the Project study areas (i.e., the existing studies describe wolf predation and hunting). It is acknowledged that black bear may also prey on caribou; however, this would be expected to follow the same effect pathways and is included in the qualitative indirect mortality assessment. Effects of apparent competition are included in the EIS and are part of the qualitative indirect mortality assessment.</p>	<p>In the final EIS, 9.3.3.3.1 Scientific Literature Review Denison will replace Predation section with the following:</p> <p>Predation McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season; however, mortality could not be confirmed for most of the caribou, with only the fate of 1 of 94 collared caribou confirmed in the four years of the study (which had been harvested by a hunter).</p> <p>Relatively low predator (e.g., wolf and black bear) densities in their study area were documented by McLoughlin et al. (2019), with other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>). While the effect on adult caribou survival by black bear is anticipated to be marginal compared to that by wolves, they may still be a predator of caribou calves and potentially a limiting factor to recruitment (McLoughlin et al. 2019).</p> <p>McLoughlin et al. 2019 noted that there was spatial separation between caribou and wolves as well as black bear, although this was found to be variable amongst individuals. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected</p>

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							<p>for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Black bears also used mixed-wood forests but particularly in the summer and fall they selected for jack pine stands &lt;40 years. (McLoughlin et al. 2019).</p> <p>While predation is believed to be the limiting factor for woodland caribou, Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.</p>
IR-147	ECCC	SAR - Boreal Caribou	<p>Section 9.3.4.2.1, Alteration and/or Loss of Habitat</p> <p>In Section 9.3.4.2.1 the Proponent states that: “Following decommissioning and reclamation, wildlife habitat is expected to recover to baseline conditions.”</p> <p>A more thorough explanation regarding post-decommissioning landscape is required to assess Project impacts.</p>	<p><b>Context and Rationale:</b> The process of in-situ recovery mining will likely create changes to the surface topography and potential ground subsidence as well as changes to groundwater elevations. These changes can affect the plant communities and ecosite types.</p>	<p>1. Provide further rationale and/or analysis regarding the return of wildlife habitat to baseline conditions post-decommissioning. Incorporate other environmental impacts including:</p> <ul style="list-style-type: none"><li>Ground subsidence and impacts on wildlife habitat</li><li>Changes to aquifers and impacts on wildlife habitat</li></ul> <p>2. Describe reclamation activities/measures, including temporal information that will be implemented to help in the recovery to baseline conditions.</p>	<p>1. The risk of ground subsidence has been assessed as part of the draft EIS (see Appendix K to Appendix 7-C). Subsequent to the filing of the draft EIS, Denison undertook additional modelling with refined, more granular inputs including consideration of subunits within the altered zone (RESPEC 2023). With this more refined analysis, the potential surface subsidence has been reduced from 7.5 cm to 2.4 to 2.8 mm (RESPEC 2023 is included here as Attachment: IR-21). Overall, the analysis shows there is negligible risk of subsidence and the magnitude of subsidence, if it were to occur, is in the range of millimeters at surface. Further, this potential subsidence would be limited to the footprint directly above the deposit.</p> <p>In consideration of the above, with specific reference to the expected level of ground subsidence, no effects on wildlife habitat nor aquifers that support wildlife habitat are expected. Moreover, Denison does not foresee that ground subsidence would be a risk to the success of wildlife habitat restoration / reclamation during Post-Decommissioning, within the context (potential for adverse effects on wildlife habitat and/or changes to aquifers that may adversely affect wildlife habitat) raised by the IR.</p> <p>As outlined in Section 2.3.3 of the draft EIS, as part of the Conceptual Decommissioning Plan (CDP), reclamation activities, including replanting, will take place once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled. Notwithstanding the execution of major decommissioning activities, Denison will look for opportunities to proactively reclaim inactive areas of the Project site as is possible in a timely manner and without delay. Progressive reclamation is considered in more detail below.</p> <p>Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on the results of these discussions, roads associated with the Project site that are no longer needed will be graded and scarified to promote natural revegetation. Access roads or trails required for post-closure monitoring or deemed useful by Interested Parties may be left to facilitate continued access. Access to the site may be restricted by gates and/or berms for safety. Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during reclamation. Lessons learned from progressive decommissioning and any site-specific reclamation studies will be incorporated into the detailed reclamation design. Additionally, information from other northern Saskatchewan mine sites will be examined to help Denison select the reclamation tools, including revegetation options, that will contribute towards decommissioning success.</p> <p>2. Specific details concerning reclamation activities / measures, including detailed temporal information for restoration will be developed as part of future updates to the decommissioning plan. The CDP included in the draft EIS contains information related to site restoration; see also the Conceptual Caribou Mitigation Plan provided in Attachment IR-149. The CDP contains the appropriate level of detail for this stage of the Project. Briefly, the three main physical decommissioning activities include:</p> <ul style="list-style-type: none"><li>mining area remediation;</li><li>asset removal; and</li><li>decontamination, demolition, and disposal.</li></ul> <p>Physical decommissioning activities are followed by reclamation. The expected duration for decommissioning is 5 years (from year 18 to 23 of the Project).</p> <p>Importantly, during physical decommissioning, the majority of Project components are scheduled to be removed from site which is expected to facilitate reclamation activities. Also, because of the selected mining method, there are no large site aspects, such as waste rock</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>

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						<p>piles or tailings management facilities, for which large scale and potentially complex reclamation strategies are needed.</p> <p>Denison has committed to progressively reclaim areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Reclamation of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed annually. Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native vegetation species and in accordance with the Reclamation and Closure Plan.</p> <p>As described in Section 2.3.3 and outlined above, the details of the decommissioning plan, including site restoration, will evolve and become more specific as the Project advances. The subsequent iteration of the decommissioning plan will be the preliminary decommissioning plan (PDP). The PDP will be submitted to regulators as part of Project licensing and permitting and will provide additional detailed information with respect to site decommissioning, including site restoration. The PDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission. Prior to executing decommissioning activities, Denison shall prepare and submit a detailed decommissioning plan (DDP) to regulators for acceptance, which builds on the PDP. In this case the DDP would reflect input that will be solicited from Indigenous Nations and communities and others prior to its submission and would also be informed by conditions on the ground at the site at that time, operational experience that has been gained and the regulatory landscape at that time. As is highlighted above, the decommissioning plan, including site restoration, will evolve over time and the plan will become more refined as the Project advances.</p>	
IR-148	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus</i> caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>1. Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>2. Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>• an account (and GIS file if available) of existing habitat affected, using the following formula: (Project footprint + 500m buffer) - overlapping (permanent alteration(s) + 500m buffer)</li></ul></li><li>3. A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</li><li>4. Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and provide a rationale for the conclusion.</li></ol> <p>See also related: IR-154.</p>	<p>1., 2., and 3.: This calculation (for Project Area + 500 m buffer) is provided for the Project at the SK1 range level in the Cumulative Effects Assessment (see Section 9.3.7.3.3). Project-specific values are provided as they add to the known existing reported anthropogenic disturbance in the SK1 range and the result shows that the Project would be adding 0.001% of anthropogenic disturbance at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit (refer to response to IR-137). Existing anthropogenic disturbance was mapped at the scale of the Terrestrial RSA (i.e., the assessment area - see Figure 9.3-15); the mapping was not extended to the entire SK1 range because: (1) this was not determined to be the assessment area (explained in response to IR-137) and (2) shapefiles are not publicly available for all developments in the SK1 range.</p> <p>4. The Project is not expected to compromise the ability of the range (i.e., SK1 range) to be restored to the undisturbed habitat threshold. This opinion is based on the small amount of disturbance (i.e., 0.001%) of anthropogenic disturbance and Denison’s commitment to progressive reclamation as well as final reclamation as part of the Decommissioning phase. Also considered was the ecology of the boreal forest which is influenced, primarily by forest fires that continue to “reset” the seral stage of forest, typically at a much larger scale than that of the Project Area. The reclamation efforts will be monitored, and deficiencies noted and addressed appropriately in a timely manner, so that lands are returned to comparable land use capability and habitat (i.e., regenerating forest), that existed prior to the Project. The Project is not expected to adversely affect the habitat within the SK1 range to the extent that the range/habitat is unable to support caribou.</p>	No updates to the draft EIS are needed based on this IR response.
IR-149	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li><li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li></ol>	<p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>The selection of valued components (VC), with key indicators (KI), and associated measurable parameters is an important part of scoping in each biophysical and human environment assessment. Woodland caribou were selected as a VC in the Terrestrial Environment assessment for a variety of reasons including a recognition of caribou as an important cultural and subsistence species, the conservation status of caribou, and that Project activities and infrastructure may affect woodland caribou populations. For the woodland caribou VC, the KI selected was also woodland caribou. The measurable parameters for the caribou VC/KI were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. woodland caribou mortalities directly or indirectly attributable to the Project.</p> <p>The main Project interactions identified in the caribou assessment were: direct habitat loss, sensory disturbance, collisions with Project vehicles and equipment, and harvest and/or predation. Accordingly, the potential effects evaluated for caribou were: 1. amount of habitat that may be altered or lost relative to its availability in the Terrestrial RSA; and, 2. mortalities</p>	The Conceptual Caribou Mitigation Plan, provided in Attachment IR-149, will be included in the final EIS as a new appendix (Appendix 9-E) to Section 9.



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					<p>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</p> <p>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>	<p>directly or indirectly attributable to the Project. Denison undertook the evaluation and assessment of potential effects on caribou in a conservative fashion to provide confidence in the assessment conclusions. For instance, where granular data concerning seasonal distribution and specific landscape uses were not available the approach was to assume the caribou at all life stages were present during all seasons. Additionally, the caribou assessment used conservative assumptions to categorize ‘available’ habitat. Denison also committed to important mitigation measures such as pre-clearance surveys, among other things.</p> <p>The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p> <p>Denison met with ECCC representatives on April 20, 2023, and agreed to provide a conceptual caribou mitigation plan as part of the IR response package, and also include the conceptual plan in the final EIS. As such, the Project’s Conceptual Caribou Mitigation Plan is provided as Attachment IR-149 and will be included in the final EIS.</p> <p>The framework for the Conceptual Caribou Mitigation Plan (the Plan) was developed during discussions between Denison and Saskatchewan Ministry of Environment (ENV) in May and June 2023. The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and ENV. Since the boreal caribou range plan for SK-1 is under development, it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan at this time is in part due to the absence of range plan priorities and reflects Denison’s commitment to continue to work with ENV to meet the management objectives and management strategies for the SK1 range. This approach acknowledges that the responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.</p>	
IR-150	ECCC	Wildlife and Wildlife habitat	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.	The report titled <i>Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results</i> is included as attachment IR-150.	No EIS updates in response to this IR.
IR-151	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<p><b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.</p>	<p>1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.</p> <p>2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.</p>	<p>To appropriately focus the EA, using an accepted/proven methodology, the EIS considers two effects: (1) alteration and/or loss of habitat and (2) change in mortality.</p> <p>Effects on movement corridors were not assessed specifically as this is not an infrastructure project that is expected to affect movement patterns across the landscape (i.e., landscape connectivity is not expected to be affected). This also considers the life stages and biology of woodland caribou, including their movement patterns. A “wildlife corridor” ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022) was identified by IK that was appropriately considered in the assessment, as this feature overlaps with the Terrestrial RSA. However, this feature was not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects. Further, the effect of habitat alteration does consider changes in species' habitat use, including movement. This approach was appropriate considering the small Project Footprint, the progressive reclamation, the baseline data, the available Indigenous Knowledge and the biology of caribou (e.g., no large-scale movement patterns) potentially using portions of the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response.
IR-152	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4, Appendix 9-B	<p><b>Context:</b> Baseline studies for Woodland caribou include:</p> <ul style="list-style-type: none"><li>Winter Track Count Survey to assess presence, abundance, feeding activity, and ecosite affiliation;</li><li>Pellet Group/Browse Availability Survey to detect presence and abundance of caribou, and frequency of occurrence and abundance of lichen;</li></ul>	<p>Please provide a summary of available baseline data on habitat use during all seasons and life stages, in particular sensitive stages such as calving, and how habitat use during all seasons and life stages was considered in the residual effect analysis.</p> <p>See also IR-145 and IR-143.</p>	Refer to the responses to IR 143 and IR 145.	No updates to the draft EIS are needed based on this IR response.

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				<ul style="list-style-type: none"><li>Covert Camera Survey to determine presence and use of linear features (roads, trails, and hand-cut lines).</li></ul> <p>The Saskatchewan Conservation Strategy for Boreal Woodland caribou [1] states that caribou are very susceptible to predation during the calf-rearing period, and populations are extremely sensitive to even minor changes in mortality rates.</p> <p><b>Rationale:</b> It is unclear if, or how, any data on seasonal and spatial use of habitat was considered in the residual effect analysis, for example summer/winter home ranges, sensitive life stages including calving (e.g., location of calving sites). It should be noted that the English River First Nation have identified caribou calving areas in the vicinity of the project footprint.</p> <p><b>Reference:</b> [1] Saskatchewan Ministry of Environment. 2013. Conservation Strategy For Boreal Woodland Caribou (Rangifer tarandus caribou) in Saskatchewan. Saskatchewan Ministry of Environment. Fish and Wildlife Technical Report 2014.</p>			
IR-153	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4.1	<p><b>Context:</b> According to ECCC (2020), forest fires can directly alter habitat, making it unsuitable for boreal caribou (e.g., through loss of mature conifer stands, loss of lichens and other forage plants, barriers to movement). Boreal caribou generally do not return to burned areas for several decades until the forest is old enough to support lichens and other food sources, although they may make limited use of burned areas to feed on new growth.</p> <p>The residual effects evaluation of alteration and/or habitat loss lists ecosites BS3 and BS7 (regenerating forest types) as available habitat in Table 9.3-22, which represent 43.5% of the Regional Study Area.</p> <p><b>Rationale:</b> It is unclear whether the ecosites BS3 and BS7 (regenerating forest types) represent suitable habitat for Woodland caribou year-round. More information is required on the habitat quality (e.g., time since last forest fire) and suitability for different life stages of caribou.</p> <p>For conservatism, it is recommended to perform a second residual effect analysis not including regenerating forest ecosites.</p>	<p>1. Please provide further information on the suitability of ecosites BS3 and BS7 for Woodland caribou in different life stages.</p> <p>2. Please provide the results of a residual effect analysis not including ecosites BS3 and BS7 for conservatism.</p> <p>3. If 2 leads to habitat fragmentation, consider connectivity of habitat patches in the residual effect analysis.</p>	<p>1. Caribou were observed within these regenerating ecosites (BS3 and BS7) during baseline studies and therefore, to be inclusive of all life stages, they were included in the "available habitat" for woodland caribou.</p> <p>2. The EIS followed a conservative approach by including these ecosites in the available year-round habitat to appropriately inform the effects assessment. No additional analysis related to connectivity of habitat patches is considered to be warranted for the Project, considering the baseline data, available Indigenous Knowledge and the biology of the caribou potentially using portions of the Terrestrial RSA</p> <p>3. Effect on habitat connectivity and fragmentation were considered in the habitat-based effects assessment within the context of habitat loss/alteration. The effects assessment considered that the project footprint had been previously disturbed/fragmented and connectivity altered. The assessment appropriately considered effects on wildlife habitat at the LSA and RSA levels</p>	No updates to the draft EIS are needed based on this IR response.
IR-154	CNSC	Woodland Caribou Alteration and/or Loss of Habitat	Section 9.3.6.4.1	<p><b>Context:</b> Lichen, the primary food source for Woodland caribou (up to 70% of the year-round diet), can be exposed to airborne contaminants and dust deposition at distances of 1–40 km (e.g., increased metal concentrations or dust were detected in lichen at distances of 1–40 km from a mine site [1, 2]).</p> <p><b>Rationale:</b> Further information is requested on how the potential for contamination of the food source “lichen” is reflected in the applied buffers of direct and indirect disturbance for woodland caribou.</p> <p><b>References:</b> [1] Watkinson et al. (2021). Effects of dust deposition from diamond mining on subarctic plant communities and barren-ground caribou forage. Journal of Environmental Quality 50(4): 990-1003. doi: 10.1002/jeq2.20251. [2] Chen et al. (2017). Does dust from arctic mines affect caribou forage? Journal of Environmental Protection 8(3): 258-276. doi: 10.4236/jep.2017.83020.</p>	<p>1. Please provide additional justification for how the potential for contamination of the food source “lichen” is reflected in the applied buffers for sensory disturbance.</p> <p>See also related IRs: IR-137, IR-148 and IR-156.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>COPC in Lichen monitoring is recommended in transects from the Project site to assess COPC concentrations and confirm whether the chosen buffer is conservative.</li></ul>	<p>Potential effects on caribou as the result of exposure to COPCs, including dietary pathways inclusive of lichen, were assessed as part of the Ecological Risk Assessment (ERA) (see draft EIS, Appendix 10-A). Hazard Quotients (HQs) associated with the exposure pathways analyses were below the benchmark of 1 for all COPCs.</p> <p>The reviewer is referred to Appendix 10-A, as well as the responses to IRs 138 and 189 for additional information.</p>	No updates to the draft EIS are needed based on this IR response.
IR-155	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou Habitat in the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine available habitat based on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>	<p>Available woodland caribou habitat was identified in the draft EIS to comprise the ecosites with observations of caribou and caribou sign during the baseline studies. This was done without seasonal differentiation because it was assumed that caribou may use these ecosites during all seasons and life stages. Section 9.3.6.4.1 of the draft EIS describes these habitat types. A reference to Appendix H of the 2020 Amended Recovery Strategy and important biophysical features will be added to Section 9.3.6.4.1. in the final EIS.</p> <p>Please see the response to IR-145 related to the acquisition of data received from the Province of Saskatchewan.</p>	Per the IR response, Section 9.3.6.4.1 in the final EIS will be updated to add: “To be conservative, the environmental assessment assumed caribou use of all habitat types during all seasons, as appropriate. This is expected to appropriately address all of the biophysical features outlined in Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020.”
IR-156	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>	<p>The EA appropriately assessed the residual effects and the cumulative effects within the RSA, as per standard, accepted EA methodology.</p> <p>As described in Section 9.3.7.3.3 of the draft EIS, ECCC identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in that range should not exceed 5% with</p>	No updates to the draft EIS are needed based on this IR response.

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				<p>significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p> <p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p> <p>The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.</p>		<p>55% being attributed to natural disturbance. In 2020, approximately 58% of the SK1 Boreal Shield range were affected by past forest fires and 3% of the range were affected by anthropogenic disturbances (i.e., 61% of the range were disturbed mostly due to fires).</p> <p>As described in the Cumulative Effects Assessment (Section 9.3.7.3.3 of the draft EIS), the Project-related (i.e., anthropogenic) disturbance was predicted to add 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. Refer to the response to IR-137 for a rationale of the assessment area for the effects assessment (i.e., the Terrestrial RSA).</p> <p>Please also refer to IR-149 and the attached Conceptual Caribou Mitigation Plan (the Plan), specifically Section 5.1 of the Plan. A mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020). Based on the analysis in Section 5.1 of the Plan using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.</p>	
IR-157	ECCC	Wildlife and Wildlife habitat	Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets.</p> <p>ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary</p>	Refer to response to IR-145.	No updates to the draft EIS are needed based on this IR response.



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					approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.		
IR-158	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p>ECCC advises the Proponent to identify additional focal species that have the ability to represent anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects (e.g., species at elevated risk of collision with vehicle traffic).</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	<p>The habitat-based assessment presented in the draft EIS appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA.</p> <p>Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds were considered as species guilds themselves, and appropriately identified as Key Indicators of the Migratory Breeding Birds Valued Component and were adequately assessed separately (i.e., at the Key Indicator level) for each Project effect and only rolled up to the Valued Component level for the significance determination. This approach was identified as the appropriate assessment method to identify Project effects on migratory breeding birds and to focus the assessment. The potential effects were identified and described for those species (within the Key Indicator group) that are most affected, and was then applied to all Key Indicator species, including those that may be less affected (e.g., risk of vehicle collisions, risk of entrapment) using a conservative, inclusive approach that considered the baseline data and the habitat. Further selection of focal species within each of these species guilds is not anticipated to affect the outcome of the assessment results or the conclusions</p>	No updates to the draft EIS are needed based on this IR response
IR-159	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	<p>The baseline data presented in the draft EIS are sufficient for the intended purpose – that is the data are sufficient, in conjunction with regionally available data, to identify potential project effects. The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site.</p> <p>As described in the EIS, pre-construction surveys will be conducted prior to the commencement of any vegetation clearing or soil disturbance. Avian species will also be routinely monitored throughout the life of the Project. Results from the surveys and monitoring activities are expected to inform the adaptive management process to update Project design and identify the need for additional mitigation measures, if required. Note: Section 9.4.3.3 of the draft EIS includes all available information from the HABISask database at the time of the assessment. While recent surveys from Environment and Climate Change Canada and the Saskatchewan Breeding Bird Atlas have expanded surveys into the northern boreal forest, these data are not yet publicly available or published to make inferences on population trends for migratory songbirds that could use the available habitat in the Terrestrial RSA.</p>	No updates to the draft EIS are needed based on this IR response
IR-160	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p>Results from baseline studies as well as other supplemental information as per IR-159 should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>	<p>The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment.</p> <p>The EIS provides a discussion and subsequent quantitative assessment of the habitat types lost and/or altered based on the Valued Components and Key Indicator species. Species richness and diversity (as evaluated in the baseline report) were included as part of the selection of "available habitat" (e.g., for migratory songbirds, ecosites with low richness and diversity were excluded; refer to the response to IR-169 for a description of these ecosites). This approach provided an appropriate assessment of the Project effects on available habitat as it relates to the direct and indirect effects on the avian community.</p>	No updates to the draft EIS are needed based on this IR response
IR-161	CNSC	Bird Species at Risk	Section 9.4.3.3  Appendix 10-A (ERA)	<p><b>Context:</b> For the assessment of effects on Bird Species at Risk (SAR), in the EIS it was decided to use representative species for certain SAR birds:</p> <ul style="list-style-type: none"><li>Olive-sided Flycatcher and Common Nighthawk were selected to represent Barn Swallow.</li><li>Yellow Rail and Rusty Blackbird were selected as substitutes for Horned Grebe.</li></ul> <p>No further rationale is provided to demonstrate that the identified surrogate species are representative of the Barn Swallow and Horned Grebe in the EIS. For example, do they share a common diet?</p> <p>Moreover, in the residual effects assessment, limited discussion is provided on the conservatism of chosen suitable habitat types for both surrogate and represented species, in the calculation of habitat loss and alteration, as well as change in mortality. For example, how does habitat for Common Nighthawk and Barn Swallow overlap (do they use identical habitat types?) and how does this affect the calculation of habitat loss and alteration used to evaluate the magnitude of residual effect?</p> <p>Finally, in the ERA, Lesser Scaup is the surrogate for Horned Grebe. Yellow Rail is also represented by Lesser Scaup but Rusty Blackbird is represented by Olive-sided Flycatcher.</p> <p><b>Rationale:</b> It is unclear what criteria were applied to select surrogate species for Barn Swallow and Horned Grebe, and how the chosen</p>	<p>1. Please provide additional information to justify the selection of surrogate species for Barn Swallow and Horned Grebe in the EIS. This should include a description of the similarity of SAR and associated surrogate species and any relevant uncertainties.</p> <p>2. Please provide conservative estimates of habitat loss and alteration for the represented and not directly assessed species (Barn Swallow, Horned Grebe).</p> <p>3. Please provide clarity as to why different surrogate species are used for Horned Grebe between the EIS and ERA.</p> <p>See also related IRs: IR-160 and IR-162.</p>	<p>1.a. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species using the accepted VC and KI approach for focus of the assessment. As described in the EIS, the Common Nighthawk (similar to the Barn Swallow) is an aerial insectivore that uses a variety of habitats, including anthropogenically disturbed and cleared areas (Section 9.4.3.3.1). As such, effects on these anthropogenically disturbed areas were appropriately assessed in the habitat-based EA methodology. Since Barn Swallows nest almost exclusively on human-made structures, specific Barn Swallow exclusion methods will be added as mitigation measures to the EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities would be conducted in accordance with the 2022 Migratory Birds Regulations.</p> <p>1.b. To focus the effects assessment on key species, it was decided to use the provincially listed Yellow Rail (and Rusty Blackbird) as surrogates for Horned Grebe. Horned Grebe use similar wetland habitat types for nesting, foraging and protective cover as Yellow Rail. As such, potential effects on these habitat types were assessed appropriately.</p> <p>2. The habitat-based approach for the assessment supports the use of surrogates that are known to utilize the same habitat types. Habitat loss and alteration were assessed for the Key Indicator species included in this Valued Component. A conservative approach of identifying available habitat for these species was chosen to include habitat for those species not directly assessed (i.e., Barn Swallow through Common Nighthawk habitat and Horned Grebe through Yellow Rail and Rusty Blackbird habitat).</p> <p>Please refer to the response to IR-131. A new species at risk appendix has been included with the IR response package and will become Appendix 9-D to the final EIS. This new final EIS appendix lists all avian species at risk (under Schedule 1 of the <i>Species at Risk Act</i>), their conservation status in Saskatchewan, and references to species-specific mitigation measures.</p>	<p>The below barn swallow exclusion methods will be added to Section 9.4.5.2.4 in the final EIS:</p> <p>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.</p>

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				surrogates relate to Barn Swallow and Horned Grebe in terms of habitat type and range, nesting, and feeding requirements etc.  There is also inconsistency with respect to the use of surrogate species for the Horned Grebe between the EIS and ERA supporting document.		3. The rationale for the use of the surrogates in the ERA was provided in the draft EIS Appendix 10-A, Section 5.1.1 Receptor Selection. The summary of species at risk and associated surrogates was provided in the draft EIS Appendix 10-A, Table 5-2. In the ERA, Lesser Scaup was selected as the surrogate for other omnivore ducks and gulls (e.g., Bufflehead, Mew Gull, Herring Gull, Bonaparte’s Gull, Horned Grebe, and Yellow Rail). These riparian bird species would all experience exposure to aquatic release through water, food (invertebrates), and sediment. As such, in the ERA, Lesser Scaup is expected appropriately address the assessment and protection of a number of other riparian bird species, including Horned Grebe and Yellow Rail.	
IR-162	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.  In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow ( <i>Hirundo rustica</i> ) and Horned Grebe ( <i>Podiceps auratus</i> ) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”  Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.	1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.  2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.  3. Assess individually each SAR that overlaps with the Project and is likely to be affected.  See also related IRs: IR-160 and IR-161.	1. It is acknowledged that Barn Swallows (unlike Common Nighthawks) nest almost exclusively on human-made structures; therefore, specific Barn Swallow exclusion methods will be added as mitigation measures to the final EIS (Section 9.4.5). If Barn Swallow nests should be encountered, any subsequent activities will be conducted in accordance with the 2022 Migratory Birds Regulations.  2. Horned Grebe nesting requirements will be addressed by implementing appropriate activity-restriction setback distances. While the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS) do not specify measures for Horned Grebe, the setback distances for Yellow Rail will be followed: the SARGSS specify setback distances between 150 and 350 m around nesting birds for medium and high disturbance categories, respectively, between May 1 and July 15.  3. The environmental assessment approach was chosen to focus the habitat-based effects assessment; mitigation measures will be updated to include species-specific approaches as determined through the adaptive management process. Note that additional text and a new table will be added to a new Species at Risk appendix to Section 9, listing all avian species at risk (under Schedule 1 of the Species at Risk Act), their conservation status in Saskatchewan, and links to species-specific mitigation measures as they relate to the potential adverse effects on wildlife.	1. The following Barn Swallow exclusion methods will be added to Sections 9.4.5.2.4 in the final EIS: Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.  2. The species at risk new EIS appendix (Appendix 9-D; refer to IR-131) includes the following specific mitigation measure for Horned Grebe: Active and/or suspected breeding and roosting locations identified during the pre-clearing wildlife surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for Horned Grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).  3. A new SAR appendix (new Appendix 9-D) will be added to Section 9 of the final EIS. It has been included here as Attachment IR-131.
IR-163	ECCC	Migratory birds	Section 9.4.3.3.3, Baseline Studies – Avian species at risk VCs	<b>Context and Rationale:</b> The baseline studies and data analysis for species at risk (SAR) birds is insufficient to accurately predict Project effects.  ECCC recommends the use of predictive modeling in relation to survey data and habitat attributes to produce distribution and density maps. Sites within the study area that support particularly high densities or diversity of an individual species, based on direct observation and, where appropriate, distribution or occupancy models, would greatly improve confidence in Project impact predictions.  Additional information on specific habitat use or models of habitat used by SAR would facilitate a more complete analysis of Project effects.	Provide additional information, including mapping/modelling of specific habitat requirements for each avian species at risk or provide a justification of models used in the draft EIS.	Denison is of the professional opinion that the data presented and analysis provided in the draft EIS is sufficient given the local / regional environment and the level of interaction with SAR birds that is expected. The habitat-based EIS approach did not include more detailed mapping/modelling because of the small Project footprint and the location (i.e., bird densities are not expected to be limited by habitat regionally).  The habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties. The VCs and KIs appropriately focused the EA; no additional modelling or assessment is considered to be required. In addition, further modeling is not expected to affect or change the findings and conclusions of the EIS. Based on the results of the baseline studies, supplemented by available additional data sources (e.g., HABISask), most avian species were conservatively assumed to be present and breeding in the Project study areas. Species-specific mitigation measures have been included and additional measures will be added (e.g., Barn Swallow exclusion measures; refer to IR-131 and IR-163). Pre-clearing surveys, ongoing monitoring during all Project phases, adaptive management (refer to the response to IR-159), and accepted, species-specific mitigation measures have been designed and will be implemented to avoid and minimize the potential for adverse Project effects.  In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species.	No updates to the draft EIS are needed based on this IR response.
IR-164	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).  As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.	1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.  2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.	1. Refer to the response to IR-158.  2. Section 9.4.3.2.3 Baseline Studies provides an overview of the avian species identified within the various habitat types that were surveyed. No important wildlife or wildlife habitat features have been identified. The effects assessment included appropriate consideration of habitat loss and/or alteration related to migratory birds (regardless of different guilds).	No updates to the draft EIS are needed based on this IR response.
IR-165	CNSC ECCC	Birds (all species)	Section 9.4.4.2.2 Section 9.4.5.2.4, Avian Deterrence	<b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:	The response to this IR is provided in Attachment IR-165.	No updates to the draft EIS are needed based on this IR response.



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			and Prevention of Entrapment  Appendix 10-A (ERA)	<p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>		
IR-166	ECCC	Migratory birds	Section 9.4.5.2 Additional Avian Species-specific Mitigation Measures	<p><b>Context and Rationale:</b> Avian species-specific mitigation measures are not presented in the draft EIS. The Proponent has committed to providing a variety of environmental management plans.</p> <p>Section 9.4.5.2 reads: “Additional mitigation measures specific to the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs, in accordance with the Migratory Birds Convention Act, and tailored to Project features will be incorporated into various Project management and monitoring plans such as the, erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.”</p> <p>Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear; this is known as incidental take. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoiding Harm to Migratory Birds website at: <a href="https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html">https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html</a></p> <p>In order to assess the effectiveness of species-specific mitigations and need for additional mitigations ECCC requires details on the species-specific mitigation measures proposed, and the monitoring plans.</p>	<p>Provide details on species-specific mitigations for species at risk (SAR) and other avian species that will include:</p> <ul style="list-style-type: none"><li>• details on what activity restrictions will be implemented for migratory birds and SAR and when they will be applied;</li><li>• details on mitigations used during regular maintenance activities such as vegetation management (e.g., mowing), access road repair (e.g., aggregate stockpiles), and infrastructure repair;</li><li>• details on methods used to detect species listed on Schedule 1 of the <i>Migratory Birds Convention Act</i> (e.g., Pileated Woodpecker) and mitigations/setback distances and timing to reduce risk to these species.</li></ul>	<p>In response to a variety of IRs, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all wildlife SAR potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. Species-specific timing windows and setback distances from the SARGGS were included in the species-specific sections of the draft EIS (see Section 9.4.3 in the draft EIS). Refer to 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk in Attachment IR-131. This section provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.</p> <p>Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner and integrates results of engagement with Indigenous nations and communities. As such, the EA is a process for identifying the Project’s potential interactions with the biophysical and human environment, predicting potential adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of EA approval and to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the Environmental Management System (EMS) is provided along with a clear commitment for Denison to include Project design and species-specific mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases.</p> <p>Please also refer to response to IR-133, IR-135, and IR-167.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p> <p>Final EIS updates related to wildlife SAR, including new species-specific mitigation measures, are outlined in response to IR-131 and exclusion methods are provided in response to IR-135.</p>
IR-167	ECCC	Migratory birds	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p><b>Context and Rationale:</b> The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: “Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered:</p> <ol style="list-style-type: none"><li>1. Most migratory birds: - Nests are protected only when they are in use or when live eggs or chicks are present.</li><li>2. Migratory birds listed in MBR 2022 Schedule 1: - For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned.</li><li>3. Migratory birds listed under SARA: - For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but</li></ol>	<p>Provide the following information:</p> <ul style="list-style-type: none"><li>• details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR).</li><li>• the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR</li></ul>	<p>Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.</p>	<p>No updates to the draft EIS are needed based on this IR response.</p>

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				are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.			
IR-168	ECCC	Migratory birds	Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment	<p><b>Context and Rationale:</b> The Proponent mentions that avian deterrents will be used on power transmission lines, buildings and other Project infrastructure. However, the Proponent does not mention any deterrents that will be used for deterring birds from the water or waste management facilities.</p> <p>Details on deterrents for all Project components should be identified to assess residual and cumulative impacts to migratory birds.</p>	<p>1. Provide information on avian deterrents to be used to prevent birds or other wildlife entering water or waste management ponds.</p> <p>2. Explain how proposed timing of use of deterrents will reduce risk of migratory birds making contact with treatment waters outside of the nesting season (i.e., during migration and stop overuse).</p> <p>3. Explain which deterrents will be used, which deterrents were considered, and what alternative, adaptive measures will be considered if deterrents are unsuccessful for any Project components.</p>	<p>Refer to response to IR-165 for a discussion on the need for additional avian deterrents at water management and treatment facilities.</p> <p>The following is an excerpt from IR-165:</p> <p>Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:</p> <ul style="list-style-type: none"><li>• Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.</li><li>• Employees and contractors will be educated on waste management policies that limit human-avian interactions.</li><li>• Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.</li><li>• Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.</li><li>• Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.</li><li>• Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.</li></ul> <p>Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. . If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:</p> <ul style="list-style-type: none"><li>• Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.</li><li>• Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006), as birds can habituate to a timely, consistent firing/noise event.</li></ul> <p>References: Exeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.</p> <p>Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.</p> <p>Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119</p>	No updates to the draft EIS are needed based on this IR response.
IR-169	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds, Table 9.4-15 and Map 9.4-11	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density and diversity, it is expected that all ecosites provide migratory songbird habitat.</p>	<p>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</p> <p>2. Explain why other habitat types were not considered as available habitat for migratory songbirds.</p>	<p>1. As per accepted methodology, to appropriately focus the habitat-based effects assessment, as per accepted EA methodology, the most frequently used habitat types (i.e., the ecosites experiencing the highest species richness, highest mean number of breeding songbird pairs, and highest species diversity) within the Project study areas were included as "available habitat" as shown in draft EIS Table 9.4-15 Summary of Available Habitat for Migratory Songbirds in the Project Study Areas and Figure 9.4-11 Available Habitat for Migratory Songbirds.</p> <p>For all three indicators (i.e., highest species richness, highest mean number of breeding songbird pairs, and highest species diversity), the three ecosites with the lowest representation were BS25 (open fen), BS19 (graminoid bog), and BS24 (graminoid fen). These three ecosites were excluded from the description of available habitat for migratory songbirds, as their use/suitability is expected to be low.</p> <p>Denison is confident that this approach is appropriate. Additionally, inclusion of these “low quality” habitat types would not be expected to alter the analysis of the residual effect nor the conclusions of the EA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).</p>	No updates to the draft EIS are needed based on this IR response



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						2. Although the habitat types excluded from the assessment are “available” to migratory birds, their low “suitability” to the KI species selected to focus the EA, resulted in these habitat types not included in the assessment. In Denison’s opinion, including these low suitability habitat types to the analysis would provide no additional value to the EA process, and would not alter the findings of the analysis nor the conclusions contained in the draft EIA (i.e., the residual effect of habitat loss on Migratory Birds was predicted to be not significant).	
IR-170	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p>Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>1. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA; no updated table or map is considered to be required. In addition, further mapping is not expected to affect or change the findings and conclusions of the draft EIS.</p> <p>2. Common Nighthawk were observed in the Project study areas during the baseline studies and are considered to be present and breeding. Rocky outcrops were not reported during the baseline studies (see Section 9.2.3). Pre-clearing surveys will be conducted, set-back buffers implemented, and pre-clearing survey and monitoring results will be used for adaptive management purposes (see also response to IR-159). Species-specific mitigation appropriate for Common Nighthawk is largely related to loss and/or alteration of habitat (including both direct and indirect effects).</p>	No updates to the draft EIS are needed based on this IR response.
IR-171	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation	<p><b>Context and Rationale:</b> Section 9.4.6.4 Residual Effects Evaluation for Bird SAR – Common Nighthawk reads: “Progressive reclamation is anticipated to begin during Construction. However, a conservative approach is used, with Common Nighthawk (CONI) habitat in the Project Area considered to be unavailable for the duration of the Project, only becoming available as habitat following Post-Decommissioning (i.e., during the regeneration of vegetation following Decommissioning).”</p> <p>CONI may nest on the roadsides of access roads within the Project area. As such, the Project area should still be considered available habitat for the duration of the Project and appropriate mitigations and adaptive management should be discussed for this species.</p>	Develop mitigation plans appropriate for avoiding collisions of common nighthawks with vehicles, when and where nighthawks are observed foraging near or roosting on gravel roads. Demonstrate how the planned mitigation activities will result in reduced residual effects from this pathway.	<p>Project design measures and species-specific mitigation measures outlined in draft EIS are expected to be appropriate to avoid or limit the risk of Project effects on Common Nighthawks. The cited text in the IR context and rationale from Section 9.4.6.4 refers to the anticipated duration of the Project effect.</p> <p>As described in the EIS, a Road and Traffic Management Plan will be implemented and mitigation measures (also described in Section 9.4.5.2.6) will include reduction of traffic volume, implementation of speed limits, installing visible signage at locations with potential for wildlife crossings (including avian species), communication (and reporting) of wildlife collisions, and maintenance of ditches and culverts. This mitigation is expected to reduce/limit potential for interactions between the Project activities and Common Nighthawk and their habitat, thereby limiting the risk of a potential adverse effect.</p>	No updates to the draft EIS are needed based on this IR response.
IR-172	CNSC	Birds (all species)	Section 9.4.6.4.2	<p><b>Context:</b> Populations of listed species may be less resilient to changes in mortality.</p> <p>CSA N288.6:22 Clause 7.2.4.3 states that effects on a few individuals of endangered, threatened, or vulnerable species would not be acceptable.</p> <p>The residual effects assessment for “Change in Mortality” for bird species at risk states that Project mitigation measures identified in Section 9.4.5 are expected to limit interactions between bird species at risk and potential sources of direct and indirect mortality. However, the mitigation measures are not discussed with respect to their effectiveness to limit interactions, specifically for bird species at risk.</p> <p><b>Rationale:</b> It is unclear if the proposed mitigation measures are effective in preventing mortality in bird species at risk for which even only a few deaths could negatively impact the population.</p>	Please provide a discussion on mitigation measures with respect to their effectiveness in minimizing mortality for bird species at risk, for which effects on a few individuals would not be acceptable.	Mitigation measures provided in the EIS were selected in consideration of their proven effectiveness and applicability to the Project, including the habitat types and species that could be adversely affected. A component of the effectiveness of the proposed mitigation is appropriately addressed in the discussion on “Confidence” for each of the residual effect assessment in the EIS. The new Species at Risk appendix that will be added to the final EIS (see IR-131) includes discussions of the effectiveness of mitigation measures that Denison is proposing to implement to avoid or reduce mortality of Bird Species at Risk.	The new Species at Risk appendix that will be Appendix 9-D to Section 9 of the final EIS has been included in this IR response package (Attachment IR-131). This new EIS appendix includes the species-specific, proven, mitigation measures and their effectiveness, that Denison is proposing to implement during the Project to mitigate adverse effects on bird species at risk.
IR-173	ECCC	Migratory birds	Section 9.4.8 Monitoring and Follow-up	<p><b>Context and Rationale:</b> Monitoring and follow up programs are part of adaptive management and implementation of additional mitigations.</p> <p>In Section 9.4.8 the Proponent states: “Considering the Project planning, baseline survey results, and proposed mitigation measures, no follow-up programs are considered to be warranted at this time.”</p> <p>Project impacts related to mortality of birds, such as collisions with the transmission line, mortality along roads and use of waste and water management facilities should be monitored during all phases of the Project and adaptively managed.</p>	<p>Provide details on the follow-up program to monitor impacts to avian mortality. The follow-up plan should include:</p> <ul style="list-style-type: none"> <li>Monitoring of avian use of waste and water facilities</li> <li>Monitoring of mortality along access roads</li> <li>Monitoring of mortality related to transmission lines</li> <li>Monitoring of effectiveness of avian deterrents.</li> </ul>	<p>As described in the draft EIS, a wildlife monitoring plan will be developed to support permitting and licensing and implemented as the Project proceeds. The wildlife monitoring plan will provide details on the monitoring and follow-up programs outlined in Section 9.4.8 of the EIS. In Section 9.4.8 of the draft EIS, Denison has outlined the following as part of monitoring programs:</p> <p>“Avian movements across the Project study areas may bring species or individuals into contact with Project components (e.g., buildings, power transmission lines, waste ponds and waste pads) and activities (i.e., vehicle and aircraft traffic), which can result in mortalities and changes to habitat use. Project design and mitigation measures (Section 9.4.5) have been identified that are expected to minimize the likelihood of adverse Project effects. However, changes in avian habitat and habitat use over the life of the Project require an adaptive management process to update Project design and additional mitigation measures, if required. The potential for these changes will require appropriate monitoring for changes in avian mortality or encounters to determine, in a timely manner, whether changes are warranted through the adaptive management process.”</p> <p>Specifically, as it concerns monitoring avian mortality the following is noted and will serve as the basis of the framework for this component of the wildlife monitoring plan. The objective of this component of the plan would be to (1) document and mitigate potential effects of Project activities on avian mortality; and, (2) reduce interactions between wildlife (in this case birds) and people. Avian mortalities observed by Denison staff would be reported immediately to the Environment Department, and an inspection by Environment staff will be made to determine the probable cause of death. Obvious injuries, the position of the animal, and anything considered unusual would be photographed and recorded. Further information such as time, date, location, estimated time of death, and any sightings of other wildlife in the area would also be recorded. A procedure would be developed for carcass removal to prevent attraction of carnivores and other scavengers to the Project site. Wildlife mortality monitoring would be undertaken as required, continuously throughout the life of the Project. All mortalities would require follow-up to determine if anything can be done to prevent</p>	Section 9.4.8 of the final EIS will be updated to note that Denison is committed to monitoring avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines as documented in the IR response. It will be further noted that such mortalities will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison.

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						<p>similar mortalities from occurring in the future. Data related to avian mortalities would be compiled to identify trends over time and to determine the cause of mortalities and identify any further mitigation would be appropriate.</p> <p>Further, it is noted that avian mortality related to avian use of waste and water facilities, as well as mortality events associated with interactions with access roads (particularly related to large-bodied carcasses) and transmission lines will be documented and reported to the Saskatchewan Ministry of Environment on a basis as determined in consultation between the Ministry and Denison. Further, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on developing scope of monitoring regimes, which could include monitoring programs and the reporting on wildlife-vehicle mortality.</p> <p>Additionally, as noted in draft EIS Section 1.7.5, Licensing and Permitting, the Project is proceeding through sequential EA and licensing process. Commitments to develop such plans, and in some cases conceptual level information regarding a number of the proposed plans has been provided in the draft EIS. Given the sequential process to which Denison has committed it is believed that the level of information provided in the draft EIS and its supporting documents (including supplemental information provided in response the IRs) is appropriate at this stage of the Project. It is planned that further detail will be developed during licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process. Denison believes this context (that is, that the detailed “plan” information needed to support licensing and permitting has not be included in the EIS) is valuable in considering this IR, as well as other IRs with a similar theme.</p>	
IR-174	ECCC	SAR - Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context and Rationale:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (<i>Myotis lucifugus</i>) and northern myotis (<i>Myotis septentrionalis</i>). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p>Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<ol style="list-style-type: none"><li>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</li><li>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</li><li>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</li><li>4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</li></ol>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to a variety of IRs, including this IR, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. This new EIS appendix provides information on little brown myotis and northern myotis. We note Denison’s commitment to pre-construction surveys to identify potential for maternity and nursery roosting habitat. Refer to response to IR-134 for the timing of clearing activities outside of roosting periods. Results from pre-construction surveys and continuous monitoring (described in Section 9.3.8) will be used in the adaptive management process to update Project design and additional mitigation measures, if required.</p>	No updates to the draft EIS are needed based on this IR response.
IR-175	CNSC	Provincially Listed Species	Appendix 9-B; section 2.2.2	<p><b>Context:</b> Vegetation and wildlife habitat characterization field surveys were completed in 2017, based on which ecosite factsheets were prepared. The factsheets list observations of two provincially listed plant species with a rank of S3 (vulnerable/rare to uncommon; Table 2.4-2) according to the Saskatchewan Conservation Data Centre, which are not discussed in the main EIS document:</p> <ul style="list-style-type: none"><li>• Angle-leaved sundew (<i>Drosera anglica</i>) observed in ecosites BS19, BS20, BS22, BS25</li><li>• Neat Spike-rush (<i>Eleocharis nitida</i>) observed in ecosite BS25</li></ul> <p>Table 9.2-12 in section 9.2.6.2.1 of the EIS indicates that there may be indirect disturbance to some of these ecosites (BS19, BS20, BS25). In section 9.2.6.3.1 it is discussed that listed plant species are not likely to return once lost from a specific location.</p> <p><b>Rationale:</b> Given that not all areas in the revised Project footprint were surveyed for listed plant species in baseline studies, there is uncertainty as to whether any species were missed, in particular those that have been observed in ecosites present in the LSA/RSA (e.g., <i>Drosera anglica</i> and <i>Eleocharis nitida</i>, see also Appendix 2 Table of Appendix 9-B). It should also be noted that rare plant surveys were completed in summer 2017 only (section 2.4.2 of Appendix 9-B), which may underestimate annual rare species that may be dormant in the seed bank in some years due to specific seed emergence requirements.</p> <p>It is acknowledged that the proponent committed to pre-construction listed plant surveys targeted on ecosites encountered in the Project Area but not previously surveyed, as well as ecosites within the Project Area with high potential to support listed plants.</p> <p>More information is requested on the potential indirect effects on rare plant species as well as the planned pre-construction surveys.</p>	<ol style="list-style-type: none"><li>1. Please provide a discussion on the potential risks from indirect effects on ecosites with observed rare plant species</li><li>2. Please provide additional information on the ecosites included in the planned pre-construction listed plant surveys</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends focusing monitoring on ecosites that have known observations of listed plant species outside of the Project Area (e.g., BS19, BS20, BS22, BS25).</p>	<p>1) As described in Sections 9.2.4.2.1 and 9.2.6.3.1 of the EIS, listed plants may be affected indirectly by the introduction and/or proliferation of invasive plants, dust deposition, edge effects, and changes to water quantity and quality. Mitigation measures planned to address these potential effects are described in Section 9.2.5, and include developing the Project footprint within previously disturbed areas to the extent practical (reducing edge effects); reducing dust deposition on vegetation by directing processing plant exhaust through a scrubber prior to release, appropriate stack height design for optimal dispersion, controlling property access, providing a wash bay, undertaking road watering and traffic controls, and monitoring dust during Construction and Operation; maintaining surface water flow (see response to IR-140); and undertaking invasive plant management. The specific risks of residual indirect effects on a given listed plant population are dependent on a suite of site-specific factors, including (but not limited to) the life requisites of the listed plant species, the species’ resilience to disturbance, the size of the population, and the location of the population in relation to Project activities. As described in Section 9.2.8.1, pre-construction listed plant surveys will be undertaken within the Project Area within ecosites that were not encountered during the 2017 surveys, as well as within selected areas of the Project Area with the potential to support listed plants (e.g., transitional habitats favoured by Alaskan clubmoss). Surveys will be undertaken to verify EA predictions and identify mitigation measures to protect Listed Plant Species, as appropriate. Should Listed Plant Species be identified within the Project Area, site- and species-specific mitigation measures will be developed by a qualified vegetation ecologist to avoid and/or minimize potential Project effects.</p> <p>2) Ecosites planned to be included during pre-construction listed plant surveys include all ecosites with the potential to support listed plants that may be directly or indirectly affected by the Project (i.e., ecosites located within the Terrestrial LSA). This includes ecosites where Alaskan clubmoss were historically observed (BS3/BS7, BS4, BS23); ecosites within the Project Area that were not previously surveyed (BS7, BS9, BS23, Waterbody); and ecosystems known to support angle-leaved sundew and neat spike-rush populations (BS19, BS20, BS25). It is noted that ecosite BS22 has not been mapped within the Terrestrial LSA and is not expected to experience direct or indirect Project effects; as such, it is not planned to be included within pre-construction listed plant surveys.</p>	No updates to the draft EIS are needed based on this IR response.



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IR-176	CNSC	Human Health with respect to radiation exposure	Section 10.1.4.2.1 Section 10.1.6.1.4  Appendix 10-A (ERA)	<p><b>Context:</b> In section 10.1.4.2.1, the proponent provides an evaluation of air quality constituents of potential concern to human health. It states: “A screening value for radon gas of 200 becquerels per cubic metre (Bq/m3) was available from Health Canada, which applies to total radon including background sources (Health Canada 2009). The radon concentrations which were predicted are incremental concentrations (i.e., above background) and were therefore compared to the applicable incremental screening value of 60 Bq/m3 for indoor air established by the Canadian Nuclear Safety Commission (CNSC) (Health Canada 2010a; Radiation Protection Regulations. SOR/2000-203).”</p> <p>The 60 Bq/m3 radon concentration value also appears in section 7.1.2 of Appendix 10-A (ERA).</p> <p>Further in section 10.1.6.1.4, it is stated: “Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 Bq/m3.”</p> <p>The Radiation Protection Regulations do not stipulate a limit for radon above background for sites licensed by the CNSC. The effective dose limits for Nuclear Energy Workers (NEWs) and persons that are not NEWs are listed in section 13 of these regulations, and in subsection 1(3) of these regulations for the general public.</p> <p>The annual effective dose from all sources associated with the licensed activities and within the scope of the Nuclear Safety Control Act and Regulations must be compared to the applicable effective dose limit. For members of the public this limit is 1 mSv per calendar year.</p> <p>In Section 4.2.5.3 of Appendix 10-A (ERA), there appears to be no reference mentioned for the radon equilibrium factors. These factors are a significant input into the dose calculations for radon.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>1. Removing the reference to a 60 Bq/m3 limit.</li><li>2. Reporting the assessment results as the total dose, from all radionuclides combined including radon progeny, and by comparing this annual effective dose to the effective dose limit.</li></ol> <p>Provide a summary of the conservative assumptions that have been included in the dose calculations.</p> <p>Provide a reference that shows how the radon equilibrium factors were determined.</p>	<p>1. While 60 Bq/m<sup>3</sup> (incremental) has been used in CNSC Oversight reports for uranium mines and mills, and referenced by Health Canada, it seems to be no longer used based on the updated Radiation Protection Regulations. Denison will remove any reference to 60 Bq/m<sup>3</sup> from the EIS and Appendix 10-A.</p> <p>2. The predicted radon concentrations will be compared to 200 Bq/m<sup>3</sup> (total) and total effective dose including radon and U-238 decay chain radionuclides will be compared to the 1 mSv/a dose limit. The total dose to the camp worker from radon (1.3E-01 mSv/a) and U-238 decay chain radionuclides (2E-02 mSv/a) is predicted to be 1.5E-01 mSv/a which is below the dose limit for a non-NEW of 1 mSv/a. This will be included in Section 4.4.1.3 of the ERA.</p> <p><u>Conservative Assumptions:</u></p> <ul style="list-style-type: none"><li>- For calculation of radon dose it was conservatively assumed that the camp worker spends 100% of their time indoors when on site (section 4.2.5.3 of ERA).</li><li>- Receptors are exposed to the maximum exposure concentrations at their location for each model scenario and Project phase (section 4.2.6 of ERA).</li><li>- For radionuclides in the U-238 decay chain (other than radon), the camp worker is also exposed through ingestion (water and food) pathways resulting in a conservative dose when also factoring in the dose from radon indoors.</li></ul> <p>The radon equilibrium factors were calculated as described in section 2.4.3 of the IMPACT Model Report, which is Appendix A of the ERA (Appendix 10-A). The equilibrium factors calculated are shown in Table 4-11 of Appendix 10-A.</p>	Per the IR response any reference to 60 Bq/m <sup>3</sup> from the EIS and Appendix 10-A and Section 4.1.1.3 will be revised as indicated.
IR-177	HC	Change to an environmental component due to radiological contaminants	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	<p><b>Context:</b> Section 10.1.4.2.1 states that, “Screening values for radionuclide concentrations in ambient air were not available. All relevant radionuclides were assessed in the HHRA in terms of their contribution to the total radiological dose to human and ecological receptors” (p. 10-22).</p> <p>Section 10 Appendix 10-A (ERA) states that, “No formal screening was conducted for radionuclides. However, since radiation dose to human receptors is of public and regulatory interest, the radionuclides in the uranium-238 decay series are carried forward as COPCs for further assessment” (Appendix 10-A (ERA): Appendix B Ref. 19-2638).</p> <p>Table 6.1-1 lists radionuclides as a key indicator for air quality, but only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.</p> <p><b>Rationale:</b> Health Canada recommends using screening values that are available for radionuclides if they are appropriate for the dose and if the screening values have listed assumptions (such as particulate size and worker exposure time that can be adapted to in Denison’s models). Two examples are ICRP 96, which CNSC uses in their regulatory reports to derive reference air quality values for Pb-210, Ra-226, and Th-230 (CNSC: Regulatory Oversight Report for Uranium Mines and Mills in Canada 2019); and Health Canada’s Guidelines for Management of NORM (Health Canada: Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials, 2011).</p>	<ol style="list-style-type: none"><li>1. Assess predicted radionuclides in Section 10 Appendix 10-A (ERA) using appropriate available screening values. Alternatively, provide a justification for why a screening wasn’t conducted for radionuclides despite the availability of screening values (e.g., ICRP 96 and NORM Guidelines, 2011).</li><li>2. Clarify if uranium progenies in air are considered in the atmospheric transport and air quality modelling and are simply not reported, or if they are not included in the models because no screening criteria are available.</li></ol>	<p>1. The methodology used in the ERA was to carry all radionuclides in the U-238 decay chain forward for quantitative dose calculations. As such, a formal screening was not conducted. No radionuclides were removed from the process, but rather all were considered constituents of potential concern (COPCs). Clause 7.2.5.4.3 of CSA N288.6-22 states “Certain COPCs may be carried forward into the EcoRA for reasons of public perception, even if screening benchmarks are not exceeded. For example, the most important radionuclides may be carried forward to demonstrate acceptable risk based on expressed public concern rather than exceedance of screening criteria.”</p> <p>2. Section 3.2 of Appendix 10-A (ERA) states that based on the ISR process the main source is yellowcake (uranium oxide) and not uranium ore. As such, at the point of release, the uranium mass is almost entirely uranium-238, and on an activity basis the uranium-238 and uranium-234 are equal. Ingrowth of progenies including Th-230, Ra-226 and Pb-210 were not considered in air since compared to the life of the Project ingrowth in air would be minimal. This was confirmed using the WISE Uranium Calculator (<a href="https://www.wise-uranium.org/rccu.html">https://www.wise-uranium.org/rccu.html</a>). Ingrowth of other radionuclides including Th-230 and Ra-226 is included in the air deposition to soil model. Ingrowth of Pb-210 and Po-210 in soil was considered negligible. The human dose results include the soil internal and external exposure pathways and are provided in the ERA results (see Appendix B, Table B.9).</p>	No updates to the draft EIS are needed based on this IR response.
IR-178	HC	Change to an environmental component due to hazardous contaminants	Section 10.1.4.2.1 (p. 10-22)  Section 6.1.4.2, Potential Project Related Effects (p. 6-31)	<p>The Baseline + Project scenario was not provided for radon levels.</p> <p><b>Context:</b> Section 6.1.4.2 states that the predicted levels for radon were not added to the respective baseline air quality levels (p. 6-31), and further explains that “In all modelled phases of the Project, annual average radon concentrations at receptors beyond the Property Boundary are expected to be indiscernible from background levels.”</p> <p>In Section 10.1.6.1.4, a different approach to evaluating predicted radon levels is mentioned: “the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m3“(p. 10-44).</p> <p><b>Rationale:</b> Without a rationale as to why baseline levels of radon were not included in the assessment, HC cannot fully evaluate the appropriateness of the air quality assessment. While Health Canada is of the opinion that using background radon levels as a screening value</p>	<ol style="list-style-type: none"><li>1. Provide further information on whether and how baseline radon concentrations in air were determined.</li><li>2. Include baseline radon concentrations in the predicted total concentrations when comparing to existing guidelines; alternatively, provide a rationale for why baseline concentrations of radon were not included.</li><li>3. Discuss the potential health implications of the project-only increment-over-baseline radon levels</li></ol>	<p>1: The baseline range of &lt;7.4-25 Bq/m<sup>3</sup> referenced in the air quality assessment is discussed in Section 6.1.1.2.3 of the draft EIS and comes from the CNSC document “The Regulatory Oversight Report for Uranium Mines and Mills in Canada” (2018). Measured baseline values presented and discussed in Section 6.1.3.2.3 of the EIS also fall within this range.</p> <p>2. The rationale for not adding baseline to modelled incremental radon concentrations in the air quality assessment is presented in Section 6.1.1.2.3. This approach was discussed and confirmed with the CNSC during a technical meeting on Sep. 17, 2021.</p> <p>3. As discussed in the response to IR 176, the total incremental dose to the camp worker from radon and U-238 decay chain radionuclides is below the dose limit for a non-NEW of 1 mSv/a.</p>	No updates to the draft EIS are needed based on this IR response

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				is appropriate in this case from a health perspective, different approaches to screening predicted radon levels in different sections appear to be used (i.e., background radon levels vs. CNSC incremental concentration).			
IR-179	CNSC	Groundwater quality decommissioning objectives.	Section 10.1.4.2.2, Release of Treated Effluent to Whitefish Lake During Decommissioning	<p><b>Context:</b> It is stated that “This process would continue until the recovered water meets acceptable groundwater quality decommissioning objectives”.</p> <p><b>Rationale:</b> The information provided does not include groundwater quality decommissioning objectives nor a reference to these objectives.</p>	Please provide groundwater quality decommissioning objectives or a reference to the information.	<p>The “groundwater quality decommissioning objectives” referred to in Section 10.1.4.2.2 of the draft EIS are the mining area decommissioning objectives provided in Table 2.3.3 of Section 2.3.3.1.1 in the draft EIS. The mining area decommissioning objectives have been developed through groundwater modelling work and are achievable based on metallurgical testing. Groundwater modelling and metallurgical testing are described in Section 7.6.2.1 of the EIS and in Appendix 7C of the EIS.</p> <p>For clarity, Section 10.1.4.2.2 will be modified in the final EIS to state: “This process would continue until the recovered water is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives (Section 2.3.3.1.1, Table 2.3-3).”</p>	Section 10.1.4.2.2 in the final EIS will be modified as follows: This process would continue until the recovered water <b>is demonstrated to be stabilized (maintained) at</b> meets acceptable <del>groundwater quality</del> <b>mining area</b> decommissioning objectives ( <b>Section 2.3.3.1.1, Table 2.3-3</b> ).
IR-180	CNSC	Human health with respect to hazardous contaminants	Section 10.1.6.1.1, Human Receptors Selection and Characterization	<p><b>Context:</b> Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.</p> <p><b>Rationale:</b> While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.</p> <p>In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?</p>	<p>Please provide justification for excluding a receptor from occupancy at lakes closer to the project during operation (McGowan, Whitefish). Alternatively, conduct a risk assessment to a receptor at these lakes during operation to determine if there is a predicted risk that may require monitoring or mitigation.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>Assessment of a receptor located closer to the point of effluent release may need to be considered to ensure there are negligible risks</li><li>If Se is expected to exceed hazard quotients further upstream, selenium removal technology may be required as part of the effluent treatment process as a mitigation measure. Other COPC’s exceeding an HQ of 1 may also be identified under this process that could require specific monitoring or mitigation measures.</li></ul>	<p>The traditional land use activities closest to the Project site are reported to occur in the Russell Lake area. However, a potential recreational lease has been identified in the McGowan Lake area. As such, a human receptor (Recreational Fisher/Hunter) was assessed at McGowan Lake in Appendix 10-A (ERA). The Fisher/Trapper was included at Russell Lake based on engagement with a local fisher/trapper (Bobby John), who had a cabin at Russell Lake. Overall, based on Indigenous and Local Knowledge, use of the area near Whitefish Lake for fishing, hunting, gathering is limited. As such the closest human receptor assessed during the Project phases was at McGowan Lake.</p> <p>No unacceptable risk was identified for the human receptor (Recreational Fisher/Hunter) at McGowan Lake due to releases from the Project. The ingestion rates for the receptor at McGowan Lake are more reflective of the average country foods diet and consumptions rates expected for human receptors in the area (based on the ERFN country foods study) than the diet of the Fisher/Trapper which would represent a higher consumption of traditional foods. As indicated in Section 4.4.1.1 of the ERA, the annual fish consumption based on engagement with a local fisher/trapper from ERFN was assumed to be 183 kg/yr (approximately 1 to 2 servings per day), which is conservative compared to an annual fish consumption of 27 kg/yr (2 servings per week) from the ERFN’s Country Food Study (CanNorth, 2017) and 88 kg/yr (approximately 1 serving per day) for the high consumer for the Boreal Shield in the First Nations Food, Nutrition and Environment Study for Saskatchewan (Chan et al., 2018).</p> <p><u>References:</u> CanNorth, 2017. English River First Nation Country Foods Study – Final Report (No. Project No. 2147). Canada North Environmental Services.</p> <p>Chan, L., Receveur, O., Sadik, T., Schwartz, H., Ing, A., Fediuk, K., Tikhonov, C., 2018. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Saskatchewan (2015). University of Ottawa, Ottawa.</p>	No updates to the draft EIS are needed based on this IR response
IR-181	CNSC	Human Health with respect to radiation exposure	Section 10.1.6.1.4	<p><b>Context:</b> In section 10.1.6.1.4, it is stated: “The maximum incremental radon concentration at the camp worker site during Operation was predicted to be 12.4 Bq/m3, which is below the CNSC limit of 60 Bq/m3 for incremental radon.”</p> <p>As per IR-176, there is no such CNSC limit for incremental radon.</p> <p>The camp worker would be considered a person who is not a nuclear energy worker (NEW) and subject to the dose limits of section 13 and 14 of the Radiation Protection Regulations, not the dose limit for the general public as per subsection 1(3) of the Radiation Protection Regulations. The CNSC has regulatory requirements for the ascertainment and recording of doses of radiation as per section 5 of the Radiation Protection Regulations. Every licensee must ascertain and record the magnitude of exposure to radon progeny, the effective dose and equivalent dose received by and committed to a person who performs duties in connection with any activity that is authorized by the Nuclear Safety and Control Act or is present at a place where that activity is carried on.</p> <p>The camp worker performs duties in connection with the licensed activity and is present at the location where the activity is carried out. Hence, they are not considered to be a member of the general public (who has no connection with the activity)</p> <p>Further, the proponent indicates that the maximum incremental radon dose to the camp worker was estimated to be 0.13 mSv/year during Operation. The assessment assumes that the camp worker spends 100% of the time indoors. Table 10.1-11 shows the maximum total incremental dose for the camp worker to be 0.02 mSv/year. This appears to be a discrepancy.</p> <p>Table 5.2 in Appendix 10-C provides internal annual dose from radon inhalation. The radon doses to some NEW workers (9.44E-02 mSv/a Driller 1 and 1.03E-01 mSv/a Wellfield Operator 1, 2) here appear less than the radon dose (0.13 mSv/year from section 10.1.6.1.4) to the camp worker, who is a non-nuclear energy worker.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>Removing the reference to a 60 Bq/m3 limit for incremental radon.</li><li>Revising all references to the ‘public dose limit’ applied to camp workers (non-NEWs) to align with section 13 and 14 of the Radiation Protection Regulations.</li></ol> <p>The proponent should explain why the radon dose for the camp worker appears as 0.13 mSv/year in one instance and 0.02 mSv/year in another.</p> <p>The proponent is also asked to provide the rationale as to why a non-NEW has a higher radon dose than a NEW.</p>	<p>1. The reference level of 60 Bq/m³ for incremental radon will be removed from the EIS and Appendix 10-A (ERA). The health impact will instead be interpreted based on dose. The incremental radon dose to the camp worker is 0.13 mSv/year during Operations, which is below the dose limit for a non-NEW of 1 mSv/year. The ERA text will be updated.</p> <p>2. The ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW. Note that the same dose limit of 1 mSv/year is applied. Section 10.1.6.1.4 will be modified to state: "Incremental radiation doses due to radionuclides in the uranium-238 decay series were compared to the regulatory public dose limit <b>and dose limit for a non-NEW</b> of 1 mSv/yr as described in the Radiation Protection Regulations under the <i>Nuclear Safety and Control Act</i>."</p> <p>The radon dose to the camp worker is predicted to be 0.13 mSv/year during operations and 0.02 mSv/year during Construction. See Table 4-12: Predicted Radon Dose to Camp Worker during all Project Phases in Appendix 10-A (ERA). No changes to the appendix are required.</p> <p>The radon dose to a NEW is presented in Appendix 10-C (Worker Dose Assessment). The radon dose to a NEW is higher in most instances than to a non-NEW at the camp. As indicated in Section 5.2 of Appendix 10-C, the dose from radon to NEWs in the ISR plant area is predicted to range from 0.53 to 2.27 mSv/year. Radon dose to NEWs from the core shack is expected to be 2.3 mSv/year. Radon dose to the Driller 1 and Wellfield Operator 1, 2 is based on exposure to radon outdoors where exposure is much lower than exposure to radon indoors for the camp worker.</p>	Per the IR response any reference to 60 Bq/m³ from the EIS and Appendix 10-A and the ERA text and Section 10 of the EIS will remove the term "public dose limit" for the camp worker and use the term dose limit for a non-NEW.



Ref. #	Department	Project Effects Link	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Information Requirement (IR) <sup>2</sup>	Denison Response	Final EIS Updates
				consistency with the Radiation Protection Regulations and the environmental impact statement.			
IR-182	HC	Change to an environmental component due to radiological contaminants	Section 10.1.6.1.4, (p. 10-44)	<p><b>Context:</b> Section 10.1.6.1.4 states, "The limit is incremental and is exclusive of natural background, such as natural levels of radon and medical exposures. A dose constraint of 0.3mSv/yr was established for the public from all radionuclides and all pathways for the Project, as recommended by Health Canada (2010a). The dose constraint represents a dose lower than the public dose limit that ensures the combined dose from multiple sources does not result in exceedance of the public dose limit. Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m<sup>3</sup>" (p. 10-44).</p> <p><b>Rationale:</b> Calculating radon separately from all radionuclides may underestimate the health risks by not considering combined doses from multiple sources when comparing to the public dose limit constraint of 0.3 mSv/yr recommended by Health Canada (2010a).</p>	1. Provide clarification on how combined doses from all sources would be accounted for in respecting the public dose limit of 0.3 mSV/yr if radon concentrations are being calculated separately.	<p>Health Canada guidance recommends reporting the dose from radon separately. See HC PQRA(rad) document in Section 5.8 Total Dose "In general, it is appropriate to compare the combined dose from external and internal radiation to a dose limit or a reference dose and to compare radon to its own criterion."</p> <p>The existing tables will be kept the same for total dose without radon and a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Note that total dose for the camp worker with radon included would be 0.15 mSv/year which is lower than the defined dose constraint of 0.3 mSv/yr. Additionally, the following text will be added to Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".</p>	Per the IR response a new table for the total dose with radon will be added in Appendix 10-A (ERA) for the camp worker only which includes one column for radon dose and one column for other U-238 decay chain radionuclides. Section 4.4.1.4 of Appendix 10-A and Section 10.1.6.1.4 of the EIS will be updated to include the following statement, "The total incremental dose to the camp worker from all radionuclides in the U-238 decay chain including radon would be 0.15 mSv/year, which is below the dose limit for a non-NEW of 1 mSv/yr".
IR-183	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C	<p><b>Context:</b> Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.	Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. As noted in responses to IRs 185, 186, and 187, some revisions to Appendix A are detailed in Attachment IR-183 to 187.	Changes to Appendix 10-C of the EIS, including example calculations in Appendix A of Appendix 10-C, are as described in response to IRs 185, 186 and 187 (see Attachment IR-183 to 187).
IR-184	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C, 2.0	<p><b>Context:</b> It is stated in Appendix 10-C, section 2.0 that: "In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers."</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p> <p><b>Rationale:</b> The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.	The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation. See Attachment IR-183 to 187.	Per the IR response, in Section 2.0, p.2-1, of Appendix 10-C of the final EIS the following text will be deleted: <del>In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.</del>
IR-185	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2  Appendix 10-C Table 3.10-3.12	<p><b>Context:</b> The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.	The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the draft EIS. The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3 and have changed inputs for drying and packaging in response to IR-186, a revised table is provided here (see Table A.3 in Attachment IR-183 to 187) that will replace Table A.3 in Appendix A of Appendix 10-C.	Per the IR response, revised Table A.3 from the memo will replace Table A.3 in Appendix A of final EIS Appendix 10-C. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same small changes in external dose (see Attachment IR-183 to 187).
IR-186	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6 Section 10.2.4  Appendix 10-C, Section 3.2	<p><b>Context:</b> In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.</p> <p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: "For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA."</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: <i>No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</i></p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p><b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the</p>	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>	<p>A very conservative dust level in drying and packaging areas had been used (representing equipment sources of dust to the exhaust system). While the dust hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for the drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 in Attachment IR-183 to 187).</p>	Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of EIS Appendix 10-C will be revised to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to reliance on PAPR as an exposure control will be removed from text throughout the EIS.

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				radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i> .			
IR-187	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6  Appendix 10-C, Section 3.3, 6.0	<p><b>Context:</b> The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p> <p><b>Rationale:</b> At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p>	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>	As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 provided in Attachment IR-183 to 187). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.	Per the IR response Revised Table A.1 provided in Attachment IR-183 to 187 will replace Table A.1 in Appendix A of final EIS Appendix 10-C. Tables 5.1 and 5.4 of Appendix 10-C will be revised in the final EIS to show the same changes in inhalation dose. Tables 5.3 and 5.4 of Appendix 10-C will be revised in the final EIS to show the changes in external dose related to the revised time allocation. References to routine use of PAPR as an exposure control will be removed from text throughout the EIS. Mitigation measures will be described as per the hierarchy of controls.
IR-188	CNSC	Human Health with respect to radiation exposure	Section 10.2.4	<p><b>Context:</b> The following is stated in section 10.2.4: “Dust inhalation is also a potentially substantial component of worker dose at the core shack. At this location, PAPR will not be required; however, N95 masks will be used, and dust levels will be monitored here...It may be possible to increase air exchange in the core shack, above the planned six exchanges per hour, should this be necessary. This would also reduce radon exposure in the core shack.”</p> <p>If it is possible to increase air exchanges in the core shack, it is not clear why this was not assessed and incorporated in the design of the core shack.</p> <p><b>Rationale:</b> It appears that a control measure (e.g., air exchange protocols in the core shack) to reduce the exposure to workers has been identified. However, it is not certain if it has been formally documented to ensure that it is incorporated in the engineered design of the core shack.</p>	Provide details on how the control measures to reduce the exposure to both workers through the air exchange protocols in the core shack have been formally documented to ensure that it is incorporated in the engineered design of the core shack.	Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. The engineering design of the core shack including control measures to reduce core shack worker exposure will be included in the detailed design and the core shack HVAC design criteria will be provided to the CNSC during Project licensing. The design mitigation measures in the EIS (Appendix 10-C) include: - Ventilation (assumed as 6 room changes per hour) - Monitoring of dust and radon, and worker doses (assumed 3 cores in shack, calculated radon level as 1.18E+3 Bq/m <sup>3</sup> , and assumed dust level as 0.0675 mg/m <sup>3</sup> ) - Managing worker exposure time and dose (time assumed as 120 d/a, 11 h/d) Although use of N95 masks was mentioned, masks were not factored into the exposure estimation.  As described in Section 10.2.4 Mitigation Measures, worker health is managed under the Radiation Protection Program (RPP), which is a worker health and safety plan specifically for radiation exposures. The RPP designates the roles and responsibilities of Denison and contractors, specifies the radiation dose limits, action levels and administrative levels, describes procedures to monitor and manage worker exposures (dust and radon monitoring, personal dose monitoring), and describes the processes for training and record-keeping. The successful implementation of the RPP, in conjunction with in-design measures described for the various project activities, is key to maintaining acceptably low doses of radiation exposure to workers during all phases of the Project.	No updates to the draft EIS are needed based on this IR response.
IR-189	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<p><b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”</p> <p>In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”</p> <p><b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.</p>	<p>Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70% lichen in the diet.</p> <p>See also related: IR-138.</p>	A second woodland caribou with a diet of 70% lichen, 20% browse, and 10% macrophytes was modelled for comparison to the existing woodland caribou with a diet comprised of 50% browse, 20% lichen and 30% macrophytes. Compared with the woodland caribou with the lower lichen diet (50% browse, 20% lichen and 30% macrophytes), the predicted total radiological dose for the woodland caribou with the higher (70%) lichen diet increased 65% to 0.0118 mGy/d, which is below the 2.4 mGy/d radiation dose benchmark for terrestrial biota. The predicted maximum hazard quotient (HQ) for the woodland caribou with higher (70%) lichen diet would generally increase by 5 to 81% with the exception of copper and molybdenum where the HQ decrease due to the copper and molybdenum concentration in lichen being lower than in browse. However, all HQs for both the woodland caribou with the lower and higher lichen diet are below the benchmark of 1 for all COPCs.	No updates to the draft EIS are needed based on this IR response
IR-190	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)  Appendix 6, Table 5 (p. 16)	<p>NO2 criteria is not being consistently compared.</p> <p><b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.</p> <p>Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.</p> <p><b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.</p>	<p>1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.</p>	The CAAQCs are applicable to measured ambient air concentrations over a three-year period and are not applicable to modelled results from a single facility. In technical meetings between Denison and ENV, the province agreed to the approach of utilizing 1-year of site-specific meteorological data. Use of the CAAQCs would require a three-year site specific data set. Denison agrees to using the 2025 CAAQCs for NO2 in future mitigation and follow-up plans.	No updates to the draft EIS are needed based on this IR response
IR-191	HC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Table 3-9 (p. 3.36) and Table 3-10 (p. 3.46)	<p>Non-threshold substances are not included in screening and monitoring plans.</p> <p><b>Context:</b> Fine particulate matter (PM2.5) is not being considered further in secondary air quality screening for short and long-term exposure at human and ecological receptors because it is not predicted to exceed the screening values of the Ontario Ambient Air</p>	<p>1. Include PM2.5 and PM10 in the secondary air quality screening for short and long- term exposure at human receptors.</p> <p>2. Include PM10 and PM2.5 in the air quality monitoring plan as they are non- threshold substances.</p>	1. PM2.5 and PM10 baseline (background) concentrations were compared to the Project AQ Criteria in Appendix 6-A, Table 5: Model Predicted COPC Concentrations for the Construction Scenario. PM2.5 and PM10 background concentrations were found to be below the Project AQ Criteria. Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5. As noted by the reviewer, PM2.5 was not included for the secondary air quality screening because the predicted maximum concentrations (which includes background air concentrations) did not	Per the IR response, Section 3.2 in Appendix 10-A will be updated to note that baseline concentrations were compared to the Project AQ Criteria and to reference Appendix 6-A, Table 5.  The commitment to include PM10 and PM2.5 to the air quality monitoring plan during



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			Section 6.1.8 (p. 6-44)	<p>Quality Criteria (OAAQC) or the Canadian Ambient Air Quality Standards (CAAQS) for both annual and 24-hour average periods (Tables 3-9 and 3-10). Furthermore, it is not compared against the baseline for analysis.</p> <p>Table 3-9 indicates that coarse PM (PM10) is predicted to exceed the 24-hour CAAQS during all phases of the project. However, Appendix 10-A p. 3.46 states that, “There were no exceedances of PM2.5 which is generally considered to be a more reliable indicator of potential health effects. However, health effects would be infrequent and reversible, subsiding after exposure; therefore, PM10 was not considered for further quantitative assessment in the ERA.”</p> <p>PM10 and PM2.5 were not included in the air quality monitoring plan (Section 6.1.8).</p> <p><b>Rationale:</b> Particulate matter and NO2 are considered non- threshold pollutants, meaning that health effects can occur at any level of exposure, The CAAQS for PM2.5 PM.10, and NO2 recognize that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). The CAAQS values should not be construed as limits to which polluting up to is allowed. In addition, based on the principles of keeping clean areas clean and continuous improvement, proposed mitigation measures should not be confined to meeting the standards but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>Furthermore, although health risks associated with PM2.5 are higher than those associated with PM10, both fractions are considered non-threshold pollutants and identified by IARC (2013) as causes of cancer.</p> <p><b>Reference:</b> [1] International Agency for Research on Cancer (IARC). 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. Lyon: International Agency for Research on Cancer.</p>	<p>3. Provide a discussion of the significance of predicted exceedances of health- based standards.</p> <p>4. Identify additional mitigation measures to reduce concentrations of non- threshold air contaminants associated with the project.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the <a href="#">2025 CAAQS Management Levels</a> to develop mitigation measures that reduce project contributions of non-threshold pollutants (e.g., PM2.5, NO2).</p>	<p>exceed the Project AQ Criteria. This is considered an appropriate approach as PM2.5 is not exceeding an acceptable risk level for PM 2.5. In the case of PM10, this constituent was included in the secondary air quality screening as it exceeded its Project AQ Criteria.</p> <p>2. Denison agrees to include PM10 and PM2.5 as part of the air quality monitoring plan during construction and determine based on adaptive management if monitoring during future phases is required.</p> <p>3. PM10 and PM2.5 are associated with adverse human health effects because these particulate sizes can be inhaled and entrained within the respiratory system (WHO, 2006). Although there are a broad number of health effects associated with the inhalation of PM10 and PM2.5, the effects target primarily the respiratory and cardiovascular systems. Epidemiological studies indicate that the adverse effects of PM are evident for both short-term and long-term exposures of PM, with the risk for adverse health effects increasing with increased exposure duration (WHO, 2006). As such, the exceedances of PM10 health-based standards, as noted in Appendix 10-A, Section 3.2.1.3.2.2, is the potential for unacceptable adverse effects associated with respiratory symptoms such as coughing or difficulty breathing, or asthma symptoms and chronic bronchitis, with effects being reversible and subsiding after exposure.</p> <p>4. The results of the air quality assessment and ERA do not warrant additional mitigation measures for air quality. However, Denison agrees to using the 2025 CAAQCs in future mitigation and follow-up plans.</p> <p>References: World Health Organization (WHO). 2006. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide Global update 2005, Summary of risk assessment.</p>	construction will be added to Section 6.1.8 and Section 16 in the EIS.
IR-192	CNSC	Human Health with respect to radiation exposure	Appendix 10-A (ERA), Section 3.1.1.2, including Tables 3-1 and 3-2	<p><b>Context:</b> Section 3.1.1.2 in Appendix 10-A (ERA) provides the method of how select constituents including cadmium, chromium, selenium and lead-210 were determined. This section does not mention how the other constituents as listed in Tables 3-1 and 3-2 are determined.</p> <p>The values for Th-230 and U-238 in Table 3-1 are unexpected. Typically, these values should be at equilibrium.</p> <p><b>Rationale:</b> The technical basis for the selection of constituents of concern is required as part of the environmental and human health risk assessments.</p>	<p>1. Provide the methodology of how all listed constituents are determined.</p> <p>2. Provide the rationale as to why Th-230 and U-238 are not in equilibrium.</p>	<p>1. In the first paragraph of Section 3.1.1.2 of the ERA (Appendix 10-A), the text explains that for most constituents the effluent values were based on the results from lab tests conducted by Denison, with a safety factor of three included. Cadmium, chromium, and selenium were singled out because the effluent quality for those constituents were determined based on the back-calculated concentration from a water quality guideline. As stated in the response to IR-117, the ERA will be revised to remove lead-210 from the list of constituents that used the derived effluent quality, as the concentration was based on Denison lab tests. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".</p> <p>2. The effluent quality for Th-230 and U-238 were based on lab results from Denison with a safety factor of 3. U-238 and Th-230 are not expected to be in secular equilibrium in the effluent as they have come out of a chemical process in which uranium and thorium partition differently. The effluent quality will continue to be refined through the licensing process based on continued testing conducted by Denison. No changes to the EIS.</p>	Per the IR response, a minor edit, same as response to IR-117. Section 3.1.1.2 of Appendix 10-A will be modified to state: "The derived effluent quality was used for a handful of constituents including cadmium, chromium, and selenium".
IR-193	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.1.2  Section 8.2.4.2.3	<p><b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>1. Provide acute and chronic water quality thresholds for all required COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>1. The application of acute water quality thresholds will be added to Section 8.2.4.2.3 and will be used to refine the effluent quality during the licensing phase (see the response to IR 114 for the updated mixing zone model results). The effluent presented in Table 8.2-9 is based on maximum effluent concentrations; however, Denison is committed to ensuring all effluent released will be below MDMER limits as well as short-term CCME guidelines for protection of aquatic life.</p> <p>2. Water quality thresholds have been applied appropriately in the draft EIS and fit for purpose. Water quality thresholds in Section 3.1.1.2 of the ERA (Appendix 10-A) were based on site-specific hardness of 5.26 mg/L (95th percentile of LA-5 and LA-6). This was to provide a conservative screening for COPCs to be carried forward for further quantitative assessment in the ERA. Water quality thresholds in Section 8.2.4.2.3 are based on Project induced hardness which is assumed to be 250 mg/L. This results in known discrepancies for some water quality parameters that are hardness induced such as cadmium, copper, zinc, and sulphate.</p>	Per the response the application of acute water quality thresholds will be added to Section 8.2.4.2.3 and where applicable are presented in Attachment: IR-114.
IR-194	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li></ol>	<p>1. As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</p> <p>2. Provide the information on predicted maximum receiving</p>	<p>1. See response to IR-114. No revisions to Appendix 10-A, ERA are needed based on the response.</p> <p>2. See response to IR-114 for the predicted maximum receiving environment surface water concentrations for constituents regulated under Schedule 4 of MDMER. As indicated in Section 3.1.1 of the ERA in Appendix 10-A a long list of constituents was initially identified for</p>	No EIS updates are anticipated to address this IR.

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				<p>2. Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</p> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided.</p>	<p>environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</p> <p>3. Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</p> <p>4. Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment.</p>	<p>consideration in the ERA based on they are known to be present in treated effluent, have existing water quality guidelines or were identified in MDMER (with the exception of cyanide). The focus of the MDMER constituents were those regulated under Schedule 4. Denison will monitor for all MDMER constituents with required monitoring in the environment. This will be included as part of Denison's Effluent and Emissions Plan to support licensing.</p> <p>3. As indicated in Section 3.1.1.1 of the ERA in Appendix 10-A the long list of constituents was reduced further based on potential for exceedance of a water quality guideline (for both protection of human health and aquatic life). Any MDMER constituent that was identified as exceeding a water quality guideline was considered a COPC and assessed further in the ERA (see Table 3-1 in the ERA). For example, effluent quality for arsenic, copper, and zinc which are all Schedule 4 constituent were identified as COPCs in the ERA based on exceeding a water quality guideline.</p> <p>4. The ERA followed the guidance in CSA N288.6-22 which does not require COPCs with elevated baseline concentrations to be considered COPCs for further quantitative assessment in the ERA. Clause 6.2.5.9 indicates that constituents with naturally elevated concentrations should be excluded from further consideration as a COPC. As indicated in Section 8.2.3.3 of the EIS constituents in baseline water quality that exceeded water quality guidelines included aluminum, and occasional exceedances for cadmium, iron, and lead. All of these constituents were considered in the ERA screening; however, were not identified for further assessment (other than cadmium) since based on a conservative screening of effluent quality water quality guidelines would not be exceeded. Section 8.4.3.2.3 of the EIS did not identify any constituents where baseline sediment quality exceeded sediment quality guidelines. Section 3.1.2.3 of the ERA in Appendix 10-A provides the predicted maximum sediment quality in Whitefish Lake for a list of constituents. These concentrations included background concentrations and are screened against sediment quality guidelines. The only constituents that exceed sediment quality guidelines are molybdenum and selenium; however, other COPCs are assessed further in the ERA (see Table 3-14 in the ERA in Appendix 10-A) even though sediment quality guidelines are not anticipated to be exceeded.</p>	
IR-195	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>	<p>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</p> <p>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</p> <p>3. Update ERA figures and conclusions as needed.</p>	<p>1. Per the draft EIS effluent is conservatively assumed to be discharged to the Whitefish Lake Middle during the operations (15 years) and decommissioning (5 years) phases at the same constant discharge rate of 36.5 m<sup>3</sup>/hr (10.1 L/s) with the same stable effluent quality as shown in Table 3-2. Therefore, the modelled maximum COPC concentrations in water are the same for operations and decommissioning phases (which is considered conservative), the same peak concentrations appear annually due to the variation of the monthly local inflow. Since COPCs are accumulated in sediment, the modelled maximum COPC concentrations in sediment appear at the end of each individual Project phase, which are year 20 for the operations and year 25 for the decommissioning in Figure 3-3.</p> <p>2. The predicted effluent quality during the Project decommissioning phase is expected to be the same as those during the operations. Effluent was set to be released during operations but not during the decommissioning phase in the current model.</p> <p>3. The model has been updated to include effluent discharge during the decommissioning phase, and the ERA figures and result tables will be updated in the next submission accordingly. <b>See attachment IR-195 for the updated Table 3-3 and Figure 3-2.</b></p>	Per the IR response, edits will be made to Table 3-3 and Figure 3-2 in Appendix 10-A. These edits are provided in Attachment IR-195.
IR-196	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.3	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>	<p>1. Provide further information and justification for the selection of less stringent thresholds.</p> <p>2. Update the ERA as needed.</p>	<p>1. As indicated in Appendix 10-A Section 3.1.2.3, “Burnett-Seidel and Liber (2013) was selected as the preferred source for the selection of the Project thresholds in the sediment quality assessment, as the reported NE2 and REF values are specifically applicable to Saskatchewan waterbodies.” Burnett-Seidel and Liber (2013) was used even if higher than CCME quality guidelines or Thompson et al (2005). In some instances, the NE2 value was lower than the REF value from Burnett-Seidel and Liber (2013). In those instances, the REF value was still used, as screening values should not be lower than background concentrations.</p> <p>2. The guidelines for copper, lead, and vanadium from Burnett-Seidel and Liber (2013) were inadvertently excluded from Table 3-6 in Appendix 10-A which results in changes to selected screening values for copper (9.1 mg/kg dw), lead (16.3 mg/kg dw), and vanadium (35.1 mg/kg dw). The predicted sediment quality for copper, lead, and vanadium are still below the sediment quality guidelines; therefore, no changes to the table are needed other than changes to the sediment quality guidelines identified above. The updated Table 3-6 is provided in Attachment IR-196 – red text indicates a change from the existing table in the draft EIS, Appendix 10-A.</p> <p><u>References:</u></p> <p>Burnett-Seidel, C., Liber, K., 2013. Derivation of no-effect and reference-level sediment quality values for application at Saskatchewan uranium operations. Environ. Monit. Assess. 185, 9481–9494.</p> <p>Thompson, P.A., Kurias, J., Mihok, S., 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110, 71–85.</p>	Per the IR response edits to Appendix 10-A, Table 3-6, as shown in Attachment IR-196, will be made in the final EIS.
IR-197	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<p><b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.</p> <p><b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that</p>	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in	Per the IR response, the following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from



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				are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.		the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible." References: Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I	the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."
IR-198	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.  Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.  <b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.	The response to IR-198 is provided in Attachment IR-198.	No updates to the draft EIS are needed based on this IR response.
IR-199	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.  <b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.	1. Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.  2. Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).	1. Model calibrated concentration inputs of COPCs were preferable over measured baseline concentrations because of the interrelation of metals and radionuclides between water and sediment. In all cases the measured baseline concentrations were used to verify that the modelled relationship between water and sediment for each constituent was considered valid. The geometric mean values of the measured baseline data were preferentially used as the baseline inputs for COPCs that had a good amount of measured data over the detection limit, which is the case for most of the COPCs in Figure 3-2 (where the modelled values overlap with the measured geometric mean values in the plots). In the case of COPCs for which most or all measured values in water were under the detection limit (i.e., 140 out of 142 measured selenium concentrations are below its detection limit), but their sediment concentration measurements were over the detection limit, the baseline water concentration was calculated from the geometric mean of the sediment measurements using the regional water-to-sediment partitioning coefficients (Kd).  2. The "poor" agreement between calibrated and measured concentrations for selenium, uranium and lead-210 is the result of more than 95% of the measured concentrations in water being reported as less then the detection limit for selenium (140 out of 142), uranium (141 out of 142) and lead-210 (136 out of 142). It's unlikely that these three COPCs are under-predicted in water.  Poor agreement between modelled and measured concentrations in sediment for arsenic and radium-226 may be a result of only one sampling campaign being available for sediment. The modelled sediment concentrations can be refined in the future when more measured sediment data are available as the Project progresses. Even though arsenic and radium-226 are conservatively over-predicted in sediment, no significant adverse effect on either aquatic or terrestrial populations or communities are predicted during the Project phases or during the future centuries.	No updates to the draft EIS are needed based on this IR response.

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IR-200	HC	Indigenous Peoples' health / Socio-economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)	<p>Indigenous consultation should be included in the Country Foods analysis.</p> <p><b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following</i>: “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p>1. Evaluate the suitability of using the 2017 EFRN survey results and consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.</p> <p>2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>	The 2017 report was authored by ERFN and as such there is no need for Denison to ask ERFN to validate their own report.	No updates to the draft EIS are needed based on this IR response.
IR-201	ECCC	Aquatic species	Appendix 10-A (ERA), Section 5.0	<p><b>Context:</b> For the ERA methodology the Proponent followed CSA N288.6-12 for the assessment of risk to aquatic biota from radionuclide and non-radionuclide COPCs. This is the 2012 version, and a more recent 2022 version was publicly released.</p> <p><b>Rationale:</b> The Proponent should review the most up-to-date version of the standard to ensure no changes to the methodology of the COPC exposure assessment are required for the ERA.</p>	Update the COPC exposure assessment methodology in the ERA using the most recent CSA N288.6-22 standard, as needed.	Denison confirms that the updated CSA N288.6-22 was reviewed and that no changes to the ERA methodology are required. Denison confirms that the ERA is also compliant with CSA N288.6-22. The EIS and ERA (Appendix 10-A) will be updated to reference the most recent 2022 version of the standard, CSA N288.6-22.	Per the IR response all references to N288.6-12 will be replaced with N288.6-22 in the EIS and Appendix 10-A.
IR-202	CNSC	QA/QC	Appendix 10-A (ERA), Section 6.0-Quality Assurance	<p><b>Context:</b> This section provides only Quality Assurance (QA) of the ERA, including planning and preparation of the ERA.</p> <p><b>Rational:</b> The Quality Control (QC) aspects are not included. Both QA and QC aspects provide confidence that ERA results are defensible and fit for use in decision-making.</p> <p>The N288.6 (Clause 10.2) requires that “Appropriate QA/QC requirements shall exist for all aspects of the ERA and should be specified prior to conducting the ERA”.</p>	Please include appropriate QC aspects, as per a Clause 10.2 of the N288.6.	<p>The ERA (Appendix 10-A) was completed in alignment with CSA N288.6-22 including the specific QA/QC requirements in Clause 10.2 and 10.3 of the standard. The ERA following the Ecometrix Quality Management System for review and verification ensuring that modelling results were correct and accurate. The ERA report as well went through a thorough review and verification by senior technical staff. The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered fit for use in the ERA.</p> <p>Another layer of review included Denison's review of the ERA. Final acceptance and submission of the ERA with the EIS package indicated Denison's acceptance of the final product. Section 6.1 of the ERA in Appendix 10-A will be updated to include some additional discussion of QA/QC activities. Specifically, the following will be added. "The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements</p> <p>Denison provides inputs to the ERA based on metallurgical test work that has been conducted under the QA/QC protocols of the Saskatchewan Research Council. The metallurgical test plan and test results are validated by a third-party Qualified Person. Once Denison provides the input values to be utilized in the ERA, Ecometrix summarises the data and provides the summary to Denison for acceptance by a Professional Engineer or a Professional Geologist prior to running the ERA model.</p>	Section 6.1 pf Appendix 10-A will be updated to include the following statement:  "The ERA utilized environmental monitoring data collected as part of the baseline monitoring program which followed either Ecometrix' Quality Management System for the monitoring conducted by Ecometrix or the Quality Management System for Denison's other subcontractors. The data collected during the baseline monitoring program was considered valid and appropriate for use in the ERA. The ERA was reviewed and accepted by Denison in accordance with Denison's QA requirements."
IR-203	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<p><b>Context:</b> This section of the ERA states “if treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p>	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the maximum upper bound discharge rate scenario.	<p>As part of the sensitivity analysis, if treated effluent is released at the maximum upper bound discharge rate, the modelled vanadium concentration in sediment is expected to be below the Severe Effect Level (SEL) of 160 mg/kg but exceed the Lowest Effect Level (LEL) of 35.2 mg/kg in Whitefish Lake Middle/South. The SEL and LEL values are defined by Thompson et al. (2005).</p> <p>The cadmium concentration in Whitefish Lake Middle/South is expected to be over the CCME sediment quality guideline of 0.6 mg/kg dw for the maximum upper bound discharge rate scenario.</p>	Per the IR response, Section 6.2 of Appendix 10-A will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "

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				<b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.		The plots in Figure 6-2 are correct. The statement in Section 6.2 will be updated to the following, "If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, <b>with the exception of cadmium and vanadium.</b> "	
IR-204	CNSC	Human health with respect to hazardous contaminants	Appendix 10-A (ERA), 7.1.1, Non-radiological Human Health Risk Assessment	<b>Context:</b> In the human health risk assessment of the non-radiological COPCs, it was determined that the project incremental HQ was predicted to remain below 0.2 for all non-carcinogens and all pathways during all phases of the project, except for selenium for the fisher/trapper at Russell Lake from the fish ingestion pathway.  <b>Rationale:</b> Given that the fisher/trapper receptor will likely be exposed to higher concentrations of selenium from the consumption of fish at Russell Lake, there is an elevated risk of selenosis in exposed individuals. This potential for selenosis would be further exacerbated in individuals who consume fish taken from other lakes closer to the mining operation. There is, however, no discussion of mitigation of these risks to exposed individuals.	Please provide a discussion of measures that could be applied to mitigate the risk of selenosis in exposed individuals who consume fish from Russell Lake and other waterbodies closer to the mining operation.  <b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following: <ul style="list-style-type: none"><li>Selenium abatement technologies may be considered to eliminate or reduce selenium in effluent entering the lake system.</li><li>If HQs continue to exceed 0.2, then it may be necessary to post fish consumption advisories, in consultation with the Medical Officer of Health for the jurisdiction where the project is located.</li></ul>	Health Canada (2017) conducted a screening assessment of selenium and its compounds under the Canadian Environmental Protection Act. Selenium is an essential element for humans; however, there may be potential human health risks at elevated exposure levels. Selenosis (also known as chronic selenium toxicity), is considered by Health Canada as the critical health effect for selenium. The symptoms of selenosis may include: intestinal upset, hair loss, nail loss, changes in nail morphology, excessive decay and discolouration of teeth, garlic odour in breath, nervous system abnormalities, and fatigue. The BC MOE (2014) identified 7.3 mg/kg dw of selenium in fish as an appropriate limit for subsistence fishing. This would equate to 1.8 mg/kg fw, assuming a dry weight to fresh weight ratio of 0.25 from CSA N288.1-20 for fish. The maximum selenium concentration in Whitefish Lake (LA-5) is predicted to be 1.57 mg/kg fw for northern pike and 2.29 mg/kg fw for white sucker (see Table B.5 in Appendix 10-A). The maximum predicted selenium concentrations in McGown Lake for northern pike and white sucker are 1.02 mg/kg fw and 1.39 mg/kg fw, respectively. The maximum predicted selenium concentrations in Russell Lake for northern pike and white sucker are 0.81 mg/kg fw and 1.06 mg/kg fw, respectively. As such, based on current predictions in lakes where fish consumption is assumed to occur (McGowan Lake and Russell Lake), fish tissue concentrations for selenium are expected to be below the BC MOE limit, indicating people eating fish from these lakes would likely be protected from selenosis.  Any further selenium abatement technologies will be considered through the BATEA process during licensing.  <b>References:</b> British Columbia Ministry of Environment, Beatty JM, Russo GA. 2014. Ambient Water Quality Guidelines for Selenium. Technical Report Update. Water Protection and Sustainability Branch. Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment. 270 pp Health Canada. 2017. Screening Assessment: Selenium and its compounds. December. <a href="https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71">https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/screening-assessment-selenium.html#toc71</a>	No updates to the draft EIS are needed based on this IR response.
IR-205	CNSC	Geology and Groundwater	Section 7, appendix H	<b>Context:</b> In this appendix the analytical concentration of various groundwater samples taken from monitoring wells is reported.  <b>Rationale:</b> There is one sample labeled as “Tracer Tank” with no definition available in the current report. It is difficult to judge whether the results presented are relevant to the EIS and how it may impact the findings therein.	Please clarify the definition of “tracer tank”.	The 'Tracer Tank' label referred to the predetermined KCl tracer concentration of 15% (75,000 to 85,000 ppm Cl and K) utilized for injection as part of the 2021 Tracer Test. This clarification will be added to Appendix 7-A, Appendix H.	Per the IR response the clarification will be made as indicated in Appendix 7-A, Appendix H.
IR-206	ISRD	Current use of lands and resources for traditional purposes	Section 11 Section 12 Section 15 Section 16	<b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.  <b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEEA 2012.	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find solutions or continue discussions with the potentially impacted Indigenous Nations and communities.	Refer to response to IR-28.	Refer to IR-28.
IR-207	CNSC	Current use of lands and resources for traditional purposes	Section 11, Perceived Risks to Lands and Resources	<b>Context:</b> The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are “ <i>perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well-being</i> ” (ERFN and SVS 2022a).” (p. 11-11)  Resource harvesters may experience Project-related disturbances and, depending on how these changes are perceived, it may cause some resource harvesters to avoid the Project Area.  Reductions in harvests may occur based on fear or uncertainty about the ongoing quality of country foods. For example, “ <i>People stopped picking berries in this area when Key Lake mine was established because of concerns about health impacts</i> ” (ERFN and SVS 2022b).  <b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEEA 2012). For the mitigation measures intended to address the effects of changes to the	How does Denison plan to work directly with Indigenous Nations and communities who currently use the potentially impacted areas, including the RSA, to mitigate and monitor the perceived risks and/changes to the RSA?  Has Denison had discussions with the potential impacted Indigenous Nations and communities on how fear and avoidance behaviors and related impacts on traditional land use will be mitigated, especially within the RSA?  Additional information is needed to determine if Denison has engaged directly with the Indigenous Nations and communities to develop potential mitigation measures to address fear and avoidance impacts, such as a community monitoring program, which could help to reduce the perceived risk to lands and resource use through education, collaboration, and long-term monitoring with Indigenous Nations, in order to build trust.  <b>Suggestions for mitigation and follow-up measures:</b> It is recommended that Denison consider engaging with potentially impacted Indigenous Nations and communities on the collaborative development and implementation of a monitoring program to help address concerns about potential impacts on lands and resources as a result of the	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, and in part due to their continued efforts to engage meaningfully with Indigenous communities relative to the Project which support continued relationship and trust building. Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time. Denison expects that important country foods harvested for food and cultural purposes (i.e. moose, fish, etc.), surface water quality, and other areas of interest will form part of this monitoring program. It is expected that the data collected through such monitoring regimes, as described above, would also be relevant to other Indigenous First Nations who may have interest in the Project.  The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are	No updates to the draft EIS are needed based on this IR response.

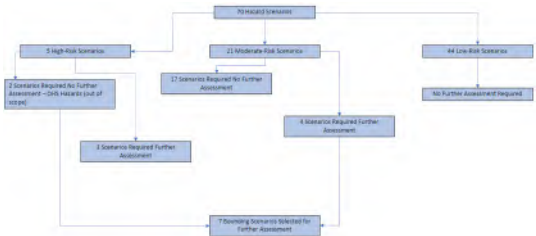


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				environment for Indigenous peoples, the proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.”  These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.	project. The program(s) could help to monitor changes over time related the potential perceived risk of contamination of the land from Project activities and subsequent effects on the quality of fish, vegetation, and wildlife resources, which in turn could affect the safety of traditional foods and human health, and impacts on culture practices, and overall community well-being that travel to region yearly.	currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).	
IR-208	CNSC	Indigenous physical and cultural heritage	Tables 11.1-3, 11.1-4 and 11.1-5  Section 11.1.3.2.6	<b>Context:</b> Black bear is listed as a species hunted by several Indigenous nations, including Pinehouse residents. CNSC participated in an in-person engagement with Pinehouse residents in October 2022 and bears eating waste was identified as a concern for hunting and consumption.  <b>Rationale:</b> Perceived risk of eating animals that are contaminated by hazardous or radiological wastes could deter community members from harvesting animals that are normally part of their traditional diet. Fencing for waste was specified as a deterrent for human trespassers, not animals.	Please specify measures that Denison will take to ensure bears and other animals do not scavenge from waste facilities.	Denison has proposed a number of Project design measures and wildlife-specific mitigation measures that will limit wildlife scavenging activities. Project design measures include waste characterization and segregation, and fencing the domestic and industrial landfills (refer to Section 2.8 Project Design Features and 9.3.5.1 Project Design Measures). Importantly, Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the landfill generating odours. For the wildlife-specific mitigation measures, refer to Section 9.3.5.2.5 Wildlife Deterrence and Prevention of Wildlife Entrapment and Section 9.3.5.2.8 Waste and Hazardous Materials Management.	No updates to the draft EIS are needed based on this IR response.
IR-209	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).  <b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)	Please provide detailed proposed mitigation measure for KML’s concerns related to loss of cultural knowledge and language should they work for Denison.	Denison respects the concern raised by KML regarding language and culture related to working at an industrial operation. Denison and KML will be working on specific items of interest to mitigate these types of concerns through private contractual arrangements, which may include specific mitigation and accommodation measures in this respect.  Mitigation measures associated with potential effects to cultural continuity (including knowledge transfer and language) are described in Section 12.1.5 and include: - working with Indigenous COIs to understand culturally important periods relative to harvest times and cultural camps to facilitate Indigenous employees taking time off to participate in such activities; - implementation of Denison's Indigenous Peoples Policy and advancement of reconciliation - Using a commuter rotation system has also shown to be effective in allowing Indigenous employees continued opportunities to spend time on the land, and important factor in the transmission of knowledge and language (see Section 11 for a description of potential effects to land use).  In discussions with Indigenous Communities of Interest since the filing of the draft EIS, it has become apparent that Denison should add additional commitment / mitigation measure in relation to this area of interest, as follows: - Encouragement to speak languages of choice while at site, except during safety sensitive situations	Section 12.1.5 of the final EIS will be updated to include the additional commitment / mitigation measure in relation to culture and language, as follows:  - Encouragement to speak languages of choice while at site, except during safety sensitive situations.
IR-210	CNSC	Current use of lands and resources for traditional purposes	Section 12.1.4.2.2, Potential Effect 2: Change in Traditional Diet, Perceived Suitability of Country Foods (p. 12-26)	<b>Context:</b> The EIS states: “Project activities could change the perceived suitability of country foods. An ecological risk assessment (ERA) was conducted to consider both radiological and toxicological risks to ecological receptors such as terrestrial and aquatic invertebrates, terrestrial and aquatic vegetation, fish, and terrestrial and aquatic mammals and birds. Results for the radiological assessment predicted no exceedances of the radiation dose benchmark for the ecological receptors. For non-radiological COPCs, no exceedances were predicted except for selenium in fish from Russell Lake, based on a conservative dietary assumption for one resource user. The traditional foods diet for the fisher/trapper is conservative as it assumes that their annual fish consumption (183 kg of fish per year) would be obtained from Russell Lake, meaning the exceedance of the benchmark for selenium from fish would only occur if fish were only sourced from this one lake. This one exceedance could potentially change the perceived safety of country foods for community members and make country foods a less desirable part of a traditional diet.  <u>Experience from other uranium operations in northern Saskatchewan suggests that resource use will continue despite the potential selenium exceedance. An examination of members of the Hatchet Lake Denesutliné First Nation who live in Wollaston Lake near the Rabbit Lake operation found that over years of being active on the landscape both with and without the presence of the uranium industry, members had developed their own culturally appropriate practice of risk assessment and management based on their relationship with the land. Hatchet Lake Denesutliné First Nation members appear to be more concerned with the direct effects of uranium mining on the local environment and less concerned about uranium mining’s effects on their health through consumption of plants and animals. This is likely due to their high level of confidence in recognizing affected plants and wildlife and avoiding them (Elias et al. 1997).</u>  The usage patterns of the ERFN Trapper have similarly allowed for continued use and access to areas proximal to other uranium operations. The ERFN Trapper had a positive relationship with other uranium operations in the ILRU LSA. He also continued to trap (i.e., used his trapline in Fur Block N-18), fish, and opportunistically pick berries, and consumed those resources during operations (KPI Program 2021). Good relationships between Denison and a new trapper who eventually	Given concerns with psycho-social impacts and the influence of perception discussed by ERFN earlier on in the EIS, does Denison have information on the perspectives from Indigenous Nations and communities to validate this conclusion is applicable?	Denison believes that the EIS conclusions are applicable, as evidenced by continued use of Indigenous communities proximal to other uranium sites in northern Saskatchewan, combined with the fact that ERFN, KML, and the YNLR were offered the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR). Denison acknowledges that not all project impacts can be eliminated in their entirety.  Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. One of the key goals of such collaboration with each Indigenous nation will be to provide the information necessary to the communities such that it provides confidence to community members regarding the impacts from the Project to the aspects of the environment which matter the most to them. Denison is committed to continual improvement in relation to such collaborative monitoring programs, in order to adapt to areas of interest which can change over time.  It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.  See also response to IR-212.	No updates to the draft EIS are needed based on this IR response.

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				takes over the trapline from the ERFN Trapper would promote continued use.” (p. 12-26)  <b>Rationale:</b> The underlined reference suggests that negative perceptions may not prevent traditional resource users from continuing to consume, due to adaptation to potential risks in the environment.			
IR-211	CNSC	Accidents and Malfunctions	Section 14.6.1, Bounding Scenario 1, Vehicle Accident and Aquatic Release of Radioactivity	<b>Context:</b> Scenario 1 describes a spill of uranium concentrate into the lake. It’s not clear how the ecological risk assessment was performed. It is stated that sediment concentrations in post-remediation conditions are expected to exceed the benthic invertebrate benchmark and that these results indicate that a spill of uranium concentrate could potentially affect benthic invertebrate populations following a spill, but the spatial extent would be limited. For water, it is stated that when evaluating the potential effect, a comparison was made between the results of the estimated short-term water quality 1,892 µg/L (1.892 mg/kg) and the guideline (33 µg/L). This indicates that there may be some aquatic species that could be affected, but the effects are expected to be transient as the water concentration quickly drops to a long-term level of 0.19 µg/L. However, when looking at dose to other receptors, the results of the ecological risk assessment indicated short-term ingestion of contaminated water resulting from an accident would not result in potential risks to grouse, vole, or deer, however rationale for how these receptors were chosen is not provided.  <b>Rationale:</b> It’s not clear from the EIS, why the receptors grouse, vole, and deer were chosen to evaluate ecological effects from a potential spill, and why they differ from receptors in the ERA. It is also not clear if the pathway from sediment ingestion/contact was considered for semi-aquatic receptors as they could be exposed to the increased concentrations post-spill. It is also not clear if SARA species exposure to sediment and water post-spill was considered.	Please clarify why grouse, vole, and deer were chosen as receptors for the ecological risk assessment performed for accidents and malfunctions scenario 1 and clarify if the sediment pathway to receptors post-spill was considered, as well as if SARA species were considered.	The indicated species were utilized to ensure representation of a variety of both aquatic and terrestrial species that could be affected by the release scenario to ensure relevant potential contaminant pathways were considered in the assessment, understanding however that exposure of local aquatic species was the most direct exposure pathway since Bounding Scenario 1 was a release to the aquatic environment.  To clarify, the sediment pathway to receptors post-release was consider in the assessment.  Also to clarify, specific SAR were not considered in the assessment; however as noted, representative aquatic and terrestrial receptors were considered that include the exposure pathways to which SAR species would also be subject and therefore the assessment and its results can be more broadly applied.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-212	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.  <b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).  The commitment regarding monitoring and follow-up activities appears limited to “ <i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i> ” (p. 14).  <b>Rationale:</b> Country food safety is not regulated federally unless foods are sold commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the predictions.	1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.  2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.  <b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and the direct involvement of communities in monitoring, surveillance, and risk communication activities.	We refer the reviewer to the following sections of the draft EIS, which are more applicable as it concerns engagement activities within the context of information sharing related to follow-up and monitoring compared to the sections listed in the <i>Reference to EIS, appendices, or supporting documentation</i> column of the IR: <ul style="list-style-type: none"><li>- Draft EIS Section 1 Project Introduction and Overview. Refer to Section 1.7.5 Licensing and Permitting for text describing that the Project is proceeding through sequential EA and licensing process. While a preview of the permits, approvals, and licences required after the EA process is complete is important to consider and provides valuable context, detailed information needed to support licensing and permitting has not be included in the EIS.</li><li>- Draft EIS Section 2 Project Description. Section 2.9 outlines the timing and framework for the Project’s management system.</li><li>- Draft EIS Section 4 Engagement. Section 4.2 outlines Denison’s engagement approach. Section 4.7 outlines future engagement activities.</li><li>- Section 11 Land and Resource Use provides a fulsome assessment of both Indigenous (Section 11.1) and other (Section 11.2) land and resource use. These assessments include the Key Indicator of <i>perceived suitability of lands and resources therein</i>.</li></ul> 1. The details of monitoring and follow-up plans are being developed to support the separate process of Project licensing and permitting. Engagement on licensing requirements, such as the environmental monitoring program and the associated surface water quality and monitoring regime will occur later in 2023 and into 2024. The specific means by which provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program, are currently under consideration with the Denison project team. It is noted that Section 4.2.1 of the draft EIS provides the variety of ways in which Denison has engaged with Interested Parties to date and it is assumed it would continue to use these means and others that may be identified to fulfil its key corporate principals for developing positive relationships (see draft EIS Section 4.2).  Denison’s plans are in line with Health Canada’s recommendations to go beyond passive dissemination of information and the intent is to solicit involvement of the Interested Parties during follow-up program development and subsequently execution.  Denison is committed to sharing information with Indigenous Communities of Interest (COIs) in a mutually agreed-upon fashion. Overall, the approach that will be utilized with respect to Indigenous community engagement will be aligned with Denison’s Indigenous Peoples Policy. Denison’s Indigenous Peoples Policy commits the company to respecting Indigenous knowledge and values regarding environmental stewardship and Indigenous peoples’ connection to the land. The relevant monitoring plans for the species/resources that support a traditional diet will reflect and incorporate these values, and will be reflective of the Indigenous COIs priorities. The monitoring plans when drafted will include more detail about	No updates to the draft EIS are needed based on this IR response.

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						<p>communication methods and their effectiveness would be assessed through ongoing engagement with communities.</p> <p>Denison will solicit input and involvement in program development and execution from Indigenous COIs. Environmental monitoring results will be presented in an accessible way including a focus on country food if relevant to Indigenous COIs. As the COIs with reserves and residential communities most proximal to the Project, Denison will be collaborating with English River First Nation and Kineepik Metis Local on a community-specific monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that surface water management and monitoring will form part of this information-sharing process. It is expected that fish species that will be monitored will be those species that have been identified as important by ERFN in their 2017 Country Foods Study, as well as using the KML Land and Occupancy Map and associated information. These programs may be adjusted based on community feedback throughout the life of the Project.</p> <p>Regulators will be involved with setting specific requirements for follow-up and monitoring, as well as reporting, through licence conditions (CNSC) and provincial approvals. A number of monitoring and reporting requirements will be generated through the completion of the environmental assessment process. Denison and its lifecycle regulators will be in regular communication throughout the life of the Project as part of routine reporting, site inspections, licence and permit renewals. Denison is committed to ongoing engagement with regulators and recognizes that this will include information sharing related to follow-up and monitoring results and any needed adaptive management plans.</p> <p>It is also noted for further reference that there are existing, non-Denison monitoring programs such as the CNSC's Independent Environmental Monitoring Program (<a href="https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm">https://nuclearsafety.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/index.cfm</a>), and the Eastern Athabasca Regional Monitoring Program (<a href="http://www.earmp.ca/">www.earmp.ca/</a>). Results from these programs provide relevant information and can complement Denison's Project-specific monitoring program. One forum for discussion of monitoring results is the Northern Saskatchewan Environmental Quality Committee (<a href="https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee">https://www.saskatchewan.ca/residents/first-nations-citizens/saskatchewan-first-nations-metis-and-northern-initiatives/northern-saskatchewan-environmental-quality-committee</a>).</p> <p>2. The relevant focus for country food intake are changes in COPC concentrations. These are integrated into the CSA N288.6 framework with ongoing updates to the ERA with new monitoring results. There are very few parameters with intake guidelines where advisories would be implemented. Adaptive management triggers and conceptual triggers will be developed as the Project advances.</p>	
IR-213	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A	<p><b>Context:</b> The proponent states that the assessment of accidents and malfunctions began with the initial identification of hazard scenarios. Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components.</p> <p>The hazard identification was conducted to identify a comprehensive list of potential project-related accident and malfunction scenarios associated with the key project components and activities with further details provided in Appendix 14-A. The initial hazards were then screened qualitatively based on likelihood and consequence to determine overall risk level using a risk matrix approach. Bounding scenarios were then selected from this initial list of hazard scenarios.</p> <p>The results of numerical analyses (RESPEC, 2021) of detailed strip model suggest that the deformation imposed on the cemented steel casing from downward movement of the rock mass may exceed the assumed casing-strain yield limits and the failure limit locally after extracting the uranium ore. However, this potential hazard is not identified in the hazard identification.</p> <p><b>Rationale:</b> Exceedance of steel casing yield limits and failure limit would either compromise the steel casing integrity or damage the steel casing and result in the leakage of injected solution, which could impact on mine operation and contaminate the surrounding groundwater.</p>	Please include the hazard of steel casing yield or damage in the table of hazard identification evaluation and conduct an initial risk screening and further detailed assessment as required.	<p>Table 3-2 of Appendix A in the A&amp;M technical supporting document (Appendix 14-A) includes a hazard scenario "piping failure in the well field" that was characterized as a "low" likelihood scenario (Score 2) with "moderate" consequence (score 3) for an overall risk ranking of "low". This scenario is thought to generally be consistent with and cover off the scenario envisioned by the IR; nevertheless, and as recommended a new hazard scenario will be added to the hazard identification evaluation to specifically reflect the FIRT review comment.</p> <p>The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as Scenario 2.4 Well Casing Yield and/or Damage (refer to Attachment: IR-213 for the updated table). For reference, and based on hazard screening analysis, this scenario is evaluated to be a low likelihood scenario (2) with moderate consequence (score 3) for an overall risk ranking of low. The scenario is viewed as a low likelihood scenario due to the proposed multilayer design of the injection / recovery well design. Further, and contrary to the comment, we do not believe the RESPEC (2021) analysis shows an increased likelihood of subsidence that could be an initiating event to a pipe casing failure; rather, anything more than very minor ground subsidence in the well field is interpreted as a very low probability event. Potential subsidence and the analysis thereof is discussed in more detail in response to IR-21 and the reviewer is referred to that response for further information.</p> <p>The scenario is viewed as one having moderate consequence. Despite the fact the scenario would result in a temporary loss of control of mining solution associated with one or a limited number of injection/recovery wells the volume of solution would be limited to the volume of solution in the pipe(s) and the release would occur within the freeze wall where it would be contained limiting the spatial extent of effects and increasing the likelihood of success of recovery.</p> <p>Overall, and based on the screening methodology used for the hazard identification / screening process this scenario has been ranked as having a moderate level of risk and as a result would not be passed on for more detailed analyses in the accidents and malfunctions analysis.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>With respect to Appendix 14-A the following is noted. The new hazard scenario will be added to Table 3-2 in Appendix A of Appendix 14-A as shown in Attachment: IR-213. In addition, editorial changes to the report reflecting the increase of one additional hazard scenario being evaluated will be made (Section 4.0; " ... a total of 69 70 hazard scenarios were identified and evaluated.") and indicating an increase of one further scenario being characterized as having low overall risk (Section 4.0; "The balance of the scenarios evaluated, 41 42, were characterized as low-risk scenarios, ...").</p> <p>With respect to the EIS, editorial changes will be made in Section 14.5.5 to reflect the editorial changes highlighted above.</p>
IR-214	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A, section 3.2.3	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <p>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is</p>	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.	<p>The clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency.</p> <p>For reference, the proposed revisions to Appendix 14-A are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for transparency. Comments include rationale for likelihood or consequence scoring where requested by the IR.</p> <p>It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.</p>	<p>Based on the response, revisions to Appendix 14-A and the draft EIS are needed.</p> <p>As noted, the clarifications identified by the review comment will be revised in the final version of the Appendix 14-A as recommended. The proposed revisions are shown in Attachment IR-214 and include editorial changes to Tables 3-1 to 3-14, as appropriate. The tables are annotated with comments in Attachment IR-214 for clarity to support IR response review.</p>



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				<p>denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</p> <p>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</p> <p>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</p> <p>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</p> <p>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</p> <p>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</p> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>			<p>Revisions to Appendix 14-A that also translate to revisions in the draft EIS will be made for consistency. Specifically, the revisions identified in the tables will be reflected in changes to the text of Section 14.5.5 of the EIS describing the outcome of the screening process (including revision to Figure 14.5-3). Section 14.5.5 of the EIS will read as follows:</p> <p>“A summary outlining the results of the initial risk screening of accident and malfunction scenarios is provided in this subsection and summarized in Figure 14.5 3.</p> <p>Three of the hazard scenarios characterized as high risk were recommended for further assessment. An additional four moderate/ALARP-moderate scenarios were identified as requiring further detailed assessment for more accurate characterization of risk.</p> <p>Twenty-one of the scenarios evaluated were characterized as moderate-risk scenarios. Generally, the moderate-risk scenarios were deemed to represent a tolerable level of risk in consideration of proposed safeguards and design features that reduce the risk level to ALARP. As previously mentioned, four moderate/ALARP-moderate scenarios require additional detailed assessment for more accurate characterization of risk. The four moderate-risk scenarios that are subsequently assessed in more detail are associated with a contaminant release to the environment, which may have potential effects that are more far reaching than can adequately be assessed by the screening assessment. As such, a more quantitative evaluation was deemed appropriate.</p> <p>The remaining scenarios evaluated (44) were characterized as low-risk scenarios based on low likelihood of occurrence and/or low consequence in consideration of planned existing safeguards and design features. Low-risk scenarios were not carried forward for more detailed analysis as they were considered to be adequately characterized by the screening process.</p>  <p>Figure 14.5-3: Summary – Initial Screening of Accident and Malfunction Scenarios”</p>
IR-215	CNSC	Human health with respect to hazardous contaminants	Section 14.6	<p><b>Context:</b> One of the potential risks of a uranium mine and mill is a spill of untreated effluent.</p> <p><b>Rationale:</b> In the EIS, it doesn't appear that the scenario of a spill of untreated effluent to the environment has been considered.</p> <p>A failure of the piping containing the untreated effluent could result in an uncontrolled release to the environment and could affect the groundwater, soil quality, and terrestrial biota.</p>	Please evaluate and provide the results for a bounding scenario of a spill of untreated effluent or provide justification for its exclusion.	The scenario envisioned in the IR has in fact been considered in the hazard screening process (Appendix 14-A) and based on that process the scenario was not passed on for more detailed analysis as a Bounding Scenario. More specifically, Table 3-12, Appendix 14-A, considers accident and malfunction scenarios associated with the wastewater treatment system, including equipment and piping failures, effluent clarifier overflows and equipment and control system failures. The overall risk ranking associated with these scenarios were ALARP-moderate, ALARP-moderate and low, respectively, in consideration of likelihood and consequence and design safeguards and features (i.e., mitigations). Per the evaluation methodology outlined in Appendix 14-A and EIS Section 14, these scenarios were not carried forward for further detailed assessment as they do not meet the threshold for such detailed analyses.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-216	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether the expected doses meet the dose limits set out in the Radiation Protection Regulations.</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.	<p>While it is understood that potential radiological doses to human receptors are an important consideration for operations such as that proposed by the Project, issues related to worker health are beyond the scope of the Accident and Malfunctions Assessment (Appendix 14-A), which focuses on environmental receptors. Worker health, including the issue raised by the review comment, will be addressed independently and part of the licensing process as required. This is why chemical toxicity was selected as the basis for the assessment of risk in this case.</p> <p>With specific regard to public risk the following is noted. Radiological risk was not considered an appropriate pathway of exposure in these scenarios since there is little chance of exposure to members of the public. As noted above, chemical toxicity was selected as the basis for the assessment of risk in this case since it is the relevant exposure pathway for these scenarios.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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IR-217	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.	<p>As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. This information is provided in a technical memorandum that accompanies this IR response/disposition table (please see Attachment IR-217). For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. The information in the technical memorandum will be added to Appendix 14-A during preparation of the Final EIS.</p> <p>As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.</p>	Based on the response, revisions to Appendix 14-A are needed. Specifically, the technical memorandum provided as Attachment IR-217 will be added in its entirety as an appendix (Appendix B) to technical supporting document Appendix 14-A.
IR-218	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.	Acknowledged. The transcription errors identified will be corrected in the final EIS as recommended. Refer to Attachment IR-218 for revised Table 14.6-5 and Table 8-5.	Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the transcription errors noted will be provided, as follows:  <u>Revisions to Section 14:</u>  - The last two rows of Table 14.6-3 will be removed.  - From Section 14.6.4.1, second to last sentence in first paragraph, “The flow rates considered for this assessment were 5 <sup>th</sup> percentile annual flows of 10.9 m <sup>3</sup> /s (minimum flow), the average annual flow of <del>24.3</del> 17.3 m <sup>3</sup> /s (average flow), and the 95 <sup>th</sup> percentile annual flow of 24.67 m <sup>3</sup> /s (maximum flow).”  - Table 14.6-5 to be revised as shown in Attachment IR-218.  <u>Revisions to Appendix 14-A:</u>  - From Section 8.1, second to last sentence in first paragraph, “The rivers flows considered for this assessment are 5th percentile annual flow of 10.9 m <sup>3</sup> /s (minimum flow), the average annual flow of 24.3 m <sup>3</sup> /s (average flow), and the 95th percentile annual flow of 24.67 m <sup>3</sup> /s (maximum flow).”  - Table 8-5 to be revised shown in Attachment IR-218.
IR-219	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.	<p>The rationale for the 95% recovery is explored in Section 8.1 of Appendix 14-A where the hypothetical uranium concentrate release is examined. The density of uranium concentrate particles is high (8.3 g/cm<sup>3</sup>) and settling of these particles in the aquatic environment is expected to be rapid (USDOE 2001). As such the concentrate is not expected to be transported far from the incident/release location. Figure 8-2 from Appendix 14-A shows the modeled distribution of deposited uranium concentrate from the release location under different flow scenarios and is reproduced below for reference. As can be seen in the figure most (&gt;95%) of the mass of the uranium concentrate would settle within a short distance of the release, even under high flow conditions. This indicates that the hypothetical release would be confined to a small area.</p> <p>Given the relatively small area affected it is reasonable to assume that the affected area can be successfully remediated and that there would be a very high level of uranium recovery.</p> <p>For these reasons, it is believed the 95% recovery rate is a reasonable assumption.</p> <p><b>Reference</b> USDOE (United States Department of Energy). 2001. Characteristics of Uranium and Its Compounds. U.S. Department of Energy, Office of Environmental Management, Depleted Uranium Hexafluoride Management Program, Fall 2001. <a href="https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF">https://web.evs.anl.gov/uranium/pdf/UraniumCharacteristicsFS.PDF</a></p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-220	CNSC	Accidents and Malfunctions	Section 14.6.1.1.1  Appendix 14-A, Section 5.1.1	<p><b>Context:</b> The proponent states that based on drum deformations performed in a previous analysis (McSweeney et al. 2004), if a drum experienced a crush force of 100,000 lbs., then the deformation of the drum would cause the lid to detach from the drum. Using this drum failure mechanism, and assuming the drums weigh 450 kg and are arranged four across in the truck, at a speed of 48 km/h, the front 25% of the drums would fail, at 60 km/h to 97 km/h 55% would fail, at 145 km/h 75% would fail, and at ≥193 km/h all would fail. Given that the</p>	Please provide information and/or rationale as to whether drum stacking would impact drum failure at different speeds and confirm whether 55% drum fail for such an accident is still valid.	<p>While the review comment correctly indicates that drum stacking would impact drum failure, Denison will not stack drums for shipment and the analysis has been completed based on that assumption. The assumption is supported given that the trucks that will be used for transport are 26 ft long by 10 ft wide and can accommodate 13 rows of drums with 5 drums per row for 2 ft diameter drums. As noted in the draft EIS and Appendix 14-A it is anticipated that 40 drums would be shipped from the site per day.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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				<p>speed of the truck is likely between 60 km/h to 97 km/h, it was concluded that less than 55% of the drums would fail upon a traffic accident scenario.</p> <p>It is assumed to be 40 drums per shipment, so some stacking or rows of drums should be expected in this scenario. The drums stacked above could be at greater risk of deformation in a traffic accident. It is not clear whether drums stacking was considered in the previous study cited by the proponent and whether less than 55% fail is still an adequate percentage of drum failures in such traffic accident scenarios if drums stacking is needed.</p> <p><b>Rationale:</b> Drum failure percentage will impact the release quantity of uranium in such an accident scenario and then impact the consequence assessment. Therefore, the drum failure should be adequately assessed and supported with sufficient information and justification.</p>		<p>For further reference, the following is also noted with respect to the McSweeney et al. (2004) document on which the drum failure mode is based. The document discusses the most common failure mode of the top of the drum coming off - that is, for the scenario assessed in the A&amp;M evaluation 55% of the drum lids are assumed to fail (come off) at truck speeds between 60 and 97 km/h. Conservatively the analysis assumed that all of the contents of these drums would be released to the environment, though this is not likely to be the case.</p> <p>References: McSweeney, T. I., S. J. Maheras, and S. B. Ross. 2004. Radioactive Materials Transport Accident Analysis. Proceedings of 14th International Symposium on the Packaging and Transportation of Radioactive Materials (PATRAM 2004). Berlin, Germany, September 20–24, 2004. Paper #274.</p>	
IR-221	CNSC	Accidents and Malfunctions	Section 14.6.1.3, Appendix 14-A, Section 7.1	<p><b>Context:</b> It is projected that there would be about 100 drums packaged per mill operating day. One trip per day for 330 days per year is assumed for the probability evaluation. This means 100 drums per trip, which is inconsistent with description in section 14.6.1.1.1 where assuming 40 drums in one shipment per day.</p> <p><b>Rationale:</b> Shipments per day will impact the probability evaluation, and number of drums per trip will impact the release of uranium during an accident.</p>	Please clarify the number of shipments per day and number of drums per shipment that are expected and re-calculate the probability as necessary.	<p>In Section 7.1 of Appendix 14-A and Section 14.6.1.3 its states that there would be approximately 100 drums packaged per mill operating day. This was incorrectly stated in both Appendix 14-A and Section 14 of the draft EIS.</p> <p>As noted elsewhere in Project documentation there will be 40 drums packaged per day and Denison has confirmed this number.</p> <p>The 40 drums per day can be transported in one shipment per day and therefore the calculation of probability that has assumed one trip per day is correct and need not be revised.</p> <p>The text of Appendix 14-A and the EIS will be revised accordingly.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, revision to the number of drums of uranium concentrate that will be package per day (40 and not 100) will be provided.</p> <p>The revision to Appendix 14-A, Section 7.1 would be as follows: "In the case of the accident scenario envisioned, calcined uranium concentrate would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be about 40 <del>100</del> drums packaged per mill operating day (Wheeler River project description documentation). It was also assumed that a traffic accident on the bridge or within 40 m from either side of the bridge has the potential for release to the Wheeler River.</p> <p>The revision to the Section 14.6.1.3 of the EIS would be as follows: "In the case of the accident scenario envisioned, UOC would be packed into standard 205 L (45 gal) steel drums for shipping. It is projected that there would be approximately 40 <del>100</del> drums packaged per mill operating day (Denison 2019). It was also assumed that a traffic accident on the bridge, or within 40 m of either side of the bridge, would have the potential for release to the Wheeler River."</p>
IR-222	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<p><b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.</p> <p><b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.</p>	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.	<p>Strictly speaking the review comment is correct in that the release of organic chemicals, including fuel does not bound the non-organic chemicals such as acids or bases and this will be clarified for context in the final EIS as well as Appendix 14-A for clarity.</p> <p>The following is noted however and provides rationale the release of fuel (diesel) was carried forward for more detailed analysis. Through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p>	<p>Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the choice to carry the diesel releases as opposed to the release of acid will be provided. The following will be added to Section 8.2 of Appendix 14-A, <i>"For the purpose of assessing the potential effects on the aquatic environment from a release of fuels and hazardous chemicals, as described in Section 5.2, the release of diesel fuel was chosen as a representative scenario, rather than other chemical such as acids and bases. Through the hazard identification screening process (see Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the scenario screening assessment methodology was not carried forward further evaluation. Rather, since the release of organic compounds (such as diesel) would have the potential for downstream transport as a compound in distinct liquid phase from that of the water in the receiving environment. In this sense it produces a greater challenge of potential contamination over a larger spatial extent and timespan than the release of acid, while coincidentally necessitates the need for / opportunity for proactive response and clean-up. In contrast, the released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP."</i></p>
IR-223	CNSC	Accidents and Malfunctions	Section 14.6.4.1	<p><b>Context:</b> The EIS states that the 3D strip numerical model predicted that stresses and displacements did not show instability in the altered</p>	Please provide information on the stresses and displacements/deformation of the area northeast of the	Additional conservative modelling scenarios were run which determined that for altered sandstone properties, both ore zone and immediately surrounding rock is marginally stable	No updates to the EIS in response to this IR.



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			Appendix 7-A, Appendix K	<p>sandstone or basement rock at the location where a freeze wall would be placed around the Phoenix Deposit boundary (RESPEC 2021). The potential damage to the freeze wall due to mine-induced stresses and displacements under this scenario is excluded.</p> <p><b>Rationale:</b> One outer section of the freeze wall (i.e., north-east freeze wall of the phase 4 mining area) and some internal cross walls are located in the desilicified zone. The RESPEC 2021 report (i.e., Appendix K of Appendix 7-A) appears not to have included the desilicified zone in the geomechanical modeling, nor is provided the stresses and the displacements/deformation of the area northeast of the phase 4 ore body where a significant extent of the desilicified zone exists.</p>	<p>phase 4 ore body from the geomechanical studies to demonstrate the resulted stresses and displacements will not impact on the freeze wall integrity after IRs for geomechanical studies for ore extraction are addressed.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>(1.0 &lt; factor of safety [FS] &lt; 1.25), and no-failure conditions are apparent (RESPEC 2023; included here as Attachment: IR-21). The predicted surface displacement is negligible at approximately 2.4 to 2.8 mm. For desilicified sandstone properties, failure conditions are predicted in 12.6 % of the modeled desilicified sandstone volume, which is located within 20 – 35 meters of the ore zone. The updated results are considered negligible by the author. Notable observations from modelling include that based upon the geological model of the Phoenix deposit, the volume of the desilicified sandstone is approximately 4% of the volume of altered sandstone. Approximately 0.05% volume of altered sandstone is desilicified sandstone that is located immediately above the low-grade ore zone.</p> <p>Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan ground freezing is used to support the sinking of deep potash mine shafts which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5m thick which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because there is no mechanism in the ISR process to create a zero stress “atmospheric” state on the ore side of the freeze wall. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. NGL is very familiar with both projects as the author of this memorandum was the responsible engineer for the initial freeze designs and oversight at both mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several meters in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it is located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.</p>	
IR-224	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 5 (Process System and Piping Failure), doses to receptors at distances of 100 and 500 metres (0.25 and 0.01 mSv respectively) are predicted. The assessment also indicated that the dose to the unprotected worker staying inside the processing plant during the spill could exceed the 50 mSv dose limit specified by CNSC if workers did not leave the area quickly after the spill.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 5 (Process System and Piping Failure).	<p>As noted in Appendix 14-A (see Section 5.5, 8.5) and the draft EIS (see Section 14.6.5) the dose calculations presented for Bounding Scenario 5 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009). In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of radon from failed or leaked thickener. The assessment assumed 20% of the contents of the thickener was released inside the processing building (US NRC 2009). Typical radon concentrations in circulating lixiviant range from 300 to 7,000 Bq/L (Brown 2008). The GEIS used a concentration of approximately 4,000 Bq/L for its assessment and this is in the range of activity of radon that is expected in lixiviant before entering the processing building.</p> <p>For transparency, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium In Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (United States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.
IR-225	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 5 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 5.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for the chemical spill emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Building ventilation to maintain the workplace air quality.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above, such documentation is in the process of being developed as part of Project-related licensing and would be available for review and acceptance by the CNSC as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li></ul>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.

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						<ul style="list-style-type: none"><li>Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including: <b>Eliminate</b> – Remove hazardous materials, processes and activities. <b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items. <b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous. <b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed. <b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p>	
IR-226	CNSC	Accidents and Malfunctions	Sections 14.6.6.1 and 14.6.6.4	<p><b>Context:</b> It is stated that in the case of the accident and for a release amount of 1 kg inside the processing plant, the dose to offsite receptors at 200 m from the project site was calculated to be less than the CNSC public dose limit of 1 mSv. The analysis also indicated that the dose to a worker in a full-face-piece powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p><b>Rationale:</b> Section 14.6.6.1 indicates that 2 kg of uranium concentrate could be released in case of the accident. No rationale is provided why 1 kg rather than 2 kg uranium concentrate is used for dose calculation. If 2 kg is used as the source term, the dose to offsite receptors at 200m and workers in the area would be higher.</p>	Please provide the rationale for using a source term of 1 kg rather than 2 kg of uranium concentrate for the dose calculation to offsite receptors and workers. If sufficient rationale cannot be provided, the doses to offsite receptors and workers should be recalculated using 2 kg uranium concentrate, and the results provide.	The rationale for the 1 kg source term is provided in Section 5.6 of Appendix 14-A. The 2 kg source term was calculated but as noted was thought to be an overly conservative value based on the conservatism layered upon conservatism. The professional decision was made to use the source term of 1 kg consistent with the referenced 2009 US NRC study as a more realistic but still conservative value.	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-227	CNSC	Accidents and Malfunctions	Section 14.6.6.1.1	<p><b>Context:</b> Bounding Scenario 6 involves a fire and/or explosion within the processing plant, resulting in the release of a large amount uranium to the atmosphere. The airborne source term for this scenario is estimated with equation developed by the United States Department of Energy (USDOE), where the respirable faction is assumed to only include particles of 10 mm and smaller.</p> <p><b>Rationale:</b> No rationale was provided to support the consideration of only 10 mm and smaller particles. As provided in Table 14.6-3, the particle size of uranium &lt;15 mm is less than 20%. Majority of the uranium particle size is larger than 10 mm. The airborne source term is an important factor for the effects assessment and should be calculated with transparent and justified information/data.</p>	Provide rationale for only considering 10 mm and smaller particles for the respirable fraction.	<p>Note that the assessment in Appendix 14-A assumed a particle size of 10 µm, not 10 mm as stated by the reviewer.</p> <p>As noted in Appendix 14-A (Section 5.6) a 10 micron diameter particle size (or smaller) is a commonly assumed size fraction as a respirable/inhalable particle and is referenced by various organizations as such US EPA (see <a href="https://www.epa.gov/pm-pollution/particulate-matter-pm-basics">https://www.epa.gov/pm-pollution/particulate-matter-pm-basics</a>).</p> <p>Uranium particles emitted from the fire would be secondary particles or aerosols that are formed during the fire. In most cases these aerosols are sub-micron in size. In consideration of this, the 10 micron diameter assumption is conservative assumption since it essentially contemplates that that all the particles are therefore respirable. Moreover, as noted in Section 5.6 of Appendix 14-A the value “1” has been used for the respirable fraction (RF) to develop the exposure source term. This again is conservative because it assumes that all the uranium content formed as particles are respirable.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-228	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 6 (Facility Fire and/or Explosion), the predicted dose is less than 1 mSv to a member of the public 200 metres away from the project site. The analysis also indicated that the dose to a worker in a full-face powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p>The proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 6 (Facility Fire and/or Explosion).	<p>As noted in Appendix 14-A (see Section 5.6, 8.6) and the draft EIS (see Section 14.6.6) the dose calculations presented for Bounding Scenario 6 are based on scenarios presented in the US Nuclear Regulatory Commission (NRC) issued Generic Environmental Impact Statement (GEIS) for In-Situ Leach Uranium Milling Facilities (US NRC 2009) and the dose calculations are presented therein. In the GEIS, the potential environmental effects from the postulated accidents involving the operation of in situ recovery facilities located in four geographic regions of the western United States were assessed. One of the scenarios assessed involved the release of yellow cake inside the processing plant due to an explosion in the dryer. The scenario considered a release of 1 kg and conservatively assumed the fraction respirable was 100 percent.</p> <p>For transparency, and details related to the analysis, a hyperlink to the US NRC document is as follows:</p> <p><a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> The reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.</p> <p>References Brown, S. 2008. The New Generation of Uranium in Situ Recovery Facilities: Design Improvements Should Reduce Radiological Impacts Relative to First Generation Uranium Solution Mining Plants, WM 08 Conference, February 25 – March 1, 2008, Phoenix, AZ Abstract #8414. US NRC (Unite States Nuclear Regulatory Commission). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities. Final Report. NUREG-1910, Vol. 1</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed. As noted, a hyperlink to the US NRC document is as follows: <a href="https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html">https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1910/index.html</a> and the reviewer is directed to Chapter 4, Section 4.2.11.2.2 Radiological Impacts to Public and Occupational Health and Safety From Accidents for further reference.

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IR-229	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.	<p>As highlighted in the hazard identification section of the A&amp;M technical supporting document (Appendix 14-A) the control measures to reduce exposure to workers and the public in relation to Bounding Scenario 6 include:</p> <ul style="list-style-type: none"><li>• Development and implementation of the Occupational Health and Safety Program, including specific plans, procedures and PPE that would protect workers, in particular from the exposures envisioned by Bounding Scenario 6.</li><li>• Development and implementation of the Emergency Response Plan which includes the procedures for fire and explosion related emergencies.</li><li>• Personnel training and orientation for related to spill response and management</li><li>• Inspection and maintenance of the equipment and process components to ensure their integrity and reliability. This will aim to lower the probability of such events.</li><li>• Fire safety plan and firefighting systems to ensure fire safety and effective fire fighting system to ensure the damage from the fire is limited.</li><li>• Ambient air monitoring for post-accident assessment.</li></ul> <p>Where programs, plans and procedures are referenced above such documentation is in the process of being developed as part of project-related licensing and would be available for review and consideration as part of that process.</p> <p>In addition to the control measures noted above, the design criteria considered for the EA included</p> <ul style="list-style-type: none"><li>• Equipment Shielding</li><li>• Reducing time near facilities</li><li>• Increasing distance in elevate zones</li><li>• Control systems with safe shut down interlock</li></ul> <p>Denison has recently completed feasibility designs for the Project in 2023 and has incorporated design for safety principles (DFS), including:</p> <p><b>Eliminate</b> – Remove hazardous materials, processes and activities.</p> <p><b>Minimize</b> – Use smaller quantities of hazardous substances, minimize the number of hazardous activities or process / equipment items.</p> <p><b>Substitute</b> – Replace a hazardous material with one that is less hazardous, substitute a hazardous activity for one that is less hazardous.</p> <p><b>Moderate</b> – Minimize the impact of a release of hazardous material or energy, by changing the layout, adopting less hazardous operating conditions or a less hazardous form of a material, facilities, or by reducing the number of people exposed.</p> <p><b>Simplify</b> – Design facilities to eliminate unnecessary complexity, thus minimizing causes of hazards and human errors.</p> <p>While DFS is often applied to process design and process safety hazards, it can be applied to design in general and in areas other than design. Examples of DSF principles include:</p> <ul style="list-style-type: none"><li>• manning philosophies – minimize the number of staff required for operations and maintenance, during construction, installation and hook-up and/or commissioning</li><li>• process design – maximize simplicity of plant, maximize use of technology and equipment that is environmentally friendly, minimize hydrocarbon inventories, moderate operating conditions, minimize leak potential, maximize integrity of containment envelope from internal to external in-design effects and accidental loads.</li></ul> <p>Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 5 will be included in the detailed design and will be provided for acceptance by the CNSC during Project licensing.</p> <p>Denison is completing feasibility designs for the Project in 2023. Detailed design to support Project licensing and permitting will begin later in the year. Any engineering design control measures identified in Bounding Scenario 6 such as ventilation will be included in the detailed design and will be provided to the CNSC during Project licensing.</p>	Based on the response no revisions to the EIS, nor to the A&M technical supporting document (Appendix 14-A) are needed.
IR-230	CNSC	Accidents and Malfunctions	Section 14.6.7.4	<p><b>Context:</b> It is stated that a conservative penetration time of 15 min was applied in the assessment. Based on this assumption, the maximum depth of contamination could be 90 cm (for penetration rate of 0.1 cm/s). It is not clear why the penetration time of 15 minutes is considered conservative as the penetration time would depend on the time needed for the emergency response team to respond.</p> <p>It is also stated that the wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from 0.15 m to 100 m. It is not clear how the groundwater travel distance of 0.15m and 100m is calculated.</p> <p><b>Rationale:</b> The penetration time will influence the penetration depth of the released materials, which in turn, considering the groundwater travel distance, will impact the potential areas and volumes of contaminated soils and shallow groundwater.</p>	Please provide justification for applying 15 minutes of penetration time, and why it is considered conservative. In addition, please provide information on how the groundwater travel distance of 0.15 m and 100 m was obtained.	<p>The calculations showed that the release of 30 m<sup>3</sup> partially saturates soil to the depths less than 1 m. Contamination deeper than 1 m is not expected due to released diesel availability and volume.</p> <p>If the penetration rate is slower than what was used in calculations, the released hydrocarbon would stay on the surface and the depth of contamination would be less. Therefore, 15 minutes is a conservative assumption that produces the maximum depth of contamination for the volume of hydrocarbon released.</p> <p>Eventually the depth of the contamination is more dependent on the volume of release than the time of the penetration. If the penetration is faster, the contamination would occur faster but would be limited by volume so would not penetrate deeper.</p> <p>With respect to the groundwater travel distance the distances provided in the Section 14.6.7.4 of the draft EIS the following are noted. The values provided are the upper and lower bound values associated calculated from the range of input parameters in the report. The calculations are based on the attenuation / degradation of diesel at the release site which is expected to occur within 75 days (Berry and Burton, 1997; Ledezma-Villanueva et al., 2015). In review of the text of Section 14.6.7.4 in preparation of this response a typo was noted and therefore to address the typo and provide some further clarity with respect to the groundwater travel distance the following revision will be made. The third from the last paragraph of Section 14.6.7.4 will be changed as follows (proposed ne text in bolded for reference):</p> <p><i>“The wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. <b>Studies by Ledezma-Villanueva et al. (2015) and Berry and Burton (1997) show that residual contamination in soil and groundwater is degraded within 75</b></i></p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Section 14.6.7.4 in the EIS would be revised per the IR response. A similar revision would be made to Appendix 14-A.



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						<p><i><b>days.</b> The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from <del>0.15 m</del> 0.03 m to 100 m.</i></p> <p>• <b>Dmax = 1.5 × 10-5 m/s x 75 days x 24 x 3600 ~ 100 m</b> • <b>Dmin = 4.4 × 10-9 m/s x 75 days x 24 x 3600 ~ 0.03 m</b></p> <p><i><b>As highlighted by the calculation,</b> <del>Ø</del>during this time period, no major migration of groundwater is expected. Thus, the contamination of soil and shallow groundwater is expected to be limited to a small area near the release location, <b>given that release site remediation would occur well within the 75 day window.”</b></i></p> <p>References Berry, K.A.T. and D/L. Burton. 1997. Natural attenuation of diesel fuel in heavy clay soil. Can. J. Soil. Sci. 77: 469–477. Ledezma-Villanueva, A. J. M. Adame-Rodríguez, I.A. O’Connor-Sánchez, J.F. Villarreal-Chiu and E.T. Aréchiga-Carvajal. Biodegradation kinetic rates of diesel-contaminated sandy soil samples by two different microbial consortia. Ann. Microbiol. (2016) 66:197–206.</p>	
IR-231	CNSC	Accidents and Malfunctions	Sections 14.6.6.4 and 14.6.6.5	<p><b>Context:</b> The EIS states that in the unlikely event of an unmitigated accidental release of uranium due to a dryer explosion, doses to the workers are expected to have a moderate effect, while doses to members of the public are expected to have a minor effect. Based on this evaluation, the severity of the consequences of this accident and malfunction scenario is predicted to be moderate. In consideration of both probability and consequences, the overall risk related to Bounding Scenario 6 is predicted to be low.</p> <p><b>Rationale:</b> When there is an explosion within the process plant, it is likely there will have worker fatality. The severity of the consequences of an explosion would be catastrophic and the risk of Bounding Scenario 6 would be higher.</p>	Please re-evaluate the consequence and the risk of Bounding Scenario 6 by considering the potential worker fatality resulted from an explosion.	<p>There was no attempt to minimize the consequence of the explosion scenario with respect to a potential fatality of a worker in the draft EIS. The hazard screening evaluation for this scenario that was presented in Appendix 14-A did acknowledge worker fatality as a potential consequence on an explosion; however, the more detailed evaluation of the scenario as presented in Bounding Scenario 6 focused on the release, for which we believe the consequence ratings were appropriate. Protections afforded to workers are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.</p> <p>It is acknowledged that the text could have been more explicit as to the above and additional text will be added to the text of the EIS and to Appendix 14-A.</p>	Based on the response, revisions to the EIS Appendix 14-A are needed. Specifically, clarity around the decision to carry the exposure scenario forward for further analysis, rather than the potential fatality aspect of the explosion will be provided. The following text will be added to Section 5.6 of Appendix 14-A, <i>“For reference it is acknowledged that this accident scenario could result in significant worker injuries and/ore fatalities and therefore this the reason that it was rated as “catastrophic” from a consequence perspective in the hazard identification screening evaluation (see Appendix A). The more detailed evaluation of the scenario as presented herein as Bounding Scenario 6 focuses on the release of uranium to the atmosphere. Protections afforded to workers in the processing plant are assumed to be ALARP and therefore from this perspective there is no further analysis specific to a potential worker fatality that could be considered further within the assessment.”</i>
IR-232	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 14-A, Table 3-7, ID# 7.1  Appendix 14-A, Table 5-5	<p><b>Context:</b> The Proponent indicates in Appendix 14-A, Table 3-7 that a release of sulfuric acid is a low consequence event therefore would not require further assessment. However, according to a Safety Datasheet on high concentrated sulfuric acid (ICSC 0362 - SULFURIC ACID, concentrated (&gt; 51% and &lt; 100%) (ilo.org)), the substance is incompatible with certain materials and can give off toxic fumes. Furthermore, it reacts with various metals to produce hydrogen gas, which is explosive.</p> <p>The Proponent provides estimates of chemicals, including sulfuric acid, to be transported to site in Appendix 14-A, Table 5-5. The annual consumption of sulfuric acid is estimated at 15,417 m3, in 617 trucks per year, but the concentration is not stated.</p> <p><b>Rationale:</b> Given the high reactivity and inherent corrosive nature of sulfuric acid combined with the volume and concentration that may be stored on site, ECCC requests that the Proponent provide a detailed risk assessment related to a terrestrial spill of sulfuric acid, specifically at the processing plant.</p>	<p>1. Provide the volume and the concentration of sulfuric acid that will be stored on site.</p> <p>2. Provide a detailed risk assessment of the fate and behavior of sulfuric acid during a release into the environment.</p>	<p>In response to Question 1 the following is noted. It is expected that a maximum of 143 m<sup>3</sup> of 93% sulfuric acid will be stored on site at any given time. Per Section 2.2.7.6.3 of the draft EIS, bulk storage tanks for chemicals that will be used for mining, processing, and water treatment, including sulfuric acid, will be located inside the processing plant, in a separate contained space away from the processing equipment. The storage tanks will sit inside appropriately designed and sized concrete secondary containment basins. The secondary containment basin for each applicable chemical system will be physically separated from the containment basins for other chemical systems.</p> <p>In response to Question 2 the following is provided. We do not feel a detailed risk assessment of the fate and behaviour of a sulfuric acid release to the environment is warranted at this time. The A&amp;M assessment has considered the transport and use on site of sulfuric acid and in neither case did the screening assessment conclude that additional more detailed assessment was needed. As noted in response to IR 222, through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the overall risk of the release of acids and bases was characterized as "moderate" and "ALARP" and as such consistent with the A&amp;M assessment methodology that scenario was not carried forward further evaluation. It was reasoned that released acids and bases dissolve in water relatively quickly and effects to local biota can be expected to be experienced on a more local basis and over a shorter timeframe. There is little likely mitigation that can be applied in that scenario and therefore, and the risk mitigation measures are limited to those that prevent accidents or reduce the probability to ALARP as mentioned in the draft EIS and Appendix 14-A.</p> <p>As noted above sulfuric acid will be stored in a dedicated area with secondary containment provided. There is no pathway from storage to the environment on which to assess risk and therefore consideration of such risks are not warranted.</p> <p>The hazard identification process considered use of sulfuric on site and its release in the process plant through a piping failure and concluded a low overall risk. It was specifically considered a low consequence event because the release would be contained in the process plant and there was no plausible pathway for the acid to the environment outside the plant.</p> <p>Overall, the risks of transport, storage and use sulfuric acid are well understood and characterized, and risks from sulfuric acid resulting from the Project to workers and the environment will be mitigated to ALARP.</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.
IR-233	HC	Human health with respect to hazardous contaminants	Appendix 14-A, Section 8.7 (p. 8.10)	<p>An effects assessment for a transportation accident scenario involving radioactive materials was not included.</p> <p><b>Context:</b> The proponent provided an effects assessment relating to a diesel spill on the ground (Section 14 Appendix 14-A, Section 8.7). However, no information was provided regarding the potential human health effects of a uranium concentrate release at the two locations considered (Section 14 Appendix 14-A p. 8.10).</p>	<p>1. Assess and describe the potential health effects (chemical and radiological) of a transportation accident involving a uranium concentrate spill at the following locations:</p> <p>a) km 160 of Hwy 914, which is the location of a cultural camp that has been established by the ERFN.</p> <p>b) km 67 of Hwy 914, which is a gathering location for the Kineepik Métis Local associated with the Northern Village of Pinehouse.</p>	<p>Such a release as envisioned by the Information Request was considered in the A&amp;M assessment (Appendix 14-A) and summarized in the draft EIS. The assessment focused generically on hazardous chemicals and utilized the release of diesel fuel to ground as a means to describe the potential spatial extent of effects and resulting consequences.</p> <p>A release of uranium concentrate to ground as the result of a transportation accident was not directly quantitatively evaluated for two primary reasons. Firstly, given the relative importance of such an event it is assumed that containment and removal would be high priorities within the emergency response and spill response plans. Response and isolation of</p>	Based on the response no revisions to the EIS, nor to the A&M technical document (Appendix 14-A) are needed.

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				<p><b>Rationale:</b> An accident involving radioactive material may have an impact on human receptors, based on the proximity of receptors and the proposed response protocols.</p>	<p>c) All other potential sites of importance for the public and Indigenous peoples.</p>	<p>the material is expected to be rapid, and clean-up is expected to be timely, efficient and complete. Secondly, the spatial extent of effects is expected to be small in size and essentially limited to the immediate vicinity of the accident location given the small size of the gamma field that would be associated with the uranium concentrate. In these regards exposure to members of the public is expected to be mitigated and based on the A&amp;M assessment methodology did not warrant consideration from a detailed perspective beyond initial screening.</p> <p>As noted in the review comment, the release to ground accident scenario focused on the two locations of interest along Hwy 914. The locations were developed with the Denison team and reflected the result of and input from Denison’s Interested Party engagement activities. These locations can serve more broadly to represent release to ground scenarios at additional locations along the transportation corridor. Since the outcomes of the accident scenarios are specifically tied to conditions at the release location as the are to the nature of the release it would not be practical to conduct such an assessment at all points of interest as suggested by the review comment. The use of representative locations, such as was done in the current A&amp;M assessment, is consistent with past practice on similar project proposals.</p>	
IR-234	CNSC	Effect of Environment	Section 15.2.2	<p><b>Context:</b> Effects of seismic events on the uranium extraction and post decommissioning are not assessed.</p> <p><b>Rationale:</b> Seismic events could further exacerbate the stability of the voids induced by the uranium extraction, which will result in extra stresses and displacements/deformation in the overlying rock formations. These extra stresses and displacements/deformation could impact on the mine operation and post decommissioning groundwater flow and contaminant transport.</p>	<p>Please provide an assessment of seismic events on the mine-induced voids stability and the resulted effects on the mine operation and post decommissioning.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>See response to IR-64 that concerns potential for ground subsidence.</p> <p>To clarify, the portion of the deposit being mined is never truly a void and what remains will be a honeycomb texture with water filled interstices. The mined area is filled with a fluid at all times, whether it be a mining solution, groundwater, or the neutralizing solution. This is different from a more traditional underground operation such as Cigar Lake where there is physical excavation of the orebody, leaving a temporary air-filled space. Although the uranium ore is high-grade by global standards it is not entirely massive in nature. As such, the uranium will be leached in a 'honeycomb' texture leaving behind a structure of partial intact rock mass with the remaining area being filled by fluid. This retains the pressure balance of the mining zone with the adjacent water-saturated rock masses.</p>	No EIS updates are anticipated to address this IR.
IR-235	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”</p> <p>RCP4.5 represents predicted climate conditions of a moderate carbon future.</p> <p>RCP8.5 represents predicted climate conditions under a high carbon future.</p> <p>The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.</p> <p><b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.</p> <p>ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a></p> <p>ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a></p> <p>The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.</p> <p>These values do not match the averages shown in Tables 15.5-1 and 15.5-2.</p>	<ol style="list-style-type: none"> <li>1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.</li> <li>2. Provide detailed calculations for the following average values: <ul style="list-style-type: none"> <li>• 25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li> <li>• 25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li> </ul> </li> <li>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</li> <li>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</li> <li>5. Compare model derived data against: <ol style="list-style-type: none"> <li>1. Natural variability of the observed data.</li> <li>2. Variability in the statistics generated via observation based time series.</li> </ol> </li> </ol> <p><b>Technical Discussion Required:</b> Yes</p>	<p>As a preamble to this IR response, Denison notes that ECCC used a different spatial scale (Geike River is a ‘large grid’ area) in the Climate Atlas compared to what was presented in Section 15 of the EIS for Tomblin Lake (which is a ‘small grid’ area). Although Tomblin Lake region is within the Geike River region, this difference in spatial scale explains the discrepancies noted by ECCC in their IR context and rationale and explains why ECCC was unable to duplicate the results.</p> <p>1. The links to the Tomblin Lake regional grid unit are as follows.</p> <p>Tomblin Lake 4.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_45/line</a></p> <p>Tomblin Lake 8.5: <a href="https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid50k/074H06/maxdaypr_2030_85/line</a></p> <p>The Tomblin Lake chart data were downloaded from the Climate Atlas for each scenario.</p> <p>2. We used average function in excel to calculate mean values from the chart data.</p> <p>Historical Mean = Average of annual mean historical values from 1976 to 2005. As shown in Table 15.5-1, the historical mean for the Max 1-Day Precipitation was 24.1 mm.</p> <p>Ensemble mean – Near term = Average of predicted annual mean values from 2021 to 2050. As shown in Table 15.5-1, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the near term mean for the Max 1-Day Precipitation was 25.9 mm under the RCP8.5 scenario.</p> <p>Ensemble mean – Far term = Average of predicted annual mean values from 2051 to 2080 As shown in Table 15.5-1, the far term mean for the Max 1-Day Precipitation was 26.7 mm under the RCP4.5 scenario. As shown in Table 15.5-2, the far term mean for the Max 1-Day Precipitation was 27.5 mm under the RCP8.5 scenario.</p> <p>3. The information in Section 15 was not used in Section 8. Section 8 PMP was conservative to account for any changes in future precipitation.</p> <p>4. The ensemble model is made up of many different models (compilation). The variability is depicted for each model, and the ensemble model predicted data are presented as the annual mean and include the 10th and 90th percentiles for each annual mean.</p> <p>5. The data in Section 15 was not used in other assessments and the PMP used in Section 8 is conservative.</p>	No EIS updates are anticipated to address this IR.
IR-236	ECCC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p><b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is</p>	<ol style="list-style-type: none"> <li>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</li> <li>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</li> </ol> <p><b>Technical Discussion Required:</b> Yes</p>	<p>1. In the draft EIS Tables 15.5-1 and 15.5-2, the maximum 1-day precipitation values were obtained from the chart data file downloaded from the Climate Atlas for the Tomblin Lake regional grid (refer to IR-235 for links to the datasets on Climate Atlas). The Historical Mean value was calculated as the average of annual mean historical values from 1976 to 2005 = 24.1 mm.</p> <p>2. The values provided in Section 15 for the maximum 1-day precipitation are correctly referenced and summarized from the Climate Atlas and have been used appropriately in the assessment. The discrepancy in spatial scale and how it effects the representation of the data between Geike River and Tomblin Lake is described in IR-235. See also response to AD-15.</p> <p>As discussed during the April 19, 2023 meeting between Denison and ECCC, the final EIS will be updated to include new tables comparing precipitation estimates for existing and future climate toas context for the Project design PMP. These have been included here as Attachment IR-236; Attachment IR-236 will be appended to Appendix 6-C of the final EIS.</p>	<p>The information in Attachment IR-236 will be added as Appendix D Summary of Precipitation Values Presented in the EIS to Appendix 6-C in the final EIS.</p> <p>The following sentence will be added to Section 15.5.2 in the final EIS:</p> <p>“Please refer to Appendix D to Appendix 6-C for a summary of precipitation values presented in the EIS.”</p>



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				highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.			
IR-237	CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>	Please see response in Attachment IR-237.	Section 16-C in the final EIS will be updated to reflect the final summary of monitoring and follow-up programs. Compared to the version contained in the draft EIS, it will be updated to include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project’s Commitment Report which will be provided as part of the final EIS documentation. Refer to Attachment IR-237 where <b><u>bold underlined</u></b> text indicates where Denison commits to revising or adding information into the final EIS.
IR-238	CNSC	Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	<p>Denison provided ERFN, KML, and the YNLR with the opportunity to review select sections of EIS prior to its submission to regulators (see Section 4.3.2.1.4 for ERFN; KML declined the invitation to review the EIS in advance of filing; Section 4.3.4.2.4 for the YNLR).</p> <p>Mitigation and monitoring was part of an in-person engagement tour undertaken in 2022 with the Indigenous and non-Indigenous Communities of Interest. Further, information about mitigation and monitoring measures were mailed out in booklets, and will be topics revisited in engagement activities set to occur in fall 2023.</p> <p>As the Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Metis Local on a monitoring regime, suited to each of their interests and needs. As part of these programs, Denison and the Indigenous community of ERFN and KML will be sharing information in an agreed-upon fashion. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc.), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>It is expected that the data collected through such monitoring regimes as described above would also be relevant to other Indigenous nations who may have interest in the Project.</p> <p>See also response to IR-28, IR-125, IR-128, IR-129 and IR-212.</p>	No EIS updates are anticipated to address this IR.

<sup>1</sup> **Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation**  
Health Canada, Water and Air Quality Bureau, October 2022

Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m3 increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:

$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \text{ }\mu\text{g}/\text{m}^3$$

$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = 1.127$$

$$\beta \times 10 \text{ }\mu\text{g}/\text{m}^3 = \ln 1.127$$

$$\beta = (\ln 1.127)/(10 \text{ }\mu\text{g}/\text{m}^3)$$

$$\beta = 0.01196$$

The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

ALCM = additional lung cancer mortality cases per 100,000 population

β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))

Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)

Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation

Years = years of project or project phase

Sample calculation:

Project estimates an exposure from relevant source(s) of 0.067 µg/m3 over 50 years of operation

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline \text{ rate} \cdot Years$$

$$ALCM = \left[ \left( e^{0.01196 \cdot 0.067} - 1 \right) / e^{0.01196 \cdot 0.067} \right] \cdot 45.5 \cdot 50$$

ALCM = 1.8 additional lung cancer mortality cases per 100,000

**References:**

- [1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: [cancer.ca/Canadian-Cancer-Statistics-2021-EN](https://cancer.ca/Canadian-Cancer-Statistics-2021-EN)
- [2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <https://doi.org/10.1186/s12889-020-08771-w>
- [3] Health Canada. Lung cancer and ambient PM2.5 in Canada: a systematic review and meta-analysis.
- [4] Health Canada, 2022. Available online at: <https://publications.gc.ca/site/eng/9.907038/publication.html>

## Attachment: IR-06

Number	IR-06
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4, Wellfield for In Situ Recovery Mining
Context and Rationale	<p>Context: This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p>Rationale: Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted . This is part of the requirement for proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p>References:</p>

	<p>[1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p.</p> <p>[2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p.</p> <p>[3] Commonwealth of Australia (Geoscience Australia). 2010. Australia's in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>
Information Requirement	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery . This information should include:</p> <ul style="list-style-type: none"> <li>• feasibility of meeting remediation targets.</li> <li>• groundwater flow conditions and validation of flow models.</li> <li>• mobilization of contaminants (e.g., Al, Se or V).</li> <li>• potential for free gas evolution/two-phase flow.</li> <li>• identifying composition of lixiviant and production solutions.</li> <li>• success despite presence of &gt;2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A).</li> <li>• site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li> </ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>



### **Response to IR-06 Part 1**

Denison used the ISR mine design and the 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells to determine the potential interactions between mining activities and the environment. Two key outputs from the ISR mine design and 3D hydrogeology modelling work were used as inputs for the groundwater assessment (Section 7): 1) The extent of mining solution migration away from the injection and recovery well screens, as defined by the mining area (50m above the ore zone and within the freeze wall) and 2) groundwater quality of the mining area following remediation. Monitoring will be completed during operations and decommissioning to confirm these inputs.

During the operation phase, and under normal operational conditions there is no interaction between the mining area and surface or down gradient environment, and the assessment focuses on the post-decommissioning period following removal of the freeze wall, once the groundwater flow paths return to pre-mining conditions.

Denison provided the FIRT team with a presentation and summary of the test work completed to date on June 16, 2023, to address IR-06. Summaries of relevant field and lab tests including the 2021 Tracer Test, 2022 Feasibility Field Test (FFT), and various site-specific lab tests are provided as part of this IR response and additional details will be provided to support licence applications.

#### **Tracer test**

An ion tracer test was completed in 2021 and the key results are summarized as follows:

- The test achieved the commercial-scale production flowrate assumed in the 2018 Pre-Feasibility Study (SRK 2018).
- The test demonstrated hydraulic control of injected solution. No elevated values of the tracer were observed in the monitoring wells surrounding the commercial-scale test pattern.
- The test established breakthrough times between injection and recovery wells, spaced 5 to 10 meters apart, that were consistent with previous proof of concept hydrogeological modelling conducted by Petrotek Corporation.
- The clean-up phase completed after the conclusion of the tracer test demonstrated the ability to remediate the test pattern. The clean-up phase was successful; the tracer concentrations were reduced to as low as 4% of peak test levels within eight days of remediation.

#### **Feasibility Field Test (FFT)**

The purpose of the FFT was to validate previous field and laboratory testing and determine the feasibility of the ISR mining methodology. The leaching and neutralization phases of the FFT were completed in 2022. The leaching phase was designed to assess the effectiveness of the ISR mining method. This phase included controlled injection of an acidic solution into the mineralized zone with recovery of the solution through existing test wells. The neutralization phase involved the injection of a mild alkaline (basic) solution into the leaching zone to neutralize the area and verify the groundwater in the area is returned to acceptable, permitted conditions.

The FFT provided the following results:

*Leaching Phase:*

- Recovered approximately 14,400 lbs U<sub>3</sub>O<sub>8</sub> over ten days of active leaching following completion of initial acidification of the Leaching Area.
- Returned maximum uranium head grade of recovered solution of 43 g/L when the leaching phase of the FFT was completed, with grades still rising (indicative of the ramp-up segment of a well production profile).
- Achieved suitable acidification for ISR mining within 7 days post initial injection at 5 metre well spacing (GWR-41) and within 17 days for 10 metre well spacing (GWR-38).
- Demonstrated ability to achieve and maintain uranium mass flow rate consistent with the assumptions in the 2018 Pre-Feasibility Study (SRK 2018).
- Further demonstrated hydraulic control of injected solution during the FFT, reporting no responses in the monitoring wells outside of the designed FFT test area.
- Confirmed breakthrough times between injection and recovery wells, consistent with the Project's hydrogeological model and the previously completed tracer test.

*Neutralization Phase:*

Sampling of groundwater monitoring wells around the FFT site has confirmed the successful restoration of the leaching zone to environmentally acceptable pH conditions, as outlined in the applicable regulatory approvals for the FFT and summarized in Table IR-06-1 below.

**Table IR-06-1: Feasibility Field Test Leaching Zone Remediation Targets compared to Interim (December 2022) Groundwater Well Monitoring Results**

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
pH	pH units	3.5	6.24
Aluminum (Al)	mg/L	9.1	3.3
Arsenic (As)	mg/L	0.7	0.05
Barium (Ba)	mg/L	0.2	0.07
Calcium (Ca)	mg/L	535	203
Cadmium (Cd)	mg/L	0.3	0.00001
Cobalt (Co)	mg/L	0.24	0.0001
Chromium (Cr)	mg/L	0.38	< 0.0005
Copper (Cu)	mg/L	0.19	0.001
Iron (Fe)	mg/L	390	144
Potassium (K)	mg/L	45	185
Magnesium (Mg)	mg/L	8.92	22.6
Molybdenum (Mo)	mg/L	0.16	0.04
Sodium (Na)	mg/L	628	193
Nickel (Ni)	mg/L	1.17	0.02
Lead (Pb)	mg/L	2	0.04
Sulfate	mg/L	4,147	1114
Selenium	mg/L	0.47	0.0002
Uranium	mg/L	501	85

Parameter	Units	Leaching Zone Remediation Target	Neutralization Phase Results <sup>1</sup>
Vanadium	mg/L	19.3	0.2
Zinc	mg/L	17.1	0.5

<sup>1</sup> Results are the average of three groundwater monitoring wells (GWR-038, -040 -041) sampled in December 2022

## **Response to IR-06 Part 2**

Field programs conducted over the past 4.5 years were focused on de-risking key elements related to the implementation of the ISR mining methodology specific to the Phoenix deposit in a high-grade Athabasca Basin setting. These key elements were focused on:

- Permeability
- Leachability
- Containment
- Processing

De-risking programs were carried out in the lab and field setting initially on an individual basis. As the programs progressed, elements were combined in additional test work ultimately culminating in the FFT, where all elements were evaluated in a single test to inform the design of ISR.

### ***Response to IR-06 Part 2a: Feasibility of meeting remediation targets***

Groundwater remediation targets provided in the draft EIS were derived from metallurgical test results completed from 2017 to 2021 with over 125 kg of material recovered from Phoenix deposit that underwent leaching and neutralization test work (see response to IR-67). In 2022 and 2023, metallurgical test work continued to further optimize remediation and strategies and confirm test work results presented in the draft EIS. It is expected that metallurgical test work will continue in the future to further optimize remediation targets, and this will be advanced through updates to the Decommissioning Plan.

The FFT provided additional confirmation that pH target and remediation targets could be met. Data gathered during the neutralization phase of the FFT provide confidence that groundwater targets proposed in the draft EIS can be met technically and economically.

Based on laboratory testing and the results of the 2022 field testing, subsurface remediation is planned to consist of rinsing the ore zone with 35 pore volumes of fresh water, slowly raising the pH and then pumping about 75 pore volumes of basic solution through the same portion of the ore zone. This basic solution will in effect further raise the pH to a level that impedes further leaching of the deposit and reduces aqueous concentrations of contaminants of concern to below their environmental target levels.

### ***Response to IR-06 Part 2b: Groundwater flow conditions and validation of flow models***

#### **Background of Data Collection**

Hydrogeological investigations have been ongoing in the field and in laboratories since 2014. Packer, open hole, and cross hole tests have been completed in conjunction with exploration drilling programs. As well, permeability tests have been completed on sections of available competent core within the

Phoenix deposit. Open hole water level surveys have been completed across the site in 2015, 2017, 2021 and 2022. The hydraulic conductivity related field and laboratory test work data are summarized in Table IR-06-2.

Table IR-06-2: Hydraulic Conductivity Related Data Set from Phoenix and Regional Wells

Test Type	Location	Number of Data Points <sup>1</sup>
Field – Packer / Injection / Pumping / Slug	Athabasca Group	56
	Unconformity	173
	Basement	20
Lab – Permeability	Athabasca Group	721
	Unconformity	1149
	Basement	1250
Total		3,369

Note: <sup>1</sup> This is not necessarily the number of tests conducted, as a single test can yield multiple data points.

Additionally, the following hydrogeological characterization work has been completed at Phoenix:

- Geophysics surveys including:
  - Neutron survey x 5
  - Borehole or nuclear magnetic resonance (BMR or NMR) x 10
  - Sonic x 1
  - Acoustic televiewer x 9
  - Gamma/caliper x 9
  - Electromagnetic flow meter (EMFM) x 9
- Tracer Test (2021)
  - Advanced FFT (2022)

Lithology at Phoenix is considered in terms of nine HGUs that have been defined to be present adjacent to or define the main Phoenix mineralized zone (Phases 1 to 5) including:

- HGUs 1a and 1b: Athabasca Group (overlying the mineralized zone)
- HGU 2a: Upper clay cap
- HGUs 2b, 2c, 2d: Main body of the mineralized zone
- HGU 2e: Lower clay cap
- HGUs 3a and 3b: Weathered and unweather basement.

In the mineralized zone, HGUs 2b, 2c and 2e (in that order) have the highest hydraulic conductivities.

Hydraulic conductivity values in the mineralized zone in Phase 1 average  $1\text{E-}06$  m/s, with the southeastern half of the phase generally having higher values than the northwestern half. Phases 1 and 3 do not appear to be hydraulically connected. In Phase 2 there is considerably less data than for Phase 1. There appears to be no hydraulic connection between Phases 1 and 2. Based on aquifer testing and electromagnetic flow meter (EMFM) data, mineralized zone hydraulic conductivity values in Phase 2 ( $\sim 4\text{E-}06$  m/s) are on the same order of magnitude as those in Phase 1 and approximately one order of magnitude greater than those in Phases 3 and 4. In Phase 3 the mineralized zone hydraulic conductivity values ( $\sim 6\text{E-}07$  m/s) average one order of magnitude lower than those in Phase 2. The mineralized zone Phase 4 has been tested at four locations. With one exception, all values obtained from pumping, injection and slug tests have been in the range  $1\text{E-}08$  to  $8\text{E-}07$  m/s. The hydraulic conductivity values ( $\sim 3\text{E-}07$  m/s) are on the same order of magnitude as those in Phase 3. Much of the mineralized zone water in Phase 4 is capillary bound, but there are some reasonably fractured intervals in Units 2c, 2d and 2e. Comparison of mineralized zone hydraulic conductivities, averaged by mining phase, indicates that Phases 1 and 2 have the highest values due to the large presence of a thick and relatively continuous section of HGU 2b in these phases. Phases 3 and 4 have intermediate values and Phase 5 has the lowest permeability due to a thinner HGU 2b unit, and relative abundance of the clay zones in this phase.

There are several lines of evidence (from laboratory testing, observations during the FFT and geomechanical modelling of the deposit) that localized hydraulic conductivity increases may occur due to the dissolution of uranium from the mineralized zone.

#### Numerical Modelling

Numerical groundwater modelling has been conducted by SRK (2018), Petrotek (2020 and 2021), and Ecometrix (draft EIS Appendix 7-C). The degree of complexity and the purposes of these models have varied. SRK (2018) created a two-dimensional model that was bound by geological outline of the defined mineral resource in the mineralized zone as part of their PFS. This simplified approach was used based on the assumption that there was a freeze cap above the deposit (the earlier version of the freeze wall). Homogenous K values were assigned to the model and incrementally increased by roughly half an order of magnitude to estimate flow rates.

Petrotek (2020, 2021) built and calibrated several models which had differing purposes. These models were calibrated to the observed responses to aquifer tests conducted in 2019, 2020 and 2021 but they assumed that there was no vertical heterogeneity within mineralized zone and only simulated the response in Phases 1 and 3. Potential well configurations and well spacings were investigated and used to predict the response to the 2021 tracer testing. A high degree of variability in the travel times from the various injection wells and to the pumping wells was found. The variability was attributed to the high degree of heterogeneity in hydraulic conductivity and storage within the mineralized zone. One of the main purposes of this work was to provide a demonstration of proof of concept for application of ISR to the Phoenix deposit.

EcoMetrix (draft EIS Appendix 7-C) developed a regional three-dimensional FEFLOW groundwater flow and transport model that was used to both evaluate residual effects from the FFT and then as part of Denison's draft EIS to examine the post decommissioning effects on regional receptors. The model was calibrated to the regional groundwater flow patterns, was consistent with their conceptual model and was also consistent with the observed hydrochemistry in the Upper and Lower Sandstone Aquifer systems. The groundwater flow in the vicinity of the deposit was observed and simulated in the calibrated groundwater model to travel eastward within the Lower Sandstone Aquifer before moving upward through the desilicified zone in the Athabasca Group sandstone units and overlying overburden deposits toward Whitefish Lake.

As part of the Feasibility Study, Denison retained Dr. Walter Illman and his Ph.D candidate Ning Luo from the University of Waterloo. The University of Waterloo group conducted hydraulic tomography (HT) analysis of the hydraulic test data from the Phoenix deposit to aid in the characterization of the subsurface heterogeneity in  $K$  and specific storage ( $S_s$ ). The areas of the HT model, with high confidence estimation were incorporated into the 2023 WSP FEFLOW model as they represented the best estimation of the 3D distribution of the hydraulic conductivity and storativity. The FEFLOW model is a numerical representation of the site hydrogeology and groundwater flow regime in the mineralized zone and was calibrated to hydraulic testing data that has been collected for the site. FEFLOW model specified well designs including well screen locations and any planned permeability enhancements to specific wells or HGUs within wells.

The FEFLOW results were used as an input into GoldSim (GoldSim V14, Technology Group, LLC). GoldSim is a mathematical model that uses the outputs from FEFLOW to estimate the uranium dissolution by HGU and by extraction well with time. GoldSim simulated the dynamic nature of the lixiviant injection and uranium recovery systems associated with the wellfield.

#### Recovery Curve

The test work and derivation of the recovery curve from laboratory testing that has been standardized to one condition and grade. The recovery curve indicates the concentration of uranium bearing solution (UBS) produced as a function of pore volumes (PVs) recovered. Therefore, by determining the hydrogeological flow field for an array of injection and recovery wells and the related PVs recovered with time, an aggregate wellfield recovery can be calculated by applying the recovery curve to each recovery well's PV distribution.

The recovery curve is scaled in the modelling to account for variations in in situ grade.

#### Hydrogeological Modelling

The numerical groundwater flow modelling methodology was conducted using FEFLOW and was described earlier. The physical setting of the mineralized zones was numerically represented in FEFLOW based on the Denison geological block model. FEFLOW was used as the basis of wellfield layout and the



simulation of the lixiviant flow within the mineralized zone. For production modelling, the following values for each of the FEFLOW numerical elements in 3 dimensions was output:

- Production unit or well capture zone that element belonged to
  - Flow per unit time
  - Element volume
  - Effective porosity
  - HGU and uranium in situ grade

#### Wellfield Production Modelling

Using the FEFLOW simulation outputs for each mesh unit, GoldSim calculated the uranium recovery based on the number of PVs through the unit and the corresponding concentration of  $U_3O_8$  in each recovery well. The mesh units are aggregated based on the associated recovery well number from FEFLOW.

Wells are started and stopped in GoldSim to simulate the progression of mining in the wellfield. Well starting is set manually. The end of operation for each well is determined by a cutoff recovery grade. In this way the overall production from the wellfield is controlled to provide process plant feed of the required flow and grade over time. At a detailed level, well operating times can be adjusted to smooth the mass flow rate of uranium to the plant, within the limits of the model granularity.

Optimizing the production rate and total quantity required several iterations of FEFLOW and GoldSim modelling. GoldSim outputs were analyzed to identify wells that were under-performing compared to expectations. The number and position of injection and recovery wells and their flow rates were adjusted based on these results, and the FEFLOW model was re-run. This iterative process involved examination of the under-performing areas and adjustment to the flows in these areas in both FEFLOW and GoldSim.

Throughout the optimization iterations, the number of unexpected low-performing wells was reduced. When it appeared the effort had reached its asymptote the remaining low performing wells were reviewed. A statistical analysis showed that four wells patterns or production blocks were outliers. These four wells that were located in areas with otherwise consistent recovery had shown more reasonable response in prior iterations. The results from these four production units was therefore assumed to be non-representative. It was assumed these production units can be mined by varying the pumping rates, wellfield stimulation and/or adding possibly adding additional wells. Recovery from these four wells were therefore added at the average rate per HGU for their Phase and included in the overall production.

Data gathered during the field tests have been utilized for both the EA groundwater model as well as the mining model.

#### ***Response to IR-06 Part 2c. Mobilization of contaminants (e.g., Al, Se or V)***

Contaminants mobilized during the FFT were similar in concentration compared to the UBS solutions that were collected during lab scale core and column leach testing at SRC which suggests that the testing Denison conducted at lab scale and the information collected is representative of the deposit. The column test assay results in Table IR-06-3 below include the maximum as well as weighted average from all phases of the leaching and remediation test. The FFT result presented in Table IR-06-3 below was the sample with the highest concentration of uranium during the test.

**Table IR-06-3: Potential for Mobilization of Contaminants - Comparison of Results from Lab Scale Column Tests and Groundwater Results from the Feasibility Field Test**

Analyte	Column Tests		FFT
	Max	Weighted Avg	GWR-041, Oct 13, 2022
U, ppm	48222.3	13902.0	43400
Al, mg/L	783.9	284.1	180
Fe, mg/L	7029.1	1757.4	1200
Ca, mg/L	1135.1	445.8	1100
Mg, mg/L	672.3	170.5	10
K, mg/L	329.6	54.0	150
Na, mg/L	927.4	52.0	90
Pb, mg/L	16.4	3.3	1
Mo, mg/L	296.6	24.8	15
P, mg/L	44.5	6.8	20
Cd, mg/L	6.2	0.2	0
Mn, mg/L	263.3	57.9	83
Cr, mg/L	14.1	0.8	5
V, mg/L	148.3	33.8	22
Sr, mg/L	17.1	2.5	16
Ba, mg/L	6.4	1.9	5
Cu, mg/L	1610.8	280.8	2
Zn, mg/L	1276.2	38.8	5
Co, mg/L	49.3	4.1	1
Ni, mg/L	166.2	6.6	1
As, mg/L	95.9	10.4	3
Se, mg/L	1.6	0.1	1
S, mg/L	24115.4	14740.9	12333

***Response to IR-06 Part 2d. Potential for free gas evolution/two-phase flow***

Calcium carbonate is known to be present in the deposit in relatively low percentage amount. The reaction between acid and calcium carbonate can release CO<sub>2</sub> gas and therefore cause two phase flow, especially when going from the hydrostatic pressure of the deposit to the atmospheric pressure at surface which will encourage degassing of solution. It is expected two-phase flow will occur during the mine life, especially as carbonate containing material are being decomposed with the sulfuric acid of the lixiviant. The FFT provided confirmation that the proposed radon degassing surge tank directly fed by

downhole recovery pump is adequate for operations and does not pose additional Health & Safety or environmental risks.

***Response to IR-06 Part 2e. Identifying composition of lixiviant and production solutions***

As part of the metallurgical test program, over 125kg of core from the Phoenix deposit has been leached in a variety of settings, including bottle rolls, column tests, and intact core tests. This has helped to predict concentrations of both the lixiviant as well as the production solutions.

The lixiviant (mining solution) concentrations will vary depending on each individual well production profile. To ensure reagent consumption is effective and efficient it will be varied during the life of each well dependent on its characteristics.

The initial acidification of the well requires a lower acid content to ensure the formation does not plug due to precipitation, whereas during periods of high production the well can accept a higher acid concentration. Towards the end of the recovery curve, the uranium is more difficult to access and therefore the strength of the acid or the flow rate to the well need to be optimized to ensure efficient use of reagents.

It is expected that the lixiviant concentrations will vary between 0-60 g/L H<sub>2</sub>SO<sub>4</sub>, and 0-20g/L H<sub>2</sub>O<sub>2</sub> and will be situationally dependent. There is also the capability to add Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, however it is not expected that this will be required in significant concentration due to the natural abundance of iron in the deposit.

**Table IR-06-4: Representative Concentration Ranges of Uranium Bearing Solution**

	<b>Lower-end Concentrations</b>	<b>Upper-end concentrations</b>
<b>U, ppm</b>	2976	116395
<b>Al, mg/L</b>	25.8	8506.1
<b>Fe, mg/L</b>	134.0	21737.9
<b>Ca, mg/L</b>	99.7	10736.0
<b>Mg, mg/L</b>	21.7	1776.4
<b>K, mg/L</b>	8.0	756.2
<b>Na, mg/L</b>	7.0	5361.9
<b>Pb, mg/L</b>	0.1	124.5
<b>Mo, mg/L</b>	0.1	64.8
<b>P, mg/L</b>	4.0	276.6
<b>Cd, mg/L</b>	0.1	66.4
<b>Mn, mg/L</b>	8.0	980.7

	Lower-end Concentrations	Upper-end concentrations
Cr, mg/L	0.1	145.9
V, mg/L	3.4	942.4
Sr, mg/L	0.6	178.8
Ba, mg/L	0.1	104.8
Cu, mg/L	1.7	1337.9
Zn, mg/L	2.7	987.9
Co, mg/L	0.5	114.9
Ni, mg/L	0.1	216.4
As, mg/L	0.1	96.5
Se, mg/L	0.1	203.2
S, mg/L	1751.3	29671.1

***Response to IR-06 Part 2f. Success despite presence of >2% carbonate minerals (siderite, FeCO<sub>3</sub>) in the ore zone (see Table 4-3 of Appendix 7-A)***

The metallurgical test work and FFT completed to date has shown that carbonate minerals present in deposit does not pose a material impact on the ISR mining method proposed for the project.

***Response to IR-06 Part 2g. Site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.)***

Please see summary above under response to IR-06 Part 2b under the heading Background of Data Collection.

### **Response to IR-06 Part 3**

Expected total recovery from deposit is 80.6%. Average uranium concentrations recovered from wellfield is estimated to be 22.5/L U. The nominal case ISR wellfield reagent consumptions are shown in the Table IR-06-5.

Table IR-06-5 Nominal ISR Wellfield Reagent Consumptions

<b>Area</b>	<b>Reagent</b>	<b>kg/kg U in feed</b>	<b>kg/m<sup>3</sup> UBS feed</b>
In situ leach (ISL)	93% sulphuric acid	1.40	12
	70% hydrogen peroxide	0.40	-
	50% ferric sulphate	0.024	-
ISL remediation	50% sodium hydroxide		15

Solutions recovered contain minimal solids based on test work completed to date. Any entrained solids in solutions will be removed through the precipitation circuits of the process plant. Should they contain appreciable of uranium, solids can be processed at another licensed facility.

#### References:

Petrotek. 2020. Interim Hydrogeologic Report – Wheeler River Project Phoenix Deposit. Unpublished report prepared for Denison Mines Corp. March 2020.

Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.

SRK Consulting. 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report prepared for Denison Mines Corp. October 2018

## Attachment: IR-10

Number	IR-10
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall
Context and Rationale	<p><b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).</p> <p>As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.</p> <p><b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.</li> <li>2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.</li> </ol>



	<p>3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.</p> <p>Technical Discussion Required: Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause</p>
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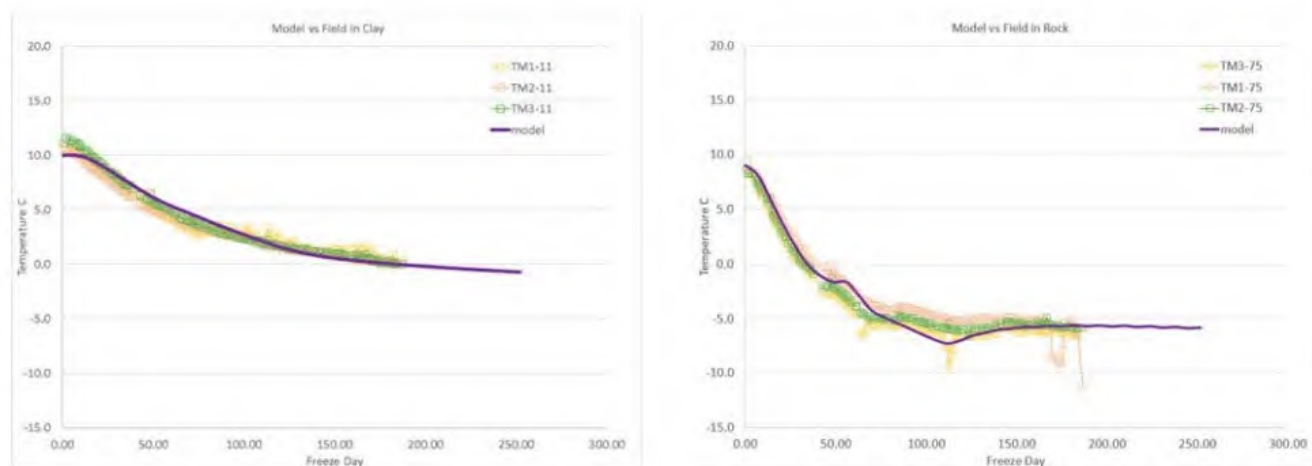
Response:

The general theme of the comments and questions stated above seem to be related to:

- verification of the freeze wall extents;
- response of the freeze wall to potential chemical interaction with the lixiviant;
- response of the freeze wall to induced hydraulic or lithostatic stress; and
- response of the freeze wall to potential exothermic processes related to ISR.

The alignment of the freeze wall is located 25 m offset from the lateral extent of the recoverable ore and the freeze wall will grow in thickness both towards the ore and away from the ore. The freeze wall will solidify all liquid porewater and develop into a contiguous impermeable barrier many metres thick. Ground temperature monitoring will be installed on both the ore and non-ore sides of the freeze wall to confirm the thickness of frozen ground and to validate thermal finite element models of the entire area. Thermal models can very accurately represent real conditions because ground thermal properties used in the analyses only vary by a factor of two to four across all ground types, unlike hydraulic or strength properties, which can vary by many orders of magnitude across relatively short distances.

The figures below are an example of field data validating modelled predictions for a shaft freeze wall at depth.



**Figure 1: Illustration of a calibrated FEM model for freezing in clay (left) and rock (right). Temperatures were measured offset from the freeze wall pipe locations and compared with model predictions at the same location.**

The injection and recovery wells will be set up such that they are within the confines of the ore itself and migration of fluids towards the freeze wall and through non ore ground between the ore and freeze wall should be minimized because hydraulic gradients will induce preferential flow to recovery wells and away from the freeze wall. Having said that, if significant excursion of lixiviant were to occur and it were to contact the freeze wall, it is not expected to chemically dissolve the in situ ice. The freezing point depression of the lixiviant proposed for this project was determined to be  $-1^{\circ}\text{C}$  and, as such, it would freeze off and become immobile before significant volume could negatively impact the freeze wall. If the lixiviant were to dissolve some of the host soil / rock binding material at the freeze wall surface, it would occupy the resulting void space, but then freeze off, which would halt further migration within the freeze wall.

Freeze walls, when fully developed, are capable of withstanding significant external pressures because the ice in the pore voids greatly improves the bulk strength of the soil. For example, in the province of Saskatchewan, ground freezing is used to support the sinking of deep potash mine shafts, which must penetrate through the Mannville formation at a depth between 400 and 500 m below surface. The Mannville formation is often described as saturated, unconsolidated beach sand and it would not support shaft excavation in a thawed state. Freezing is used to create a structural and impermeable wall up to 5 m thick, which can resist a stress gradient driven by full hydrostatic and/or lithostatic pressures on the outside of the wall, and an open to atmosphere excavation within the shaft. This loading condition is much more extreme than any condition the freeze walls at the Phoenix deposit will experience because the interior side of the freeze wall where active ISR mining is occurring is not open to atmosphere and is fluid filled in the same way that the regional groundwater system is on the exterior side of the freeze wall, creating a balanced pressure system, where loading is equal on both the interior and exterior sides.. While freeze walls are very strong when fully developed, they are also plastic in nature. This means that they can slowly deform without failing in response to localized ground deformations. As the freeze wall deforms towards a lower stress zone, it maintains its thickness and integrity. While the above example referred to potash shafts, other examples can be drawn from the experience at the McArthur River or Cigar Lake uranium mines. At McArthur River, open stopes are generated directly adjacent to a freeze wall that is a nominal 4 m thick. At Cigar Lake, open mine cavities 10 m high and several metres in diameter commonly exist within the frozen ground. Neither site has had a breach of the freeze wall during mining activity. Given that the freeze wall at Denison will be much thicker than at McArthur River and that it will be located up to 25 m from the ore zone, it is not anticipated that it will be exposed to a stress environment that will put it at risk.

The leaching process has the potential to be exothermic and generate heat, which may flow toward the freeze wall. In this instance, there is low sulphur content in the ore zone and the exothermic reaction will be minimal. Despite this, all thermal modelling in support of the freeze design assumed that the freeze wall had to develop and be sustained in the presence of an ore zone that generated a nominal amount of heat—sufficient enough to sustain a minimum temperature of  $10^{\circ}\text{C}$  even though it would naturally tend to cool below this in response to the freeze system. It is understood that the lixiviant may be heated as part of the pre-injection process, so some accounting for heat in the ore zone was included in the analysis to date. Should the lixiviant generate more exothermic reaction than predicted, there is a very low risk of it degrading the freeze wall in any significant amount. Referring back to the potash mine shaft freezing illustration, it is not uncommon for in shaft excavation activity and concrete work to

generate temperatures between 30 and 60°C that act on a freeze wall only 5 m thick and only a few metres away from the exposed shaft wall. In this extreme case, the freeze wall is more than capable of removing the generated heat. The physics of heat flow are such that heat generated by the ISR process would be free to flow towards the freeze wall; however, most of it would flow to the coldest location (e.g., the actual freeze pipes at the mid-point of the wall thickness) before it is manifested as an observable significant rise in ground temperature. Even if the heat were to warm the ore side of the freeze wall, it would not impact the non-ore side of the wall (which is where half of the total wall thickness resides). This heat may penetrate to the center of the wall but if the refrigeration plant is operating, that heat can not then flow “up gradient” on the non-ore side of the wall and thaw that side.

The concentration of the lixiviant (max ~8% sulfuric acid conc.) has a freezing point of ~-4°C. The lixiviant itself will not react chemically with the freeze wall, other than having a slightly different freezing point than formation water. The main reaction expected is dissolution of uraninite with the combination of sulfuric acid, hydrogen peroxide, and ferric iron. This reaction is exothermic, but there are several natural mitigating factors of the wellfield that aid in minimizing heat transport to the freeze wall:

- The wellfield will have flexibility in terms of reagent concentrations being added. With the bulk of the uranium being contained within a higher-grade core (interior to the deposit), the exterior of the deposit will see either lower injection/recovery flows or lower concentrations of lixiviant to be efficient with reagent consumption. Whether the concentration or flow is reduced, this limits the reaction rate and therefore total heat generation at the extremities of the deposit.
- There is no refortification of reagents underground compared to typical uranium tank leaching. This prevents additional heat generation from dilution of sulfuric acid or hydrogen peroxide.
- The heat capacity of lixiviant/UBS should be higher than the ore in the deposit, which means the UBS solution will carry the majority of the heat to surface rather than keeping the heat of reaction at depth.
- In the event the freeze wall thickness monitoring network detected an actionable thinning to the freeze wall, the concentration of lixiviant could be decreased which would reduce the heat generated per m<sup>3</sup> of lixiviant and re-establish the desired freeze wall thickness.

To summarize the risk of the degradation of the freeze wall due to exothermic reaction, it is almost impossible—with the freeze plant operating—to practically add sufficient sustained heat to thaw the proposed freeze wall to the point hydraulic containment is compromised. Sufficient operational controls will be in place to verify the freeze plant is operating, to measure the temperature in the ore zone, and to measure the temperature on adjacent sides of the freeze wall so that early detection of any upset conditions can be identified and addressed. Options for addressing issues are to lower the temperature of the freeze system to draw more heat out, to increase the freeze coolant flow rates in freeze wells nearer to active ISR cells, or to adaptively manage the lixiviant injection and recovery rates in cells located nearer the freeze wall.

## Attachment: IR-18

Number	IR-18
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.2.3.9, Project Description Appendix 8-E
Context and Rationale	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent's responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>
Information Requirement	1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.

	<p>2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</p> <p>3. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</p> <p>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</p> <p>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</p>
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Supporting table to the response provided in IR table:

Table 2.2-1 - Upper Bound Industrial Wastewater Treatment Plant Effluent Quality (updated)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration
Chloride	mg/L	120	SEQG/CCME	<b>600</b>
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>
Sulphate	mg/L	128	BC MOE	<b>3915</b>
TDS	mg/L	500	SEQG	<b>6420</b>
TSS	mg/L	15	Schd 4 - MDMER	6
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>
Lead	mg/L	0.005	CCME	0.0003
Molybdenum	mg/L	0.07	WHO	2.5
Nickel	mg/L	0.07	WHO	0.014
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>
Vanadium	mg/L	0.12	FEQG	0.059
Zinc	mg/L	0.1	FEQG**	0.042
Mercury	mg/L	0.000026	SEQG/CCME	0.000001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078
Phosphorus	mg/L	0.015	BC MOE	N/A
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>
Lead-210	Bq/L	0.2	HC	<b>0.419</b>
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>
Notes (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia calculated				



## Attachment: IR-20, IR-67, IR-69

Number	IR-20
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.1  Appendix 7-C
Context and Rationale	<p><b>Context:</b> The proponent's objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The proponent's acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCAN's opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the proponent's decommissioning groundwater quality objectives. Therefore, the proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>
Information Requirement	NRCAN requests that the proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.

Number	IR-67
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.1 (Remediation Objectives)
Context and Rationale	<p>Context: Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices. Rationale: The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given</p>

	its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).
Information Requirement	1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities. 2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining. 3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.

Number	IR-69
Dept.	NRCAN
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3  Appendix 7-C, sections 3.1 and 3.2
Context and Rationale	<p><b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-C, sec. 3.1.2). According to the proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCAN's opinion, the proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This information is important when considering source terms in reactive transport modeling.</p>
Information Requirement	NRCAN requests that the proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.

Response:

It is also important to note that Denison is completing a sequential EA and licensing process for the Project (see draft EIS Section 1). Detailed ISR mining-related information needed to support licensing

and permitting has not been included in the EIS; it will be provided to regulators as part of permitting and licensing.

For the EIS, an initial understanding of the mining area remediation was needed to initiate the assessment of migration of constituents of potential concern in groundwater out of this area in the post-decommissioning period. The findings and conclusions of the EIS were also used, in turn, to inform and bound the engineering and feasibility work. The coreflood 2b and 3c, plus the Pre-Feasibility work (Denison, 2018) on mining area remediation (Section 2 (decommissioning section), Section 7, Appendix 7-C) was used in the draft EIS. This IR response provides additional information to support the selection of these studies.

#### Response to #1

### **1.0 Summary of Test Work**

This response is focused on the metallurgical test work done to support an understanding of the:

- a) mineralogy and hydrogeochemical changes in the ore and barrier zones as a result of the lixiviant (mining solution) injections (see IR-69);
- b) the composition of the uranium bearing solution (UBS) at the end of mining and prior to any remediation (see IR-20); and
- c) water quality and secondary mineral phases formed during remediation of the ore zone (IR67; this IR).

Metallurgical testing completed, the objectives and results of the work, and the information carried forward for discussion in this response are summarized in Table 1.

Further details on the metallurgical testing, including the sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition) are provided in the sections below. All data presented herein are from the metallurgical test programs used to support the 2018 Prefeasibility Study (Denison 2018) and the Feasibility Study (Denison 2023).

Table 1: Summary of Metallurgical Testing

Years	Description	Objective	Results	Information informing IR-20, IR-67 and IR-69
2017-2018	Batch leach tests and bottle roll/agitation leach tests	Early testing of leaching with alkaline and acidic based lixivants	Supported decision for Acid Leaching	No discussion herein; very preliminary testing.
	A column leach test conducted using sulfuric acid followed, which also included simulated groundwater restoration tests.	Initial column test with acid leaching and evaluation of groundwater remediation	Early indication of groundwater remediation needs	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation)
2021	Column leach tests on blended crushed ore	Test leach recoveries on a range of feed grades. Determine potential recovery and generate a representative sample for process plant testing.	Operationally, the feed sample for Column 1 is was verified as a reasonable blend to represent ISR wellfield production of UBS. Groundwater remediation with groundwater and alkaline solutions	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Column leach and remediation tests on crushed and screened core from individual hydrogeologic units	<ul style="list-style-type: none"><li>•Develop information to support geochemical modelling of the deposit, including leaching and neutralization phases.</li><li>•Generate a detailed chemical and mineralogical characterization of the dominant hydrogeological units(HGUs) within the ore zone</li><li>•Evaluate behaviour of different HGUs during ISR and neutralization, in particular those hosting the majority of the resource.</li><li>•Compare the efficacy of neutralization of different HGUs, with the use of dilute sodium hydroxide</li></ul>	Uranium leachability was found to vary amongst the HGUs. Also, there were some indications of an HGU ("2A") to be avoided during operations to prevent clay mobilization.	Water Quality of UBS at the end of mining.
2018	Static uranium ore dissolution (jar) test on intact core	Room temperature, 1,138 hours (48 days) exposure of drill core to concentrated sulphuric acid (35 g/L) in a very slow-motion shaker.	Provided visual indication that with sufficient soak time, lixiviant will penetrate into intact high grade uranium pieces. The incomplete recoveries at the end of the tests can be attributed largely to requiring longer residence time	No discussion herein; testing limited to visual information.
2018-2022	Coreflood tests on intact core in 2018 to 2022	Simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Objectives were to: evaluate the rate of uraninite dissolution and changes in permeability of the core with leaching; generate laboratory scale test results applicable to planning the 2022 field test; and delineate a life-of-well-pattern production profile.	<p>Results were inconsistent in the early work (Coreflood 1 to 3C) due to highly variable reagent dosages in this pioneering work. Coreflood 4 and 5 (2021-ongoing).</p> <p>In Coreflood 4, as uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase. Lessons learned from past testing, particularly with respect to reagent adjustments, were put into practice with this testing to enable completion of the longest test run to support the feasibility work. In total, 51.8% of the initial dry mass of the sample was removed by leaching; 50% of this was the result of uranium leaching. Feed grade was 26.66% U3O8.</p> <p>In Coreflood 5 is ongoing and is focused on HGU 2B, which has the majority of contained uranium, highest grade and highest natural permeability. The methodology was different from the other coreflood tests in that the flow was directed through a pencil hole in core. Cumulative recovery at end of February 2023 was 33%.</p>	Water Quality of UBS at the end of mining and Restoration Phase/flushing solution (groundwater remediation). Mineralogy.
2022	Feasibility field test (FFT) leaching and remediation in 2022	The FFT was a full-scale proof of concept in an ISR method; to demonstrate injection of lixiviant and recovery of UBS from the CSW test pattern. Injection was into 1 well (GWR-041).	After pH below 3 was achieved in GWR-041, active leaching of uranium began. UBS grade from GWR-041 rose while pH declined. Uranium grade trended upwards to 25 g/L over four days, while injection pressure decreased. This suggests that leaching played a role in reducing resistance to flow. A peak sample grade of 43 g/L U was collected from GWR-041 after a further three days, so the acid injection phase was ended (on October 12). A global leaching recovery curve could be developed using the field testing and coreflood tests.	No discussion included herein.

### **1.1 2018 Column Leach and Groundwater Restoration Test**

In early 2018, a column leach test with acid lixiviant was performed. The core material used for testing came from three drill holes. Select intervals of overlying very low-grade sandstone was blended with very high-grade intervals to create a composite feed grade of 24.2% U. Details on the core material used in the leach tests are provided in Appendix A to this response, in Table A1.

A total of 137 pore volumes (PVs) of uranium bearing solution (UBS) was generated at flow rate ranging between 2 to 4 PV/d. A 90% recovery was achieved with a peak individual sample uranium grade of 27.4 g/L and average UBS grade of 8.4 g/L U. Following the leaching, the column was flushed with simulated groundwater to simulate groundwater restoration. Analytical results from the first pore volume of water removed from the column during the restoration phase are incorporated into the range in UBS composition at the end of mining presented in Table IR-20, IR-67, IR-69-2.

*Table 2 addresses IR-20. This table summarizes information from the metallurgical testing with respect to composition of the UBS at the end of mining, prior to remediation.* See further discussion below in Section 1.3.

Flushing of the column with simulated groundwater (Phase 1 of restoration) was continued for 84 pore volumes. Phase 2 (RPV 84-108) circulated simulated ore zone water quality fortified with 1 g/L Bicarbonate [from  $\text{NaHCO}_3$ ]. The test simulated the operation of a Reverse Osmosis (RO) water treatment step where solution exiting the column would be treated prior to being re-introduced. Phase 3 (RPV 108-114) re-established injection of simulated groundwater quality. The objective of this phase was to displace the bicarbonate and to ensure ground water stability once the circulation of fluid is halted. Analytical results for groundwater collected during this restoration process are shown in Table 9 and Table 10. Information presented in those tables is discussed further in Section 2.0.

### **1.2 Column and Coreflood Tests**

The following were common to all column and coreflood tests performed:

- The pore volume was determined by pumping water (deionized water, site groundwater) into each column or core until filled.
- Temperature was controlled to 10°C by placing the apparatus in a walk-in cooler.
- An online UBS or Remediation/Flushing Solution sample was taken daily.

Table 2:UBS Chemistry at end of Leaching (Mining)

Test	Units	Coreflood 2B (2021)	Coreflood 3C	Number of Samples	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Baseline Ore Zone Groundwater Chemistry
Sample Name		D-CF2B-57	D-CF3C-142		Minimum	Maximum	GWR-032 (2021-06-04)
Acidity	mg/L			5	65000	87000	
Bicarbonate	mg/L	-	-	6	0	<1	118
Carbonate	mg/L			5	<1	<1	<1
Chloride	mg/L			1	<10	1220	220
Hydroxide	mg/L			0	<1	<1	<1
P. alkalinity	mg/L			0	<1	<1	<1
pH	pH units	2.1	1.1	13	0.63	2.10	6.83
Specific Conductance	uS/cm			9	52100	303000	860
Eh	mV			10	580	870	
Sum of ions	mg/L			5	52700	70100	504
Total alkalinity	mg/L			5	<1	<1	97
Total hardness	mg/L			5	202	1480	182
Nitrate	mg/L			5	<4	<40	<0.04
Fluoride	mg/L			5	1	34	0.23
Total dissolved solids	mg/L			5	8970	47900	599
Calcium	mg/L	557	723	13	58	723	55
Magnesium	mg/L	47	<63	13	<10	240	11
Potassium	mg/L	148.8	<86	13	6.2	149	4.6
Sodium	mg/L	17.9	<77	13	6.0	12300	81
Aluminum, dissolved	mg/L	1738	71	13	69	4609	0.0006
Antimony, dissolved	mg/L			5	0.040	1	<0.0002
Arsenic, dissolved	mg/L	<0.1	<1	13	<0.1	21	0.2
Barium, dissolved	mg/L	<0.1	<1	13	<0.05	<0.5	0.063
Beryllium, dissolved	mg/L			5	0.07	0.4	<0.0001
Boron, dissolved	mg/L			1	<1	<10	0.43
Cadmium, dissolved	mg/L	<0.1	<1	13	0.018	1.809	<0.00001
Chromium, dissolved	mg/L	9.1403	<1	13	<0.1	9.140	<0.0005
Cobalt, dissolved	mg/L	5.41	<1	12	0.5	15	<0.0001
Copper, dissolved	mg/L	5.16	10.23	13	5.2	964	<0.0002
Iron, dissolved	mg/L	3309	4094	13	820	4094	4.2
Lead, dissolved	mg/L	0.97	19.45	13	0.20	19	<0.0001
Manganese, dissolved	mg/L	16.35	<81	13	2.70	41	0.22
Molybdenum, dissolved	mg/L	1.65	59.57	13	1.65	60	0.0038
Nickel, dissolved	mg/L	15.7	<1	13	<1	27	0.001
Selenium, dissolved	mg/L	18.4	<1	13	<0.025	26	<0.0001
Silver, dissolved	mg/L			5	<0.005	<0.05	<0.00005
Strontium, dissolved	mg/L	5.2	<1	7	0.60	5	1.66
Thallium, dissolved	mg/L	-	-	5	0.05	<0.2	<0.0002
Tin, dissolved	mg/L	-	-	5	0.07	0.30	-
Titanium, dissolved	mg/L			5	2.80	32	<0.0002
Uranium, dissolved	mg/L	7.45E+03	3.88E+04	13	7.70E+02	3.88E+04	1.10E-02
Vanadium, dissolved	mg/L	160.88	62.57	13	6.16	161	<0.0001
Zinc, dissolved	mg/L	134.37	4.03	13	2.30	331	2.62
Sulfur	mg/L	9,263	22,877	13	5211	209411	4.3
Phosphorous	mg/L	-	75.4	13	2	75	<0.01
Silica, soluble, dissolved	mg/L	-	-	6	31	192	13.3
Radium-226*	Bq/L	-	-	4	230	3000	180
Radium-228*	Bq/L	-	-	1	5	5	-
Lead-210*	Bq/L	-	-	4	600	1700	2200
Polonium-210*	Bq/L	-	-	4	290	2000	110
Thorium-230*	Bq/L	-	-	4	21000	220000	7
Thorium-232*	Bq/L	-	-	4	2	12	-
Radium-226*	mg/L	-	-	4	6.29E-06	8.21E-05	4.92E-06
Thorium-230*	mg/L	-	-	4	2.75E-02	2.88E-01	9.17E-06

Notes

* Analytical results for radionuclides are limited. The ranges of radionuclide concentrations (Bq/L) provided are considered conservative because they reflect composite samples collected over the ISR leaching period in the 2021 column samples, not UBS at the end of mining	
	Analytical results for Coreflood 2B and 3C are provided (in addition to the range of UBS Constituent Concentrations) because results from the remediation portion of these tests was used for development of the Restored Solutions modelled in the draft EIS (Appendix 7-C)
	Used to highlight baseline groundwater quality in the ore zone for comparison with UBS Composition at end of mining.



## 2021 UBS Column Tests

The objective of the 2021 column tests was to test leach recoveries on a range of feed grades. Four samples were generated from nine drill holes, all proximal to the WS Shear where most of the resource lies. The samples contain varying amounts of uraninite, sulphides, clay and iron and represent blends of the various hydrogeologic units within the deposit (HGUs). Samples were crushed to -10 mm. Columns with a diameter of ~100 mm were packed with the samples. Four column tests were conducted, with details for each sample listed in Table 3.

The 2021 column tests used the full-size distribution of crushed core and achieved relatively high mineral liberation in contact with lixiviant. This results in relatively rapid leach kinetics compared to intact core. The initial flow rate was calculated based on a retention time of eight hours (3 column pore volumes per day (PV/d)).

Table 1: Summary of Samples for Column Test 1 to 4

Column No.	Sample ID	Mass (g)	Feed U <sub>3</sub> O <sub>8</sub> (wt%) <sup>a</sup>	HGUs in Blend <sup>b</sup>	Hole IDs	Number of PVs - Leaching	Number of PVs - Remediation
1	Sample A	27,338	48.1	2A/B/C/D	GWR-10, 16, 19, 21	116	6.7 (D.I. Water)
2	Sample B	18,619	46.1	2B	GWR-10, 19, 23, 26	120.4	16.5 (Site GW, 10g/L NaOH Solution)
3	Sample D	9,180	1.8	2A/C/D/E	GWR-15, 16, 19, 26	14.7	15.5 (Site GW, 10g/L NaOH Solution)
4	Samples C&E	8,742	26.9	2A/C/D/E	GWR-01, 19, 22	29.7	11.2 (Site Water, 1.5g/L NaHCO <sub>3</sub> )

Notes

<sup>a</sup> Back Calculated

<sup>b</sup> HGUs = Hydrogeological Units in the Ore Zone

A single pass flow of dilute sulfuric acid and hydrogen peroxide lixiviant was run between 22 to 38 days. Lixiviant strength was generally decreased over the course of each run. UBS composition from each of the column leach tests at the end of leaching is shown in Table 2.

On completion of the leaching tests, each column was flushed with water (de-ionized water or groundwater) and for columns #2, #3 and #4, neutralization of groundwater was evaluated using alkaline solutions. Solutions used and porewater volumes flushed are summarized in Table 3. Analytical results for solution composition during the remediation phase are included in Table 9 and Table 10.

Mineralogy of the column samples pre-testing were analyzed by XRD and QEMSCAN; the mineral assemblages aligned with the overall understanding of the ore zone mineralogy, provided as Table IR-20, IR-67, IR-69-A2 (Appendix A to this response). XRD results for the fine particles are provided as Table 4. These results show the formation of secondary sulphate minerals during the uranium ore leaching process. The other mineral phases are associated with the (pre-mining) ore zone mineralogy, provided in the draft EIS as Table 3-1 of Appendix 7-C, and provided herein in Appendix A as Table 2.

Table 4: XRD Results for Fine Particles in UBS, Column Experiments #1 to #4 (2021)

Mineral Phase	Column #1	Column # 2	Column #3	Column #4
Anglesite	18.1	9.8	-	6.6
Anhydrite	7	-	-	-
Biotite	-	38	24.2	8.3
Chlinochlore	62.6	21.2	20.3	20.1
Gypsum	-	4.4	-	-
Kaolinite	-	22	41.1	57
Quartz	-	-	5.4	-
Pyrite	12.3	4.6	8.9	7.1

Notes

Secondary Minerals

## 2022 Column Leaching and Remediation Tests

A suite of 5 column leaching tests was undertaken to support remediation planning. Whereas core flood testing may more realistically represent the ISR conditions with respect to operational conditions (i.e., using intact core and pressure applied), this phase of column testing used crushed material to accelerate the testing process and, thus, provide key information on the remediation phase and prepare for the (2022) field feasibility study.

The 2022 column testing program consisted of five 100mm diameter columns loaded with samples from different HGUs providing characterization of ore variability. The samples were selected from a blend of assay sample splits of fresh core from GWR-054 through GWR-061, supplemented by preserved core from GWR-016, GWR-022 and GWR-024 stored frozen by Denison. The hole locations are shown Figure 1 ranging along the length of the deposit. Intervals from five to eight different drill holes were composited to meet required sample mass and/or to meet representativeness for each HGU.

The samples were hand crushed to minimize fines generation, to a maximum size of 30 mm. Minimum size fraction was +0.212 mm by wet screening out fines. This was designed to promote flow through the column and minimize exposed mineral surface area. Overall procedures were like 2021 column tests. The lixiviant was a mixture of sulphuric acid and hydrogen peroxide and was prepared using Wheeler River groundwater. Lixiviant was injected upwards in essentially flooded plug flow conditions. The flow rate was calculated based on ~0.67 measured column PV/d. Test parameter variables were minimized, so the differences between HGUs could be distinguished.

Initially, all five columns were fed lixiviant from a common tank. The low-grade columns 2A and 2E were run until fully leached. From that point forward, 2A and 2E were fed from a separate tank to perform groundwater flush and neutralization. A summary of details of the column tests including pore volumes during leaching, during post-leaching flushing with groundwater, and during neutralization are provided in Table 5.

UBS composition at the end of the leaching period is provided in Table 2, and groundwater quality following the groundwater flushing and neutralization is provided in Table 9 and Table 10.

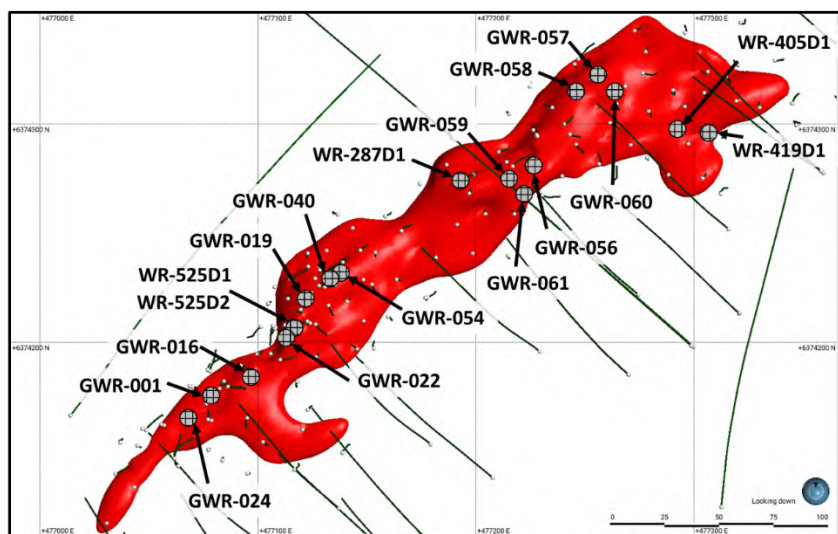


Figure 1: Metallurgical Hole Locations for 2022 Column Leach Testing

Table IR-20, IR-67, IR-69-2: 2022 Column Leach Testing Details

Columns	2a	2b	2c	2d	2e
Estimated Grade (wt % U <sub>3</sub> O <sub>8</sub> )	5.0%	58.3%	41.3%	46.1%	1.6%
	Numbers of Pore Volumes				
Phase 1: Groundwater equilibration	2.9	3.1	3.0	2.8	3.1
Phase 2: In-Situ Recovery (ISR)	20.8	66.7	64.1	62.4	19.4
Phase 3: Groundwater Flushing	15.0	16.2	15.1	11.6	14.9
Phase 4: Neutralization	4.4	4.2	11.0	2.6	3.7
Total Pore Volumes	43.1	90.3	93.1	79.4	41.1
pH at end of Phase 2	0.93	0.95	0.91	0.91	0.95
pH at end of Phase 4	9.53	7.1	3.8	7.22	7.87

QEMSCAN was done on the column pre-testing and at the end of the flushing period. The results are presented as Table 6. Mineral phases that reflect basement-derived materials in the ore zone residuals include biotite, spodumene, petalite and garnet.

Table 6: 2022 Column Leach Test QEMSCAN results

QEMSCAN	Column 2a		Column 2b		Column 2c		Column 2d		Column 2e	
	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)	Pre-Test (Feed)	Post-Test (Residuals)
Mineral	2A-BATCH-1	DCL-2a-R	2B-BATCH-1	DCL-2b-R	2C-BATCH-1	DCL-2c-R	2D-BATCH-1	DCL-2d-R	2E-BATCH-1	DCL-2e-R
Anglesite		3.84		3.28		3.99		14.18		1.15
Biotite	4.84	1.38	0.25	0.44	4.26	0.83	1.16	1.41	2.96	1.98
Bornite	0.36	0.07					0.70	1.15	0.43	0.20
Calcite			0.42	0.69		0.14				
Chalcocite (CuS)			1.54		0.28		0.31		1.28	
Chalcopyrite	12.37	13.03	0.71	2.27	0.11	0.16		0.25	8.76	3.48
Chlorite				3.15						
Clinocllore-(Fe)		11.34				0.8		9.39		52.26
Covellite (CuS)	0.35	0.38	0.19	2.61	0.39	1.34	0.06	0.18	0.10	0.20
Fe-oxide		0.03				1.15		0.53		0.03
Galena	0.63	0.40	0.43	1.23	0.25	0.3	0.53	3.06	0.10	0.02
Garnet	0.25				2.52		1.47		0.43	
Goethite-Clay mix	4.31	0.03	0.35	0.10	7.37	16.78	10.95	1.66	1.52	0.41
Illite	0.21	0.52		0.05					0.32	0.67
Ilmenite		0.08				0.09				0.47
Kaolinite	42.04	40.41	1.52	3.28	7.12	11.67	0.75	2.09	62.20	28.63
Muscovite	9.46	6.09	0.79	3.35	0.81	1.2	0.15	2.06	13.69	8.79
Petalite		0.15		0.05				0.03		0.02
Pyrite	8.48	10.44	1.49	3.38	0.98	1.58	0.12	0.09		0.84
Quartz	4.40	9.11		1.05	0.05	0.42		1.74	1.01	0.12
Rutile	0.61	0.58	0.07	0.04	0.04	0.04			0.44	0.32
Sphalerite	0.56	0.41		0.04	0.03			0.02		
Spodumene		0.17		0.05		0.16				0.05
Uraninite	10.70	1.07	92.10	74.89	75.74	58.72	83.73	61.93	6.67	0.29
Zircon	0.36	0.45	0.06	0.02		0.04				
Siderite						0.54				

## 2018-2022 Coreflood Tests

Core testing machines (CTM) were typically used to study in situ oil recovery processes, for flooding uranium deposit drill core with lixiviant to simulate ISR conditions on a micro scale which are referred to as coreflood tests. All drill cores tested were from vertically oriented drill holes allowing the flow from end to end of the coreholder to simulate flow in the vertical direction of the deposit. This is tangential to the intended predominantly horizontal flow path between wells in situ.

From late 2019 to mid-2021, coreflood tests numbered 1, 2A, 2B, 3A, and 3C were performed. The main objective was to simulate the in situ field conditions, to understand and develop the lixiviant conditions necessary for successful full-scale ISR. Priority was placed on testing a large number of samples over short durations. Tests were ended early, so, uranium recoveries were low relative to later testing (generally < 10%). Results for Coreflood 2B and 3C are discussed further herein.

### Coreflood 2B and 3C

Details for the testing of Coreflood 2B and 3C are provided in Table 7.

Table 7: 2021 Coreflood Test Details

Coreflood	2B		3C	
Corehole	GWR-024		GWR-019	
Core Dimensions (average diameter, average length), in mm	60 x100		78*70	
Core Pore volume (mL)	36.9		53.1	
Estimated Grade (wt % U3O8)	24		70.7	
	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)	Number of Pore Volume	pH (at end of Leaching or Remediation Phase)
In-Situ Recovery (ISR)	34.4	2.1	82.7	0.98
Groundwater Flushing	22.7	1.91	91.6	2.83
Neutralization with NaOH	55.6	11.92	-	-
Neutralization with NaHCO <sub>3</sub>	-	-	62.4	6.87
Post-Neutralization Groundwater Flush	9.3	11.47	17.2	6.43
Total Pore Volumes	122	-	253.9	-

The UBS composition at the end of leaching for Coreflood 2B and 3C is provided in Table 2. The analytical results for these samples were provided in Table 2 because Corefloods 2B and 3C were the primary basis for the development of the restored solutions. UBS composition during flushing for these coreflood tests is discussed further in Section 2.0 and is summarized in Table 9 and Table 10.

At the end of testing, the core from Coreflood 2B was frozen. The frozen core was cut in the middle into two sides. XRD, QEMSCAN and SEM was done on one half of the sample, on the inside cut. The XRD results indicated:

- 19.5 wt% Kaolinite
- 26.7 wt % Montmorillonite
- 45.3 wt % Dickite
- 2.9 % Fluorite
- 5.6 % Pyrite

The cumulative uranium recovery for core 2B was low, and thus the sample (post-leaching) has a mineralogical composition comparable to that of the unmined ore zone. The portion of the sample that underwent mineralogical analysis was also rich in clay minerals. The QEMSCAN results are shown in Figure 2. The SEM image (not shown) shows the presence of uraninite, pyrite, and sphalerite.

The QEMScan shows a minor amount of mineral phase suggestive of a small amount of jarosite (“Fe-Al-Si-S”) closely associated with pyrite. This suggests formation of oxidation products/secondary minerals in the core with exposure to lixiviant.



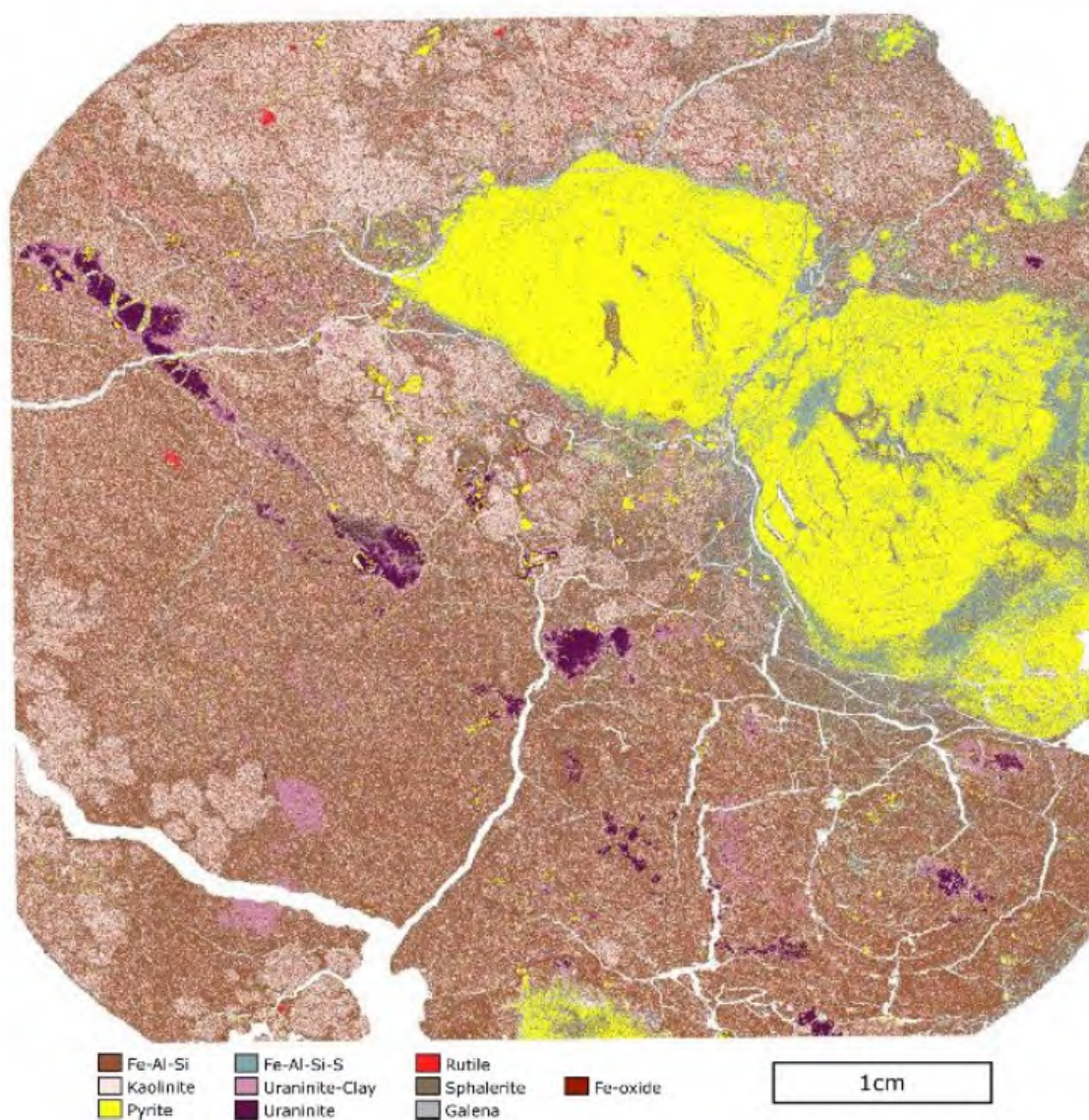


Figure 2: Coreflood 2, QEMSCAN

#### **Coreflood 4**

The Coreflood 4 sample was taken from a high-grade segment of HGU 2C from hole GWR-040, which is the middle CSW in the planned field feasibility test (FFT) well pattern. Thus, it was an excellent candidate to correlate with subsequent FFT results.

Coreflood 4 feed sample side view is shown in Figure 3. Near-horizontal mineral banding is evident.



Figure 3: Coreflood 4 Feed Sample Side View, Prior to Placement in Coreflood Machine

Coreflood 4 ran for a total of 113 PVs over 391 days, with life-of-test average UBS grade of 18.7 g/L U and reagent consumptions of 2.78 kg H<sub>2</sub>SO<sub>4</sub> and 0.35 kg H<sub>2</sub>O<sub>2</sub> per kg U. Part of the difficulty of production ramp-up of Coreflood 4 was due to the flow constraint of low micro scale permeability through the intact core, particularly with generally lower permeability in the vertical flow direction of coreflood samples. As uranium mass gradually leached away, there was a mild trend of increasing flow rate at the same pressure, indicating permeability increase.

In total, 51.8% of the initial dry mass of the sample was removed by leaching. Just over half of the mass loss is accounted for by uranium leaching, and the remainder is accounted for by gangue mineralization leaching. The feed grade was back calculated from measurements of the total uranium in UBS collected throughout the test plus leach residue sections. Feed grade was 26.66% U<sub>3</sub>O<sub>8</sub>, and final recovery was 97.1%. Coreflood 4 is the most comprehensive simulation of ISR for the Phoenix FS, with the highest recovery demonstrated from an intact core to date.

Coreflood 4 provides the most information about the mineralogical and hydrogeochemical changes that are occurring in the ore zone during mining. Post-leaching, the core leached in Coreflood 4 was cut into segments, as shown in Figure 4, assayed and visually examined (photographed) for changes to the core due to leaching. The mineralogy of each section was determined.

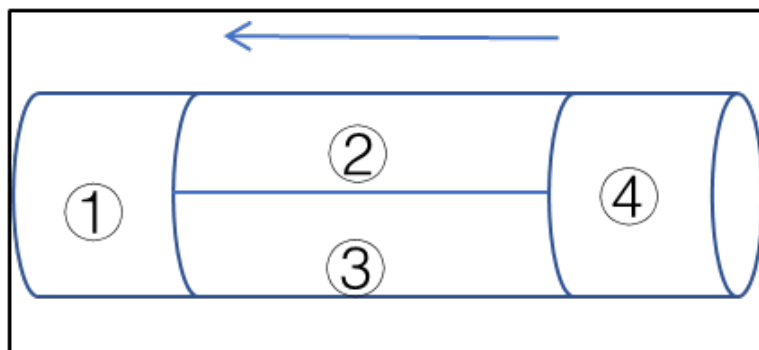


Figure 4: Coreflood 4 Cut Sections and Direction of Flow

Coreflood 4 feed side puck (Section 4), inlet face view is shown in Figure 5. The feed end was deeply eroded, nearly through to the discharge side of the section.



Figure 5: Coreflood 4 Feed Side Puck (Section 4), Inlet Face View

Coreflood 4 middle (Section 2), centre longitudinal cut face view is shown in Figure 6. It was strongly bleached throughout, with cracks that appeared after drying.





Figure 6: Coreflood 4 Middle (Section 2), Centre Longitudinal Cut Face View

Coreflood 4 discharge end puck (Section 1), inlet face view, dried, is shown in Figure 7. It was strongly bleached across the entire cross-section.



Figure 7: Coreflood 4 Discharge End Puck (Section 1), Inlet Face View, Dried

XRD for each of the sections is given in Table 8. Mineral phases that reflect basement-derived materials in the ore zone residuals include anorthite.

Table 8: XRD Results for Coreflood 4 Core Sections

Mineralogical Composition Post-Extraction	D-CF4A-1	D-CF4A-2	D-CF4A-3	D-CF4A-4
Location/section in the coreflood column	Discharge End	Midsection	Midsection	Feed End
Kaolinite (Al <sub>2</sub> Si <sub>2</sub> O <sub>9</sub> H <sub>4</sub> )	74.7	22.1	38.3	43.8
Pyrite (FeS <sub>2</sub> )	17.9	20	12.4	16
Chamosite (Mg <sub>2.518</sub> Fe <sub>2.482</sub> )Al <sub>1.25</sub> Si <sub>3.80</sub> H <sub>10</sub> ) (Chlorite Group)	7.3	5.8	1.4	--
Gypsum (CaSO <sub>4</sub> H <sub>2</sub> O)	--	7.5	4.5	4.8
Barite (BaSO <sub>4</sub> )	--	1.6	0.7	--
Anorthite (CaSi <sub>2</sub> Al <sub>2</sub> O <sub>8</sub> )	--	30.7	31.8	--
Goethite (FeO <sub>2</sub> H)	--	12.4	10.9	4.3
Anglesite (PbSO <sub>4</sub> )	--	--	--	31.1

### 1.3 Composition of the UBS remaining in the Ore Zone at the end of Mining (IR-20)

The analytical results for the UBS composition in Coreflood 2B and 3C are shown in Table 2 along with a range of UBS composition that was developed from the relevant analytical results for a total of 13 samples from across the column and coreflood tests. The ranges of values for constituents of potential concern (COPCs), as defined in Appendix 7-C of the draft EIS, are provided in Table 2. Uranium and other COPC concentrations generally vary by 2-3 orders of magnitude. There is expected variability in the UBS composition because of the nature of the deposit, which has been captured in the conditions of the metallurgical testing, and the nature of the testing (e.g., core vs. crushed rock, test duration, lixiviant composition, etc.). The analytical results were given explicitly for Coreflood 2B and 3C because of the use of results from these coreflood tests to develop the restored solutions, which is discussed further in Section 2.0.

***The range of UBS composition at the end of mining has been included in Table 3-5 of Appendix 7-C as was requested as part of IR-20, such that UBS quality at the end of mining and remediated conditions (represented by the Restored Solutions) can be compared. The updated Table 3-5 has been added to this response as Appendix B.***

### 1.4 Mineralogical and Hydrogeochemical Changes to the Ore Zone with Mining (IR-69)

Understanding of changes in the mineralogy of the ore zone with mining are informed by the XRD results from Coreflood 4, as this test was terminated at the completion of the ISR process, and QEMSCAN results for the 2022 columns, because these tests provide quantitative information on the mineral assemblage following mining and with remediation. The following conclusions are made with respect to changes in the mineralogy in the ore zone with mining:

- The mining process is effective as leaching uraninite from the ore zone and also results in partial dissolution of sulphide minerals (pyrite, sphalerite, galena, etc.);
- Secondary sulphate minerals are formed as a result of the mining process. The associated equations are shown in Appendix A. Jarosite minerals were suggested surrounding pyrite particles in the QEMSCAN of Coreflood 2, but were not detected in any of the other post-mining residuals. Gypsum and barite were detected in XRD but not present at quantifiable levels in association with the 2022 column residuals. Formation of anglesite is shown by XRD and QEMSCAN in post-mining residuals.

- The elevated concentration of aluminum in solution evidences clay mineral dissolution, but overall the relative abundance of clays in the ore zone increases with ISR mining, as would be expected with ore dissolution.

The hydrochemistry of the ore zone post-mining is presented in Table 2. Consistent with the dissolution of parent minerals and the pH of the UBS, most COPCs concentrations in the UBS at the end of mining are elevated with respect to baseline groundwater conditions in the ore zone.

## 2.0. Composition of the Restored Solutions (Addresses Question #2 of IR-67)

The restored solutions were developed using the metallurgical data that were available when conditions in Post-Decommissioning were being conceptualized in 2020-2021 for numerical modelling and effects assessment (Appendix 7-C of the draft EIS). This included the early results on acid leaching of the core (2018) and Coreflood 2B and 3C results. At that time, the coreflood tests provided the most detailed information from which to develop the chemistry of the Restored Solutions #1 and #2, using the remediation portion of the tests. From the results of that testing, “Restored Solution #1” and “Restored Solution #2” (Table 3-5) were developed to represent the bounding scenarios for groundwater quality considered in the reactive transport model to evaluate the potential for environmental effects following remediation of the mining area. As is discussed further below, these solution compositions were developed to reflect remediation of the ore zone through flushing and neutralization, without over-neutralization – meaning, base addition past circumneutral conditions to alkaline conditions.

Since that time, more information from the column and coreflood tests has become available that supports the composition of the Restored Solutions put forward in the draft EIS as being representative of porewater within the mining zone with remediation.

When developing the restored solutions for the draft EIS, the approach was generally to select concentrations for any given element/parameter that represented a low to mid-range value for the COPC from the metallurgical testing solutions, to be conservative with respect to evaluating potential effect, but also to reflect the goal of the remediation (to align with ALARA, as is discussed below). For dissolved uranium, the concentration in Restored Solutions #1 and #2 were set to upper bounds of 100 mg/L and 30 mg/L, respectively. In some cases, like Co and Ni, the values selected for modelling were identified to be on the high end upon subsequent metallurgical testing. Thus, the concentrations for these elements modelled are conservative with respect to anticipated pore water concentrations of these elements post-remediation.

The basis of the selected concentrations for Restored Solution #1, which was the solution modelled in Appendix 7-C of the draft EIS, is provided below in Table 9. As Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone), this solution was carried forward for geochemical reactive transport modelling to evaluate environmental effects.



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Table 9: Groundwater Chemistry basis for Restored Solution #1

Metallurgical Test		2018 Pre-Feasibility: Restoration Phase Data	Coreflood 2B	Coreflood 2B	Coreflood 2B	Coreflood 3C	2021 Column, 2	2021 Column, 3	2021 Column, 4	2022 Column, 2a	2022 Column, 2c	2022 Column, 2d	2022 Column, 2e	2022 Column, 2e	Restored Solution #1	Notes on Value Carried Forward in Restored Solution for Model	
Sample Name		RPV30-23	D-CF2B-121-143	D-CF2B-134-144,146	D-CF2B-COMBINED-1 (D-CF2B-134-144,146)	D-CF3C-225-237	D-CL2-FW-2	D-CL3-FW-2	D-CL4-FW-2	D-CL2A-68	D-CL2C-114	D-CL2D-111	D-CL2E-63	D-CL2E-68			
Statistic		-	Average Value <sup>a</sup>	Average Value <sup>a</sup>	-	Average Value <sup>a</sup>	-	-	-	-	-	-	-	-			
Remediation Method		GW Flush	NaOH Neutralization	NaOH Neutralization	NaOH Neutralization	Bicarbonate Neutralization	Groundwater	Groundwater	NaOH Neutralization	NaOH Neutralization	GW Flush	GW Flush	GW Flush	NaOH Neutralization			
pH		pH units	3.87	4.4	4.42	2.97	2.6	2.44	2.66	3.80	2.58	2.46	2.48	4.05	4.3	High end of observed	
Eh		mV		520	525	Same as adjacent (D-CF3C-238-256)					570	542	426	648	-	Set in model to reflect oxidized conditions	
Pore Volumes of remediation		-	30-32	59-74	69-76		109-130				19.4	15.1	11.6	14.9	18.6	-	
Aluminum, dissolved		mg/L	5.6	9.7	10.3	7.0	<5	5.4	26	9.1	9.0	9.9	12	32.8	15.6	7	Low end of observed
Arsenic, dissolved		mg/L	<0.010	0.17	0.22	0.03	0.48	0.15	0.31	0.1	0.02	0.14	0.06	0.4	0.012	0.06	Low end of observed
Barium, dissolved		mg/L	<0.05	0.10	<0.1	<0.05	<0.1	<0.005	<0.05	<0.05	<0.05	<0.05	0.006	0.018	0.05		Mid range of observed
Total Inorganic Carbon (C(4))		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	58		Assumed to be approximately equivalent to GW values and considers some bicarbonate
Calcium		mg/L	109	228	210	-	81.7	11	43	23	21	22	380	20	35	110	
Cadmium, dissolved		mg/L	<0.001	<0.1	<0.1	0.015	<0.1	0.061	0.033	0.020	0.051	0.001	0.004	0.0004	0.0003	0.015	
Chloride		mg/L	37	-	-	-	1	<1	1	33	<1	6	3	9	200		Very limited information available. Set to a higher value to consider potential for values closer to baseline ore zone water quality
Cobalt, dissolved		mg/L	-	2.8	2.1	2.0	<0.1	-	-	0.15	0.03	0.16	0.53	0.42	2		High end of observed
Chromium, dissolved		mg/L	0.04	0.22	0.14	<0.05	<0.1	0.18	0.76	0.16	<0.05	<0.05	0.17	0.013	0.05		Mid range of observed
Copper, dissolved		mg/L	2.23	0.21	0.24	0.17	<0.1	6.2	5.8	9.2	25	3.1	3.2	20.1	4.7	0.17	Low end of observed
Fluoride		mg/L	NA	-	-	-	2.4	0.32	1.6	3	6.0	4.2	2	3	-		No data available at time of developing Restored Solution
Iron, dissolved		mg/L	54.1	378	334	324	13.0	23.2	92	40	124	33	75	74	57	100	Mid range of observed
Potassium		mg/L	<1	10.1	9.5	-	<8	3.5	4.7	1.5	3.7	1.5	5.6	1.9	1.4	9	High end of observed
Magnesium		mg/L	3.7	-	-	-	<6	0.6	11	0.2	3.0	0.4	4.4	38	43	6	Mid range of observed
Manganese, dissolved		mg/L	0.68	9.3	-	3.4	<8	0.57	0.63	0.85	2.0	0.98	4.1	0.31	0.30	3.4	Mid range of observed
Molybdenum, dissolved		mg/L	0.05	0.22	0.22	0.10	<0.1	0.16	2.1	0.10	0.05	0.05	0.03	0.58	0.019	0.1	Mid range of observed
Sodium		mg/L	221	283.2	351.0	-	120	3.1	4.1	2.8	760	3.0	4.3	3.7	378	190	Mid range of observed
Nickel, dissolved		mg/L	0.20	12.8	10.0	9.7	<0.1	0.56	3.2	0.75	0.55	0.06	0.35	1.04	0.92	9.7	High end of observed
Lead, dissolved		mg/L	3.08	2.9	3.41	3.1	1.8	4.97	0.68	0.96	1.3	0.22	0.10	2.64	0.50	3.1	Mid-high range of observed
Sulfate		mg/L	860	2700	2724	-	679	300	750	480	2180	470	1460	690	1220	620	Mid range of observed
Selenium, dissolved		mg/L	<0.025	0.31	0.23	0.08	<0.1	0.39	0.10	0.13	0.01	0.02	0.05	0.042	0.098	0.08	Mid range of observed
Si		mg/L	71.9	-	-	-	-	-	-	-	-	-	-	-	-	40	limited information available; value similar to available data assumed
Strontium, dissolved		mg/L	-	4.5	4.4	4.4	3.2	0.32	0.70	0.22	0.62	0.43	0.58	0.67	0.76	4.4	Upper range of observed
Zinc, dissolved		mg/L	1.48	1.6	1.4	1.4	0.14	1.7	3.6	3.0	10	0.14	-	0.20	0.13	1.4	Mid-range of observed
P		mg/L	-	-	-	-	<4	-	-	-	-	-	-	-	-	4	applied limited information
Uranium		mg/L	105	586	334	338	45.2	92	217	579	145	288	328	38.1	30.8	100	Mid-low end of observed; value set as upper bound in the EIS
Vanadium, dissolved		mg/L	0.09	2.9	0.8	0.51	0.32	0.35	2.8	1.1	0.13	0.70	0.51	1.8	0.006	0.51	Low end of observed
Polonium-210		Bq/L	6.3+/-0.5	-	-	1600	-	-	-	-	-	-	-	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228		Bq/L	-	-	-	<10	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-228		Bq/L	-	-	-	<3	-	-	-	-	-	-	-	-	-	-	Not modelled
Thorium-230		Bq/L	105+/-9.6	-	-	<500	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Radium-226		Bq/L	65.8+/-0.3	-	-	<200	-	-	-	-	-	-	-	-	-	-	See Below for values in mg/L
Lead-210		Bq/L	530+/-1.3	-	-	2400	-	-	-	-	-	-	-	-	-	-	Not modelled (transport behaviour taken into account with Pb)
Thorium-232		Bq/L	0.2+/-0.04	-	-	0.05	-	-	-	-	-	-	-	-	-	-	Not modelled
Radium-226		mg/L	1.80E-06	-	-	<5.47E-06	-	-	-	-	-	-	-	-	-	5.47E-06	Limited data, high end value <sup>b</sup>
Thorium-230		mg/L	1.38E-04	-	-	<6.55E-04	-	-	-	-	-	-	-	-	-	3.93E-06	Limited data set <sup>c</sup>

Notes

<sup>a</sup> Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS

<sup>b</sup> Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.

<sup>c</sup> Limited data set meant that PFS groundwater flushing data at pH 5.8 was also considered in setting this value, with a Th-230 concentration of 2.62E-07 mg/L and a Ra-226 value of 1E-05 mg/L (see Table IR-67-10)

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Table 10: Groundwater Chemistry basis for Restored Solution #2

Metallurgical Test		2018 Pre-Feasibility; Restoration Phase Data			Coreflood 3C	Coreflood 3C	2021 Column, 4	2022 Column, 2b	Restored Solution #2	Notes on Value Carried Forward in Restored Solution for Model
Sample Name		RPV 38-42	RPV 42-53	RPV 54-57	D-CF3C-238-256	D-CF3C-COMBINED-1 (D-CF3C-238-256)	D-CL4-FW-3	D-CL2b-116		
Statistic		-	-	-	Average <sup>a</sup>	-	-	-		
Remediation Method		GW Flush	Neutralization (NaHCO <sub>3</sub> )	GW Flush	Bicarbonate Neutralization	Bicarbonate Neutralization	Distilled Water Flush Post NaOH Neutralization	NaOH Neutralization		
pH	pH units	5.8	8.5	8.3	6.51	Same as adjacent (D-CF3C-238-256)	7.48	6.51	6.1	Low end of Observed
Eh	mV				402		-	387	-	Set in model to reflect oxidized conditions
Pore Volumes of remediation		-	76-84	82-108	-	131-162	-	18.70	-	
Aluminum, dissolved	mg/L	0.27	1.32	4.4	<5	0.56	0.70	10	0.56	Low end of observed
Arsenic, dissolved	mg/L	0.10	0.04	0.06	0.25	0.1	<0.01	0.000259	0.1	Upper end of observed
Barium, dissolved	mg/L	<0.05	0.05	0.04	<0.1	0.05	<0.05	0.2	0.05	Mid range of observed
Total Inorganic Carbon (C(4))		mg/L	-	-	-	-	-	-	105	Assumed to be approximately equivalent to GW values and considers some bicarbonate neutralization
Calcium	mg/L	28	13	5	48.1		16	127	10	Low end of observed
Cadmium, dissolved	mg/L	0.002	<0.001	<0.001	<0.1	0.004	0.004	<0.1	0.004	Mid range of observed
Chloride	mg/L	15	2	12			6	-	50	Set to a higher value to consider potential for values closer to baseline ore zone water quality
Cobalt, dissolved	mg/L				0.11	<0.01		<0.1	0.01	Low end of observed
Chromium, dissolved	mg/L	<0.01	<0.01	<0.01	<0.1	<0.05	0.05	<0.1	0.05	Mid range of observed
Copper, dissolved	mg/L	0.04	<0.01	<0.01	0.12	<0.02	0.33	0.2	0.02	Low end of observed
Fluoride	mg/L	0.5	1.2	0.8			1.4	-	0.8	Mid range of observed
Iron, dissolved	mg/L	6.13	0.44	1.23	9.1	4.7		10	4.7	Mid range of observed
Potassium	mg/L	<1	<1	2	<8		1.2	<8	3.5	Mid range of observed
Magnesium	mg/L	<1	<1	<1	6.7		1.2	<6	3	Mid range of observed
Manganese, dissolved	mg/L	0.07	0.02	0.05	<8	0.48	0.28	<8	0.48	Mid range of observed
Molybdenum, dissolved	mg/L	0.03	0.05	<0.005	0.47	0.13	<0.01	0.4	0.13	Mid range of observed
Sodium	mg/L	36	235	87	251		351	887	90	Low range of observed
Nickel, dissolved	mg/L	0.03	<0.01	<0.01	0.10	<0.01	0.21	0.1	0.01	Low end of observed
Lead, dissolved	mg/L	2.13	0.36	0.39	0.20	0.32	0.25	10.0	0.32	Mid range of observed
Sulfate	mg/L	174	117	100	718.7		440	2480	136	Low end of observed
Selenium, dissolved	mg/L	<0.025	<0.025	0.026	0.86	<0.01	0.09	<0.1	0.01	Low end of observed
Si	mg/L	43.7	43.8	44.4				132.6	40	Mid range of observed
Strontium, dissolved	mg/L				2.0	2.4	0.20	0.7	2.4	Upper end of observed
Zinc, dissolved	mg/L	0.08	<0.01	<0.01	0.10	<0.05	0.46	0.1	0.05	Mid-range of observed
P	mg/L				<4			<5	4	applied limited information available
Uranium (mg/L)	mg/L	3.5	4.1	0.5	19.3	26.4	187	38.7	30	Upper End of Observed
Vanadium, dissolved	mg/L	<0.01	0.007	0.03	0.13	0.16	0.03	0.2	0.16	Upper end of observed
Polonium-210	Bq/L	14.9+/-0.3	1.9+/-0.1	2.7+/-0.1	-	280	-	-	-	Not modelled (lack of thermodynamic constants)
Radium-228	Bq/L	-	-	-	-	<2	-	-	-	Not modelled
Thorium-228	Bq/L	-	-	-	-	<1	-	-	-	Not modelled
Thorium-230	Bq/L	0.2+/-0.03	1.36+/-0.14	3.2+/-0.4	-	<100	-	-	-	See Below for values in mg/L
Radium-226	Bq/L	389+/-0.7	262+/-0.5	129+/-0.4	-	370	-	-	-	See Below for values in mg/L
Lead-210	Bq/L	301+/-0.7	40+/-0.3	22+/-0.2	-	660	-	-	-	Not modelled (transport behaviour taken into account with Pb modelled)
Thorium-232	Bq/L	<0.01	<0.01	<0.01	-	0.007	-	-	-	Not modelled
Radium-226	mg/L	1.06E-05	7.17E-06	3.53E-06	-	1.01E-05	-	-	1.01E-05	Limited data, high end value
Thorium-230	mg/L	2.62E-07	1.78E-06	4.19E-06	-	<1.31E-04	-	-	1.31E-06	Limited data set ; Low end of observed
Notes										
		Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS								
		Data Available when developing the Restored Solutions for the modelling in Appendix 7-C of the EIS, but not considered in the development of Restored Solution #2 as pH was alkaline								
		Arithmetic average values, calculated using detected measurements or where all values were non-detect, assumed the detection limit. pH value is the median, not the arithmetic average.								

### 3.0. Remediation of Mining Area within the context of ALARA (Addresses Question #3 of IR-67)

Section 2.2.3 of the draft EIS presents the conceptual decommissioning plan (CDP). As part of the CDP, and as highlighted in Section 2.3.3.1.1 of the draft EIS, remediation of the mining area will continue until recovered water reaches and is demonstrated to be stabilized (maintained) at acceptable mining area decommissioning objectives. Such decommissioning objectives consider protection of plausible downgradient water uses. For the purpose of the assessment "plausible use" has been determined to be the protection of aquatic life in Whitefish Lake, since numeric 3D groundwater modelling has indicated that Whitefish Lake is where groundwater associated with the remediated mining area will discharge to. It is within this frame of reference therefore that the ALARA concept should be considered. That is, ALARA can be defined for the purpose of the remediation of the mining area to the extent that subsequent discharge of groundwater to Whitefish Lake does not adversely affect aquatic biota in the lake.

The metallurgical testing done to date evidences an amelioration of UBS quality post-mining with flushing using groundwater and base (hydroxide or bicarbonate) to a restored solution of pH in the range of 4.5-5.5. The intent of the remediation approach is to raise the pH consistently but incrementally, so as to avoid over-neutralizing and yielding an alkaline solution. Alkaline pH conditions favour the formation of precipitates that are not desired from a physical (clogging) or chemical standpoint (secondary solids formed in place of removal of COPCs in the dissolved-phase from the subsurface). Potential environmental effects were thus evaluated based on plausible use, as defined above, at a pH and groundwater conditions that were shown to be achievable through groundwater flushing and addition of base without the risk of over-neutralization. Restoration Solution #1 contains the higher remaining concentrations, and lower pH (i.e., differs more from baseline conditions in the ore zone) and was carried forward for geochemical reactive transport modelling to evaluate environmental effects.

It is noted that the freeze wall will remain in place during mining area remediation (see draft EIS Section 2.3.3.1.1), until decommissioning objectives are achieved to ensure there is no loss of tertiary control of the mining fluid (even in a diluted state). Refinement of the mining area decommissioning objectives and associated modelling will be done as the Project progresses through updates to the Decommissioning Plan; nevertheless, the objectives as they may evolve will be bound by the objectives evaluated in the EIS, which as shown are protective of aquatic biota in Whitefish Lake. The final acceptable mining area decommissioning objectives will be developed prior to initiation of groundwater remediation, as part of the Detailed Decommissioning Plan (DDP).

#### References

Denison (Denison Mines Corp), 2018. Prefeasibility Study Report for the Wheeler River Uranium Project, Saskatchewan, Canada. Report dated: September 24, 2018.

Denison (Denison Mines), 2023. Feasibility Study.

## IR-20, IR-67, IR-69 Appendix A

### 2018 Column Leach Testing

Table A1: Sample Inventory for 2018 ISR Column Leach Test

Original Sample Purpose	Sample I.D.	WR Hole No.	Lithology	Est. U%	Mass (g)	Mass U (g)
Porosity/Perm.	S066906	419D1	BSMT	0.22	320	0.61
Porosity/Perm.	S066907	525D2	SDST	0.06	323	0.17
Porosity/Perm.	S066908	405D1	SDST	0.06	270	0.14
Porosity/Perm.	S066909	405D1	BSMT	0.08	299	0.21
Porosity/Perm.	S066910	525D1	BSMT	51.72	843	375
Leach Testing	S066911	525D1	SDST	0.06	282	0.17
Leach Testing Composite Sample	S066912- S066916	525D1 525D2	SDST & BSMT	29.4	1,090	276
Leach Testing Total Composite Sample	S066906- S066916	405D1 419D1 525D1 525D2	SDST & BSMT	19.03 (wet)	3,427 (wet)	652.3

Table A2: Mineralogy of the Ore Zone\*

Unit	Mineral	Ideal Formula	Major (≥2% w/w)	Minor (< 2% w/w, or, shown to be present in Petrography or core logging)
Ore Zone	Pyrite	FeS <sub>2</sub>	X	
	Galena	PbS	X	
	Chalcopyrite	CuFeS <sub>2</sub>	X	
	Quartz	SiO <sub>2</sub>	X	
	Chlorite	(Fe,Mg)2(Al,Fe3+)3Si3AlO10(OH)8	X	
	Muscovite/Illite	KAl2(Si3Al)O10(OH,F)2	X	
	Kaolinite	Al2Si2O5(OH)4	X	
	Fe-oxy-hydroxides	FeO(OH)·nH <sub>2</sub> O	X	
	Uraninite	UO <sub>2</sub>	X	
	UO <sub>2</sub> .33	U <sub>3</sub> O <sub>7</sub>	X	
	UO <sub>2</sub> .25	U <sub>4</sub> O <sub>9</sub>	X	
	Schoepite	UO <sub>3</sub> ·2H <sub>2</sub> O	X	
	Siderite	FeCO <sub>3</sub>	X	
	Fluorite	CaF <sub>2</sub>	X	
	Gersdorffite	NiAsS		X
	Nickeline	NiAs		X
	Dravite	NaMg3Al6(Si6O18)(BO3)3(OH)3(OH)		X
	Pyrrhotite	Fe <sub>1-x</sub> S (x=0-0.17)		X
	Sphalerite	(Zn,Fe)S		X
	Feldspar	KAlSi3O8		X
	Calcite	CaCO <sub>3</sub>		X
	Apatite	Ca5(PO4)3(F,Cl,OH)		X
	Corundum	Cr <sub>2</sub> O <sub>3</sub>		X
	APS Minerals	CaAl3(PO4)(PO3OH)(OH)6		X

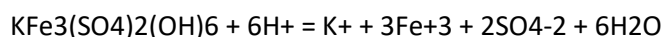
#### Notes

\*The table above is excerpted from Table 3-1 of Appendix 7-C of the draft EIS (mineralogy for other “Units” provided therein are not shown here)

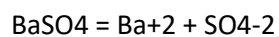
**Uraninite** **Blue bolded text** indicates dominant minerals; can be present at values exceeding 40% w/w

### Reactions forming secondary sulphate minerals

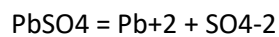
#### K-Jarosite



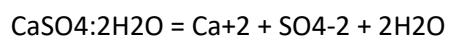
Barite



Anglesite



Gypsum



**IR-20, IR-67, IR-69 Appendix B**

**Table 3-5: Restored Solutions, UBS Composition representative of End of Mining conditions, and Representative Groundwater Composition by Hydrostratigraphic Unit**

Parameter/ Groundwater or Restored Solution	Unit	Ore Zone (GWR-032)	PWZ (GWR-031 and Cigar Lake)	Lower Sandstone Aquifer and Decalcified Zone (GWR-011)	Intermediate Sandstone Aquifer (GWR-046)	Overburden and Upper Sandstone Aquifer (GWR-036, Primarily)	Range of Values of UBS constituent concentrations across Metallurgical tests from 2018-2021 representative of End of mining conditions		Restored Solution #1	50% Restored Solution #1	Restored Solution #2	50% Restored Solution #2
							Minimum	Maximum				
pH	unit	6.83	6.7	6.46	7.053	6.45	0.63	2.1	4.3	5.1	6.1	6.3
pe	unitless	-1.3	1.9	2.3	4.5	1.2	9.80	14.7	10	(set) 7	7.8	(set) 4
temp	°C	7	7	7	7	7	7	7	7	7	7	7
Al	mg/L	6.00E-04	3.40E-02	5.20E-02	8.00E-01	3.70E-02	6.90E+01	4.61E+03	7.00E+00	3.53E+00	5.60E-01	3.06E-01
As	mg/L	2.00E-04	5.00E-02	1.30E-03	4.75E-06	3.00E-04	<0.1	2.12E+01	6.00E-02	3.07E-02	1.00E-01	5.07E-02
Ba	mg/L	6.30E-02	3.60E-02	5.40E-02	2.41E-01	5.70E-03	<0.05	<0.5	5.00E-02	5.20E-02	5.00E-02	5.20E-02
C(4)	mg/L	1.76E+02	1.54E+02	8.66E+01	1.01E+02	3.39E+01	-	-	5.80E+01	7.23E+01	1.05E+02	9.58E+01
Ca	mg/L	5.50E+01	6.76E+00	9.78E+00	1.07E+01	2.70E+00	5.80E+01	7.23E+02	1.10E+02	6.00E+01	1.00E+01	9.89E+00
Cd	mg/L	1.00E-05	1.00E-05	1.00E-05	3.36E-05	1.00E-05	1.80E-02	1.81E+00	1.50E-02	7.52E-03	4.00E-03	2.01E-03
Cl	mg/L	1.90E+02	8.65E+01	7.20E+00	8.63E+00	6.86E+00	<10	1.22E+03	2.00E+02	1.04E+02	5.00E+01	2.86E+01
Co	mg/L	1.00E-04	1.00E-02	1.00E-04	5.84E-03	4.00E-04	5.00E-01	1.49E+01	2.00E+00	1.00E+00	1.00E-02	5.05E-03
Cr	mg/L	5.00E-04	4.50E-03	5.00E-04	1.69E-03	5.00E-04	<0.1	9.14E+00	5.00E-02	2.53E-02	5.00E-02	2.53E-02
Cu	mg/L	2.00E-04	5.00E-03	1.80E-03	6.29E-03	6.00E-04	5.16E+00	9.64E+02	1.70E-01	8.60E-02	2.00E-02	1.09E-02
F	mg/L	2.30E-01	5.30E-01	1.80E-01	5.90E-02	6.00E-02	1.00E+00	3.40E+01		9.00E-02	8.00E-01	4.90E-01
Fe	mg/L	4.20E+00	4.90E-01	8.60E-01	6.03E+00	4.05E-01	8.20E+02	4.09E+03	1.00E+02	5.05E+01	4.70E+00	2.78E+00
K	mg/L	4.60E+00	5.60E+00	2.00E+00	6.77E+00	2.80E+00	6.20E+00	1.49E+02	9.00E+00	5.51E+00	3.50E+00	2.75E+00
Mg	mg/L	1.10E+01	3.09E+00	1.60E+00	3.91E+00	1.80E+00	<10	2.40E+02	6.00E+00	3.80E+00	3.00E+00	2.30E+00
Mn	mg/L	2.20E-01	7.00E-01	3.60E-01	3.91E+00	1.40E-01	2.70E+00	4.10E+01	3.40E+00	1.88E+00	4.80E-01	4.20E-01
Mo	mg/L	3.80E-03	1.28E-02	4.20E-03	3.89E-03	7.00E-04	1.65E+00	5.96E+01	1.00E-01	5.22E-02	1.30E-01	6.71E-02
Na	mg/L	8.10E+01	7.61E+01	6.10E+00	8.96E+00	2.90E+00	6.00E+00	1.23E+04	1.90E+02	9.82E+01	9.00E+01	4.81E+01
Ni	mg/L	1.00E-03	1.50E-02	1.00E-04	4.87E-02	1.80E-03	<1	2.68E+01	9.70E+00	4.86E+00	1.00E-02	5.05E-03
Pb	mg/L	1.00E-04	1.00E-04	1.00E-04	1.57E-03	1.00E-04	2.00E-01	1.95E+01	3.10E+00	1.55E+00	3.20E-01	1.60E-01
S(6)	mg/L	1.30E+01	4.55E+00	4.70E+00	1.01E+01	1.90E+00	5.21E+03	2.09E+05	7.03E+02	3.54E+02	1.36E+02	7.04E+01
S(-2)	mg/L	1.00E-08	1.00E-09	1.00E-09	1.00E-09	1.00E-09	-	-	1.00E-09	1.00E-09	1.00E-09	1.00E-09
Se	mg/L	1.00E-04	1.00E-04	1.00E-04	3.59E-04	8.00E-04	<0.025	2.64E+01	8.00E-02	4.01E-02	1.00E-02	5.05E-03
Si	mg/L	1.33E+01	9.18E+00	2.41E+01	1.31E+01	2.62E+01	3.07E+01	1.92E+02	4.00E+01	3.21E+01	4.00E+01	3.21E+01
Sr	mg/L	1.66E+00	1.17E+00	1.20E-01	1.15E-01	1.20E-02	6.00E-01	5.19E+00	4.40E+00	2.26E+00	2.40E+00	1.26E+00
Zn	mg/L	2.62E+00	4.25E-03	1.20E-02	1.25E-02	4.40E-03	2.30E+00	3.31E+02	1.40E+00	7.07E-01	5.00E-02	3.10E-02
P	mg/L	1.00E-02	1.00E-02	1.00E-01	5.00E-02	4.00E-02	2.20E+00	7.54E+01	4.00E+00	2.05E+00	4.00E+00	2.05E+00
U	mg/L	1.10E-02	1.24E-02	7.00E-04	2.26E-02	5.00E-04	7.70E+02	3.88E+04	1.00E+02	5.01E+01	3.00E+01	1.50E+01
V	mg/L	1.00E-04	1.00E-04	1.00E-04	1.20E-03	1.00E-04	6.16E+00	1.61E+02	5.10E-01	2.55E-01	1.60E-01	8.01E-02
<sup>226</sup> Ra	mg/L	4.92E-06	5.47E-09	1.37E-08	2.54E-08	1.64E-09	6.29E-06	8.21E-05	5.47E-06	2.75E-06	1.01E-05	5.06E-06
<sup>230</sup> Th	mg/L	9.17E-06	1.00E-06	1.31E-07	2.62E-07	2.62E-08	2.75E-02	2.88E-01	3.93E-06	2.02E-06	1.31E-06	7.14E-07



## Attachment: IR-21

Number	IR-21
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 2.3.3.1.3, Project Description
Context and Rationale	<p>Context: The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p>Rationale: From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.</p>
Information Requirement	Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.

### Response:

RESPEC (2023) memo is attached here to support the IR response provided in the table.



## EXTERNAL MEMORANDUM

**To:** Xavier Lu Dac  
Dana Harris  
Denison Mines Corporation  
230-22nd Street East  
Suite 200  
Saskatoon, SK S7K 0E9

**cc:** Project Central File 02924

**From:** Neel Gupta  
Cody Vining  
Brett Dueck  
RESPEC  
3824 Jet Drive  
Rapid City, SD 57703

**Date:** July 14, 2023

**Subject:** Results of a Geomechanical Study Investigating the Stability of the Rock Mass in Response to In Situ Recovery of Uranium-Enriched Rock for the Wheeler River Uranium Project

Denison Mines Corporation (Denison), a uranium exploration and development company, has a flagship Wheeler River Uranium project. This project is the largest undeveloped in situ recovery (ISR) uranium project in Northern Saskatchewan's eastern Athabasca Basin. The project site is located approximately 35 kilometers (km) north-northeast of the Cameco Corporation (Cameco) Key Lake operation and 35 km southwest of the Cameco McArthur River operation in the eastern Athabasca Basin. Denison proposes developing the Phoenix deposit in this region.

At the Phoenix deposit, Denison plans to drill the set of injection/recovery wells for ISR of uranium-enriched rock through leaching with a freeze wall isolating the operations from the surrounding rock mass. In response to the leaching process, the remnant ore zone may displace or fail and may no longer be able to support the overburden load while causing instability in the surrounding rock mass because of the stress redistribution. Denison, therefore, has requested a geomechanical study to analyze the geomechanical stability of the rock mass around the excavation and freeze wall from the leaching process. This memorandum documents the geomechanical study and briefly discusses the study objectives and approach, significant results, and conclusions.

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## STUDY OBJECTIVES AND APPROACH

In a recent geomechanical study [Vining et al., 2023], RESPEC Company, LLC (RESPEC) developed a three-dimensional (3D) strip model of a specific geological section where maximum ore extraction is planned to investigate the stability of the mined cavity and estimate the surface disturbance. The boundary conditions of the strip numerical model assumed an infinite array of the modeled cross-section, where ore extraction is maximum, along the length of the Phoenix deposit. Considering the boundary conditions of the strip model and presuming the average material properties of key stratigraphic layers, the numerical model predicted surface displacement of approximately 7.5 centimeters (cm) and marginal stability of the rock mass limited to the extent of 16 meters (m) from the top extent of mined excavation.

The primary objectives of the current study are evaluating the geomechanical stability of the rock mass around the excavation and proposed freeze wall in response to the in situ leaching operations in Zone A of the Phoenix deposit. To achieve the desired objectives, RESPEC modified the previously developed 3D strip model [Vining et al., 2023] to create a full-scale 3D model using the structural finite difference program *FLAC3D* [Itasca Consulting Group, Inc., 2021] while presuming the similar, average material properties of key stratigraphic layers. Considering the computational time and analysis effort, creating a numerical model that extends across the entire extent of Zone A is impractical. Because the *FLAC3D* program imposes a plane of symmetry along its boundaries, RESPEC, in consultation with Denison, simulated the half-length of Zone A, and the modeling domain encompasses the Phoenix deposit's northeast extent, as shown in Figure 1. The vertical extent of the 3D model is assumed to be 1,000 m below ground surface (bgs), and the lateral boundary is approximately 135 m away from the extent of the low-grade ore zone. The model boundaries located far away from the excavation boundaries isolated the influence of model boundaries on the excavation response. The kinematic boundary conditions of the numerical model prevent normal (horizontal) displacements along the four vertical boundaries of the model and vertical displacements of the bottom boundary. These constraints allow the interior portion of the model to move freely. In situ stress data were not available for the Phoenix deposit. The vertical stress was assumed to be lithostatic (i.e., equal to the weight of the overburden) and determined as a function of depth from the weight of the overburden. In rock mass, the horizontal stress is considered isotropic (i.e., maximum and minimum horizontal stress equal to the vertical stress). For instance, at the depth of 400 m bgs, the average in situ vertical stress is approximately 10 megapascals (MPa).

Denison provided the AutoCAD drawings of key stratigraphic layers in the Phoenix deposit, which were used to develop the 3D structural model. Table 1 summarizes these stratigraphic layers. Figure 2 presents the elevation view of the 3D model, which illustrates the continually changing elevations and thicknesses of the rock layers, for example, upper and lower clay, sandstone with sulfide, and altered basement. Except for the desilicified sandstone and sandstone with sulfide, the modeled stratigraphic units and their material properties are consistent with the 3D strip model in the previous geomechanical study [Vining et al., 2023]. In consultation with Denison, RESPEC assumed the Mohr-Coulomb property of sandstone with sulfide was similar to altered sandstone and the desilicified sandstone was similar to sand [Terzaghi and Peck, 1967].

Random rock removal was adopted to represent the in situ leaching process in the numerical model. Rock removal included the instantaneous excavation of 30 percent of rock by volume from the high-grade ore zone and 3 percent from the low-grade ore zone. According to Denison, high- and low-grade ore zones are based on the uranium grade and encompass different stratigraphic layers (e.g., upper clay, lower clay, ore zone) within the Phoenix deposit. Denison plans to adopt the freeze wall design for ISR of uranium-enriched rock; therefore, RESPEC explicitly modeled the freeze wall, which

was 20 m thick and located at a distance of 15 m from the extent of the low-grade ore zone. Figure 3 presents the vertical extent of the high- and low-grade ore zones on the vertical plane and surrounding freeze wall.

In the numerical simulation, the pressure at the excavation surface was maintained at a pressure equivalent to a wellhead pressure of 0 MPa with a freshwater gradient of 0.01 MPa/m. Considering that the overlying sandstone is fractured and permeable, and the elevation of the potentiometric surface is near the ground level, RESPEC also simulated the influence of porewater pressure on the predicted stresses and displacement, which is consistent with the previous study [Vining et al., 2023].

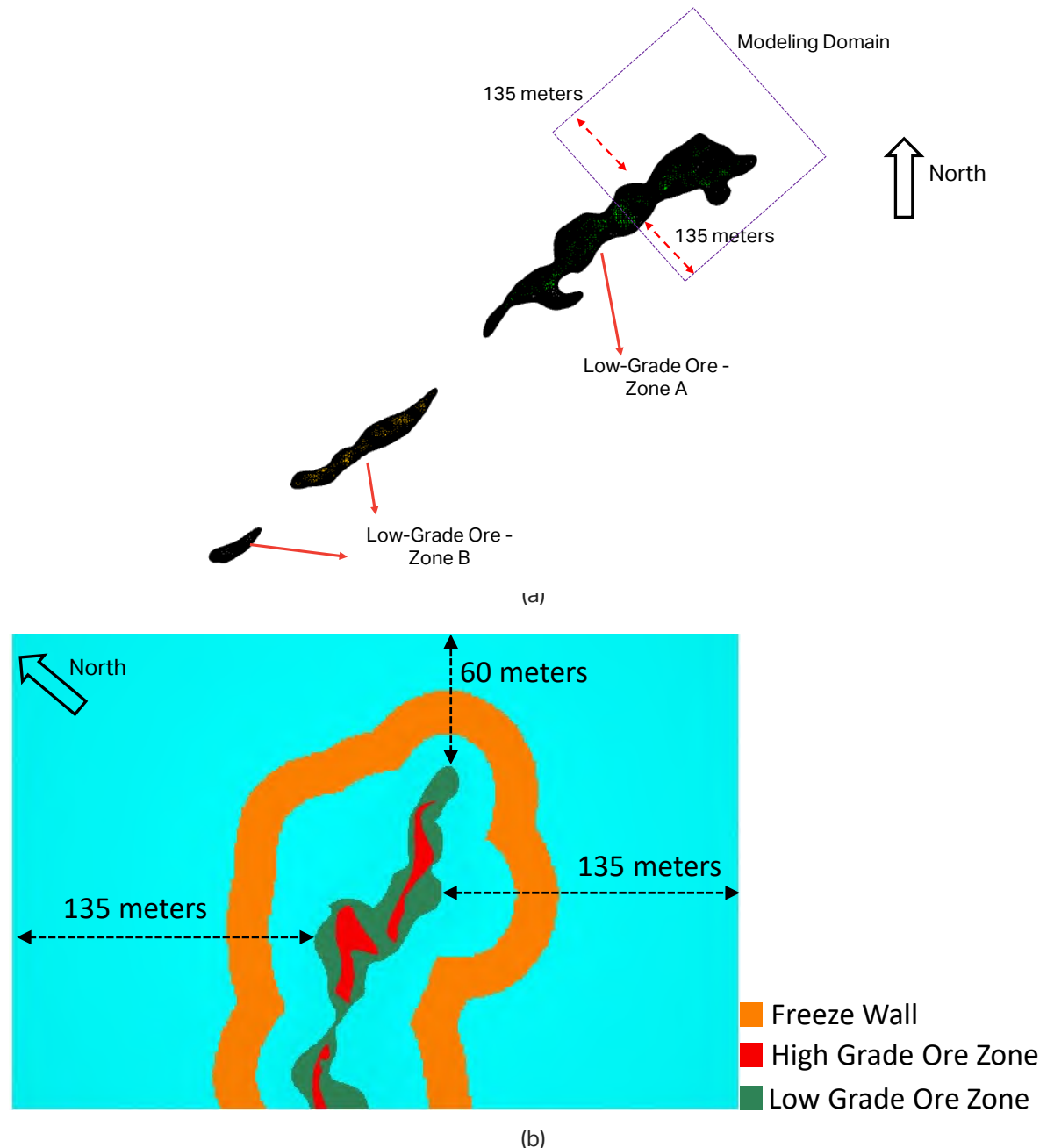


Figure 1. Plan View of the (a) Low-Grade Ore in Zone A and Zone B of the Phoenix Deposit and (b) Extent of Modeling Domain.

Table 1. Average Material Properties

Stratigraphy	Cohesion (MPa)	Friction Angle (degree)	Rock-Mass Compressive Strength (MPa)	Tensile Strength (MPa)	Rock-Mass Modulus (MPa)	Poisson's Ratio (—)	Density (g/cc)
Overburden	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Stiff Sandstone	1.44	26.93	4.84	4.7	2,241.65	0.20	2.6
Altered Sandstone	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Sandstone with Sulfide	1.07	22.54	3.39	1.0	1,363.76	0.25	2.1
Desilicified Sandstone	0.0	30.0	0.0	0.0	1,363.76	0.25	2.1
Upper Clay	0.03	16.6	0.12	0.20	55.17	0.28	1.7
Ore Zone	0.22	20.11	0.54	0.51	188.75	0.28	4.2
Lower Clay	0.15	18	0.48	0.20	206.43	0.28	1.7
Altered Basement	2.72	25.88	9.17	1.2	4,254.55	0.15	2.1
Stiff Basement	5.57	31.46	20.34	10.7	11,564.83	0.11	2.7

g/cc = grams per cubic centimeter

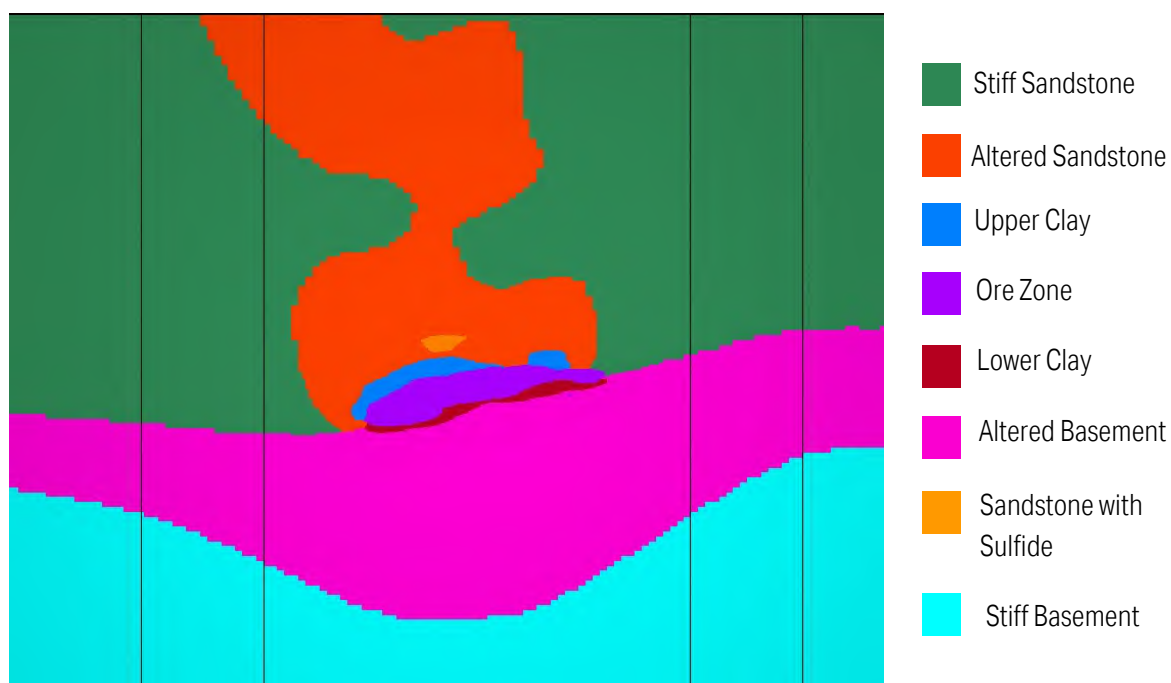


Figure 2. Elevation View of the Numerical Model Illustrating Changing Elevation of Different Stratigraphic Units Represented in the Structural Model.

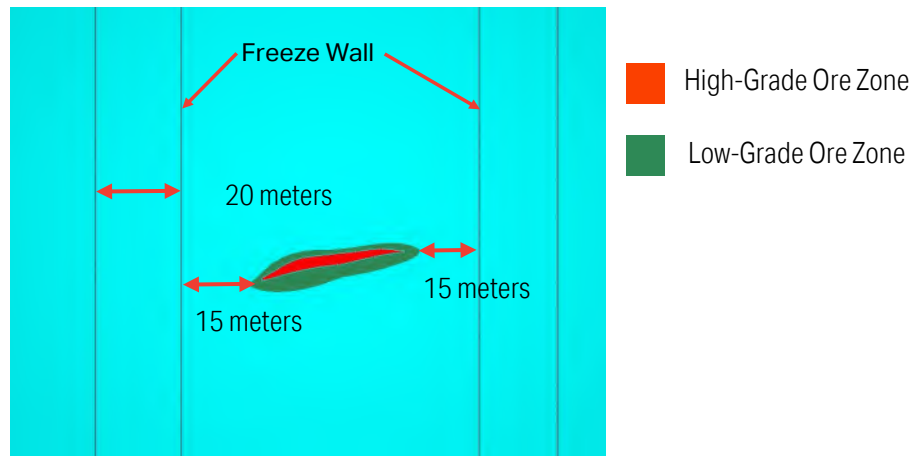


Figure 3. Elevation View of the Numerical Model Illustrating the Relative Location of the Freeze Wall to the High- and Low-Grade Ore Zones in Zone A of the Phoenix Deposit.

## RESULTS

The numerical model-predicted stresses and displacements were scrutinized to assess the surface subsidence and the stability of the remaining ore zone, surrounding rock mass, and freeze wall. The outcomes of the numerical simulation are discussed in the following subsections.

### ROCK STABILITY

RESPEC simulated the rheological behavior of rock presuming the Mohr-Coulomb constitutive model for each stratigraphic unit to analyze the stress redistribution in case of failure of the remnant rock around the excavation. In the post-simulation analysis, the Mohr-Coulomb Factor of Safety (MCFS) was determined to quantify the competency of the rock mass based on the predicted stress fields. The MCFS value greater than, equal to, or less than 1.0 quantifies the material as not failing, at failure, or failed, respectively. The potential for tensile fracturing in the rock mass was also analyzed using the least compressive principal stress (LCPS). The magnitude of LCPS will be positive at locations where a tensile stress component exists in any direction. Site-specific strength properties of the rock after freezing were unavailable at the time of the study; therefore, RESPEC took a conservative approach and assumed that the properties of the freeze wall were similar to the host rock.

Figures 4 and 5 present the MCFS contour and LCPS contour, respectively, on a horizontal plane passing through the depth of 390, 399, 406, and 413 m bgs. Figures 6 and 7 present the MCFS and LCPS contour on multiple vertical planes. MCFS contour (Figures 4 and 6) presents that the failure conditions (i.e., red contour) are limited within the close proximity (i.e., 5 to 8 m) of the low-grade ore zone, and its lateral extent varies with the depth of the ore zone below the ground surface. However, the MCFS is always greater than 2.50 within the modeled extent of the freeze wall. LCPS contour (Figures 5 and 7) presents that the marginally compressive stress conditions (i.e., yellow and red contours) are predicted within the extent of the low-grade ore zone, and compressive stresses greater than 5 MPa are predicted within the proposed extent of the freeze wall. Figure 8 quantifies the failure volume predicted within the different stratigraphic units. Within the modeled domain of Zone A, the predicted failure volume was approximately 8, 22, 41, and 26 percent of the modeled volume of sandstone with sulfide, upper clay, ore zone, and lower clay, respectively. However, the failure volume is less than 0.02 percent of the modeled volume of stiff or altered sandstone, desilicified sandstone, and altered and stiff basement rock. Additionally, 0 percent failure volume is predicted within the freeze wall.



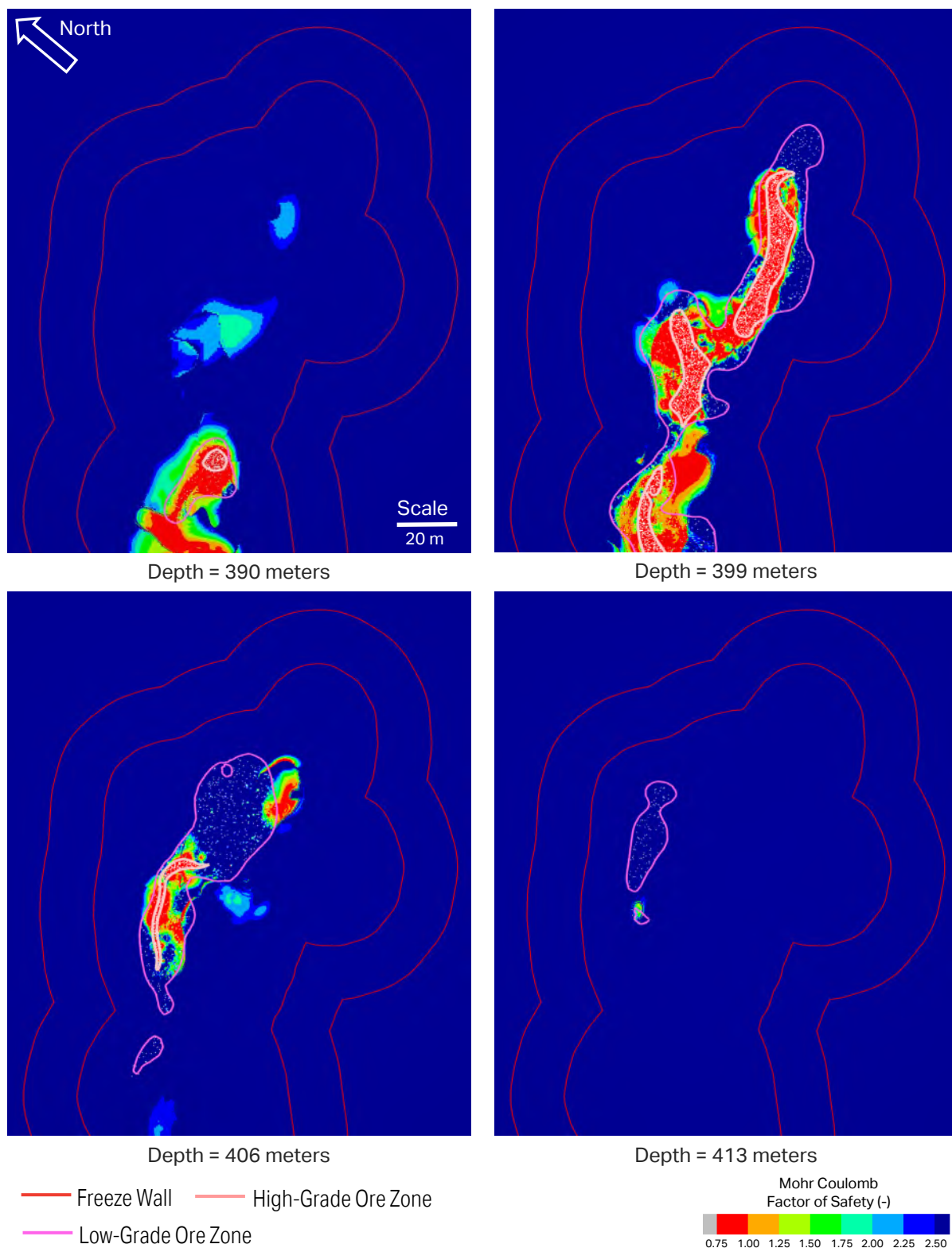


Figure 4. Plot of Mohr-Coulomb Factor of Safety Values on a Horizontal Plane Passing at a depth of 390, 399, 406, and 413 Meters Below Ground Surface.

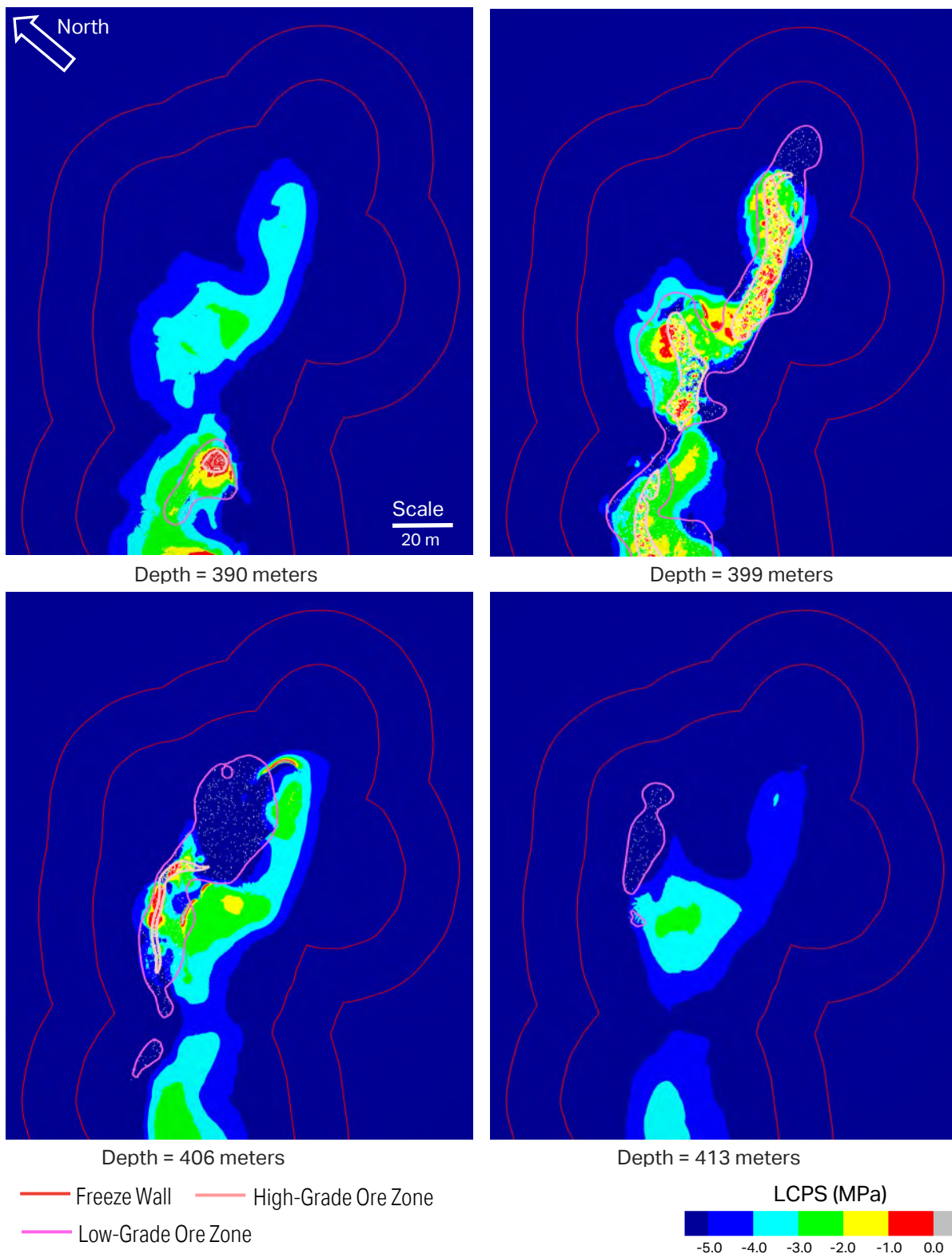


Figure 5. Plot of Least Compressive Principal Stress Values on a Horizontal Plane Passing at a Depth of 390, 399, 406, and 413 Meters Below Ground Surface.

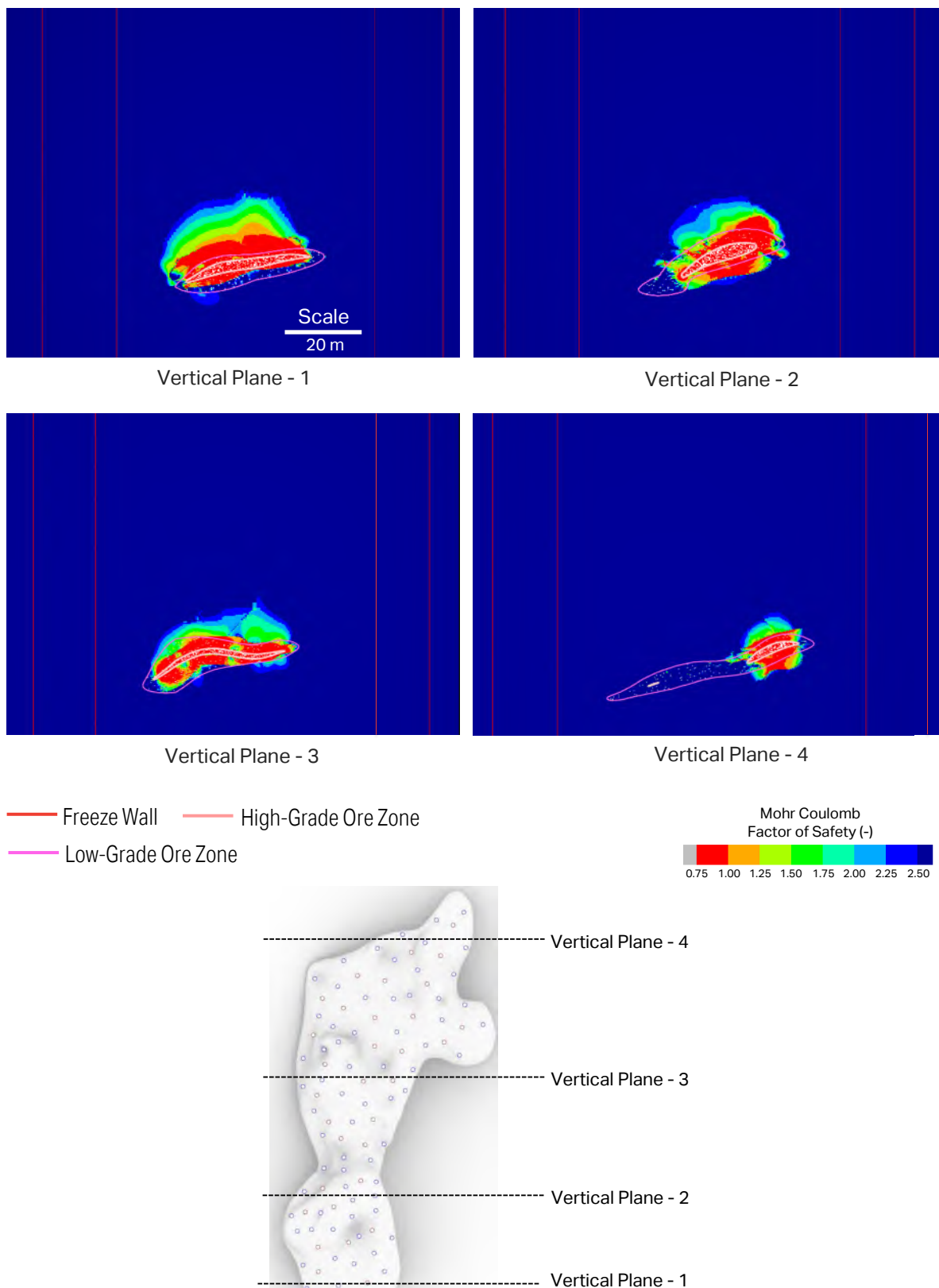


Figure 6. Plot of Mohr-Coulomb Factor of Safety Values on Multiple Vertical Planes.

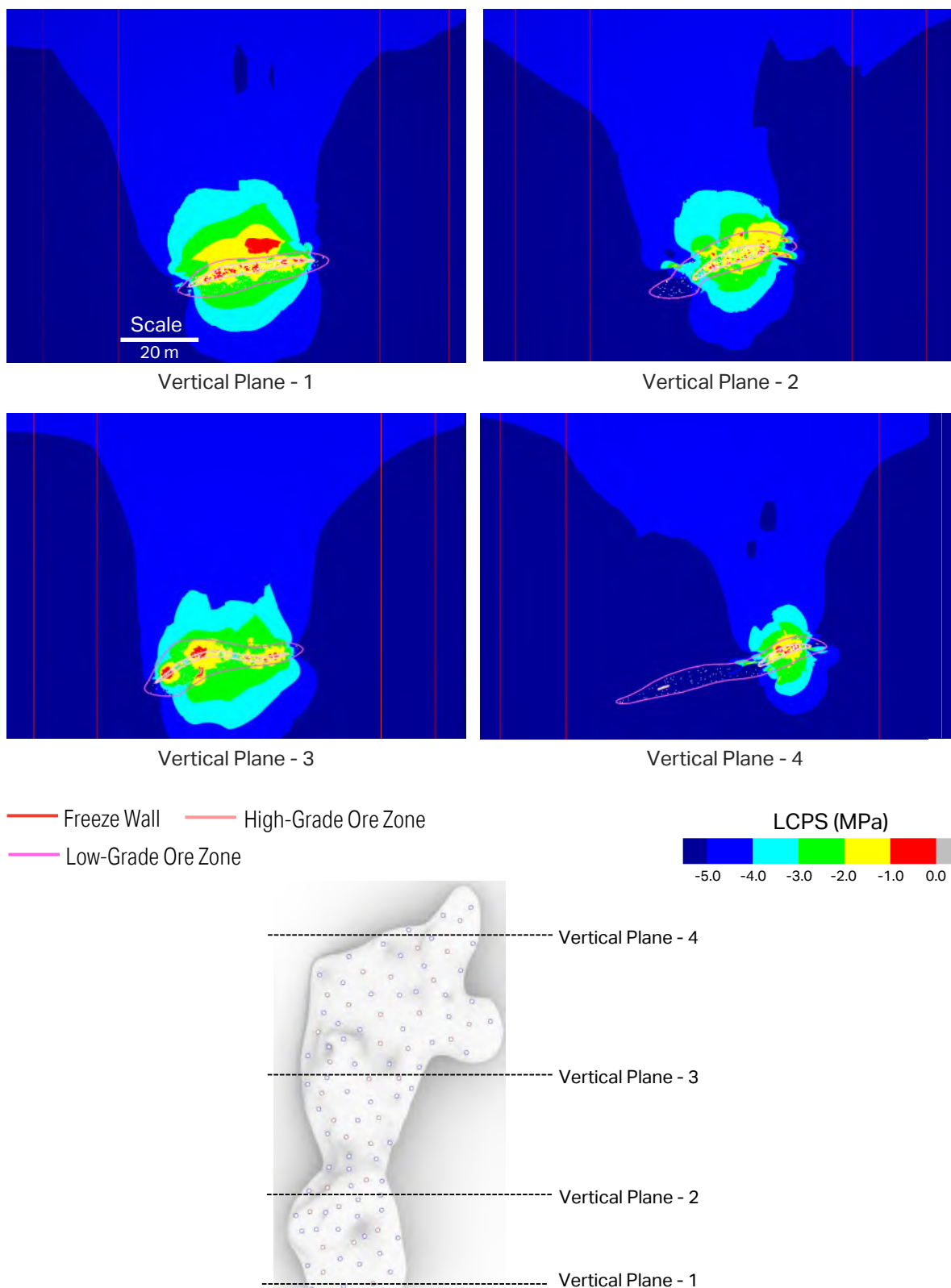


Figure 7. Plot of Least Compressive Principal Stress Values on Multiple Vertical Planes.

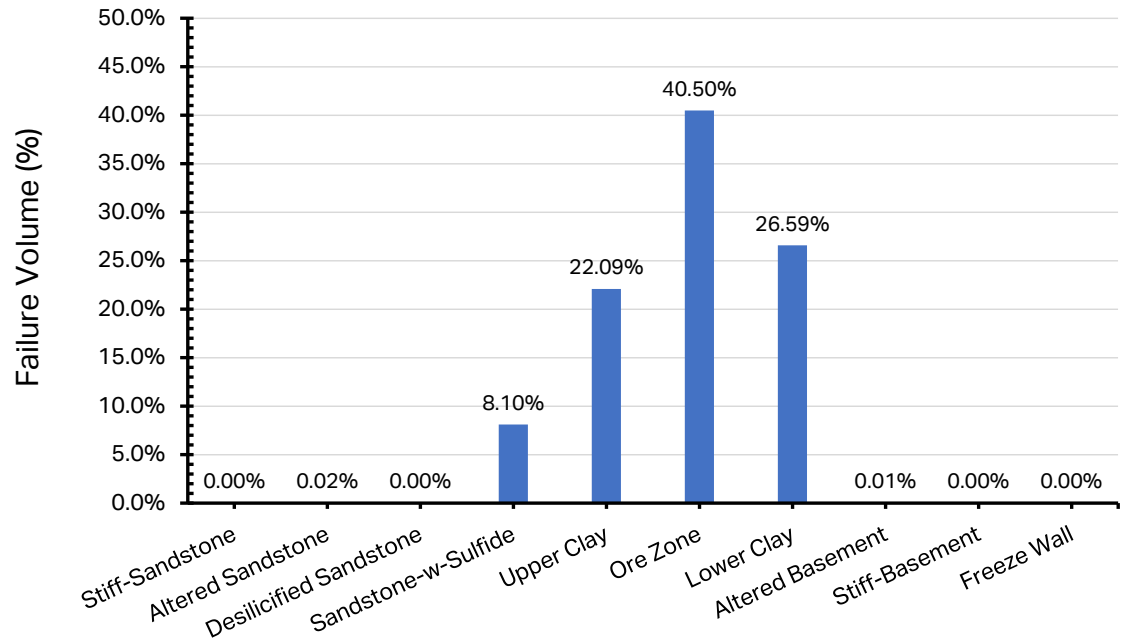


Figure 8. Failure Volume in Different Stratigraphic Units.

### SURFACE SUBSIDENCE

In response to the proposed leaching process, the surrounding host rock will displace into the mined cavity, which manifests as subsidence at the ground surface. The numerical model predicted the negligible vertical displacement of approximately 2.5 millimeters (mm) on the ground surface. Figure 9 presents the contours of vertical displacement predicted on a vertical plane passing through the modeling domain's southern boundary. The contour on the vertical plane presents that the vertical displacement of the rock mass immediately above the low-grade ore zone ranges between 42 and 49 cm and quickly reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. The current study's numerical model-predicted surface subsidence is significantly smaller than the surface subsidence of 7.5 cm predicted in the previous geomechanical study [Vining et al., 2023], which is likely attributed to the difference in the modeling domain and boundary conditions between the two models. In the previous study, the 3D strip model presumed an infinite array of modeled cross sections and corresponding excavation of uranium-enriched rock; in the current study, the full-scale model included the representative extent of Zone A at the Phoenix deposit.



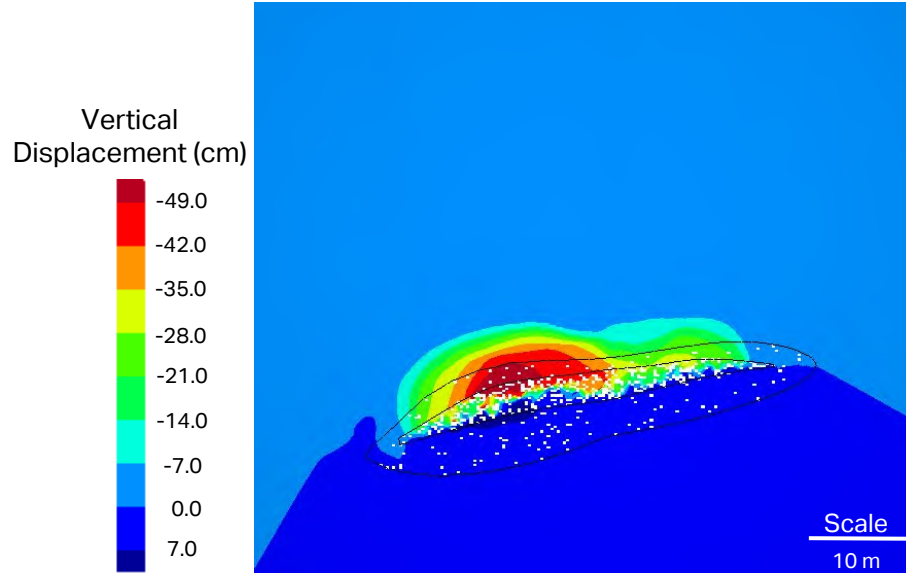


Figure 9. Contour of Vertical Displacement After the Proposed Volumetric Extraction on a Vertical Plane Passing Through the Modeling Domain's Southern Boundary.

## CONCLUSIONS

The study objective was to better understand the anticipated response of the surrounding rock mass, particularly the freeze wall, after proposed volumetric rock extraction from the high- and low-grade ore zone. The significant outcomes from this study are as follows:

- / **The geomechanical numerical model predicted stability against shear or tensile failure within the proposed extent of the freeze wall.** Considering the average estimate of the material properties of modeled stratigraphic layers, the predicted failure conditions in the rock mass are limited to 5 to 8 m of the extent of the low-grade ore zone. Within the proposed extent of the freeze wall, the MCFS values are greater than 2.50, and the magnitude of LCPS is greater than 5 MPa in compression, indicating the limited potential of instability in the freeze wall.
- / **The numerical model predicted vertical displacement at the surface in response to the proposed volumetric extraction is negligible.** The vertical displacement of the rock mass near the modeling domain's southern extent is at a maximum immediately above the low-grade ore zone, ranging between 42 and 49 cm, which reduces to the range between 0 and 7 cm at a distance of 4 to 5 m from the low-grade ore zone. At the ground surface, the average vertical displacement is approximately 2.5 mm.

## REFERENCES

Itasca Consulting Group, Inc., 2021. *FLAC3D: Fast Lagrangian Analysis of Continua in 3 Dimensions*, 7<sup>th</sup> Edition (Version 7.00.154), Minneapolis, MN.

Terzaghi, K., and R. B. Peck, 1967. *Soil Mechanics in Engineering Practice*, 2<sup>nd</sup> Ed., John Wiley & Sons, New York, NY.

Vining, C. A., N. Gupta, and J. Nopola, 2023. *Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 2)*, RSI(RCO)-2924/5-21/14, prepared by RESPEC, Rapid City, SD, for X. Lu Dac and D. Harris, Denison Mines Corporation, Saskatoon, SK, February 9.



## Attachment: IR-24

Number	IR-24
Dept.	CNSC
Project effects link	Alternative Means
Reference to EIS, appendices, or supporting documentation	Section 2.10.2 Alternative Means
Context and Rationale	<p>Context: While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Rationale: As noted in the Agency’s Operational Policy Statement on Addressing “Purpose of” and “Alternative Means” under the CEAA 2012: “If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice.”</p>
Information Requirement	<p>Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>Note: In addition to the adding text to summarize, Table 6 in Appendix 2-C could be useful to understanding table 2.10.1 in the EIS.</p>

### Response:

*Revised text for final EIS, Section 2.10.2.*

#### **2.10.2 Alternatives Means Assessment**

Denison first evaluated production potential from the Project in 2010. Since that time, the Project has undergone significant design and review stages and has naturally evolved into the Project described and assessed in this EIS. Appendix 2-C provides details related to the alternative means assessment framework employed and the results of the alternatives assessment for key Project components and activities; this section of the EIS provides a summary of Appendix 2-C.

Alternative means are the various ways Denison considered to implement Project components and activities. During the planning process, it is common to consider various means by which to fulfill a specific aspect of the Project.

A systematic assessment of these alternatives was used to select preferred alternatives that are carried forward as Project design elements in a manner consistent with Canadian Environmental Assessment Agency's operational policy statement (Canadian Environmental Assessment Agency 2015). These preferred alternatives ultimately become the basis upon which potential Project-related effects are evaluated in the EIS. The preferred alternatives have been presented in the preceding section of this Project Description. The documentation of this systematic alternative assessment provides transparency and traceability with respect to decision making on Project design. It also documents how input received by Indigenous groups and other Interested Parties has been considered in the design/planning process.

The alternative means assessment has been carried out in a stepwise fashion as follows (Figure 2.10-1):

1. Identification of Alternative Means: Project components for which alternate means were considered are identified;
2. Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors: the technical and economic feasibility of these alternate means is considered along with a specific screening for land use intensity and importance. Only alternate means that are deemed technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.
3. Potential Residual Effects Associated the Alternative Means: the potential residual effects of each alternative, in consideration of mitigation, are described; and,
4. Evaluation of Alternative Means: a comparative evaluation of alternative means that considers the potential residual effects for each alternative relative to various assessment criteria and indicators.

A description of the above four steps along with an example from Appendix 2-C (for Mining - Method) is provided in the following sections.

#### **2.10.2.1 Identification of Alternative Means**

Several Project components and activities had alternate means or options considered:

- Mining
  - Method
  - Freeze design for tertiary containment of mining solution
  - Permeability enhancement

- Mining solution
- Processing
  - Location of processing
  - On-site processing method
- Water management
  - Freshwater supply
  - Drinking water
  - Treated effluent discharge location
  - Treated effluent discharge location to surface water
- Waste management
  - Organic waste disposal
  - Process precipitate management
  - Domestic waste disposal
- Access and transportation
  - Access road alignment
  - Stream crossing structures
  - Worker transportation
- Power
  - Primary power supply
- Support facilities
  - Camp location optimization

For each Project component or activities listed above, a variety of options were considered. For example, the options considered under Mining – Method included:

- Option 1: Open pit
- Option 2: Jet boring
- Option 3: Surface boring
- Option 4: Micro tunnel boring
- Option 5: ISR

#### **2.10.2.2 Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors**

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015).

Denison integrated an additional category at this early stage in the alternative means assessment framework: land use screening. Although technical feasibility can include land use considerations, Denison opted to include land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by interested parties. In conjunction with screening for technical and economic feasibility, an initial evaluation was conducted to review Indigenous and other land use in the area to identify alternative means that may interact with areas of high land use intensity or areas of cultural importance (e.g., known gravesites). Consideration was given to information made available to Denison in the early stages of project planning. Note that subsequent, additional consideration of engagement information, including Indigenous and other land and resource use is completed at later stages in the alternatives means assessment framework (Section 2.10.2.4). The purpose of considering land use information at this stage was to identify land use that could compromise the feasibility of the Project and screen an alternative means out from additional evaluation.

For each Project component or activity, a consideration of the technical, economic, and land use characteristics of each alternative was considered. The purpose of this step in the alternative means assessment framework is to identify feasible alternatives for further assessment and to eliminate those alternative means that are not considered to be feasible from a technical, economic, or land use lens. Only those alternatives that are deemed technically and/or economically feasible and avoided interaction with areas of high intensity or high importance land use, are carried forward for further assessment.

For example, at this step in the alternative means assessment framework Option 1 Open pit mining (under Mining – Method) was screened out due to economic factors. For Mining – Methods, the remaining four options were carried forward for further assessment.

#### **2.10.2.3 Potential Residual Effects Associated the Alternative Means**

For all alternative means carried forward from the previous step, the expected residual effects following application of mitigation measures were considered. This step in the alternative means assessment framework identifies the potential residual effects which are then brought forward to the evaluation of alternative means. Again, as an example, the information related to Mining - Method (from Appendix 2-C, Table 4) is summarized here in **Table 2.10-1**.

#### **2.10.2.4 Evaluation of Alternative Means**

Detailed comparative evaluations of alternative means is presented in Appendix 2-C, Table 6 to Table 22. These evaluations considered the relative residual effects of each of the technical and economically feasible alternatives for each of the evaluation criteria identified in **Table 2.10-2** (same as Table 5 from Appendix 2-C), following the application of mitigation measures (described in Appendix 2-C Table 4).

By way of example (refer to Appendix 2-C for details), a detailed evaluation of Mining – Method from Appendix 2-C has been provided here as **Table 2.10-3**.

Based on the above alternative means assessment process, a preferred alternative means for each respective Project component or activity evaluated was selected. Rationale for the selection based on the comparative evaluation of alternatives is provided in Appendix 2-C including input received by Indigenous groups and other Interested Parties.

For reference, the alternative means assessment is conducted at a screening level, appropriate for the stage of the Project when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information as available. The comparative evaluation identified more preferred versus less preferred alternatives. The preferred alternative(s) was selected and evaluated in much greater detail in the EA. A summary of the alternative means carried forward into the EA is provided in **Table 2.10-4**.

### **2.10.3 Summary of Influence of Indigenous Knowledge, Local Knowledge, and Engagement on the Alternative Means Assessment**

As described above, Indigenous Knowledge, local knowledge, and engagement has influenced the alternative means assessment, specifically in step 2 (Consideration of Technical Feasibility, Economic Feasibility, and Land Use Factors) and step 4 (Evaluation of Alternative Means) of the alternative means assessment framework.

Alternative means considered in an EIS must be technically and economically feasible (CEAA 2015). Denison opted to integrate an additional category at this early stage in the alternative means assessment framework: land use screening. Denison included land use separately to provide greater transparency on the approach taken and also in recognition of the importance of local land use that has been communicated by Interested Parties. At this step in the alternative means assessment framework, an option for treated effluent discharge location was eliminated due to land use screening in conjunction with technical considerations.

Denison's specific engagement initiatives on Project alternatives are outlined in Appendix 2-C for the 1) mining method, 2) freeze design for tertiary containment of mining solution, 3) treated effluent discharge location to surface water, and 4) access road alignment. In addition to these targeted engagement sessions, information gathered more broadly during engagement was also considered in Project alternatives through the consideration of general concerns or statements. The comparative evaluation of alternative means includes specific input received from

Indigenous groups and other Interested Parties that contributed to the selection of the preferred option, when applicable. Refer to the row titled *Input received from Interested Parties* in **Table 2.10-3** below for an example of how engagement influenced the selection of mining method.

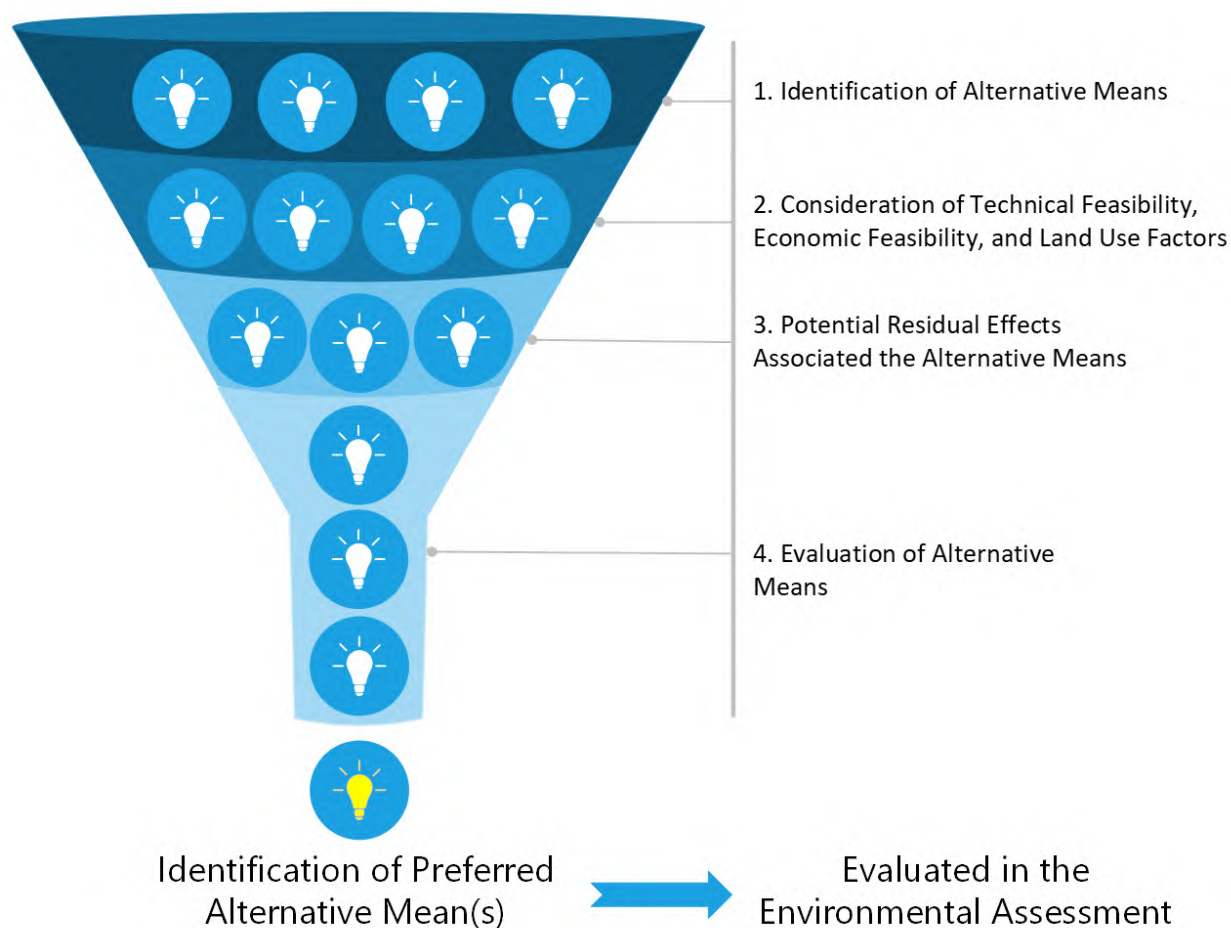


Figure 2.10-1: Alternative Means Assessment Framework for the Project



**Table 2.10-1: Mitigation Measures and Residual Effects for Mining - Method (Excerpt from Appendix 2-C Table 4)**

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
Mining	Method	Option 2: Jet Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features
		Option 3: Surface Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features
		Option 4: Micro Tunnel Boring	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance	Effects to local geology by development of underground workings  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support mining  Effects on air quality via emissions from ventilation of underground workings  Effects on groundwater quantity and flow paths based on need to dewatering underground mine workings

Project Component		Alternative Means Carried Through after Screening for Technical, Economic, and Land Use Factors	Mitigation Measures	Residual Effects
			Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to surface water quality and surface water-related receptors whereby mine water is released to local surface water features
		Option 5: ISR	Through design and monitoring, make sure emissions from ventilation meet applicable air quality emissions criteria  Any water associated with workings and mining activities meets applicable discharge quality criteria prior to release  Limit any surface development to extent practical and avoid areas of significance  Follow best management practices and standards for waste characterization and management, containment of hazardous material, liner designs, fuel management	Effects to local geology by development of ISR mining area  Effects on local vegetation, soil, bird, and wildlife habitat as a result of clearing required to develop surface infrastructure to support ISR mining  Effects on groundwater quantity and flow paths based on development of ISR wellfield (injection and recovery well systems)  Effects on groundwater quality by introduction of ISR mining solutions to the mining area  Effects to surface water quality and surface water related receptors whereby mine water is released to local surface water features

**Table 2.10-2: Detailed Alternatives Means Assessment Evaluation Criteria and Metrics (same as Table 5 in Appendix 2-C)**

Criteria	Section	Valued Component	Indicator	Metric
Biophysical Environment	Atmospheric and Acoustic Environment	Air quality	Changes in air quality, including concentrations of dust, combustion products, uranium, metals and/or radionuclides	Alternatives that minimize changes in air quality and effects on ecological and human receptors are preferred.
		Noise	Changes in sound levels	Alternatives that minimize the increase in sound levels, and subsequent effects on wildlife and human receptors, are preferred.
	Geology and Groundwater	Geology	Changes in geology	Alternatives that avoid or minimize effects on geology are preferred
		Groundwater quantity	Changes in groundwater levels, groundwater flow patterns, and discharge rates to local surface water bodies	Alternatives that minimize interaction with groundwater quantity are preferred.
		Groundwater quality	Changes in concentrations of physical and chemical parameters in groundwater with consideration of discharge to local surface water bodies	Alternatives that minimize changes in groundwater quality, in the context of groundwater discharge to surface water bodies, are preferred.
	Aquatic Environment	Surface Water Quantity	Changes in surface water quantity through water taking, surface water discharge, and project overprinting of drainage areas (footprints)	Alternatives that minimize Project footprint, as well as surface water intake and release to surface water bodies, are preferred.
		Surface Water Quality	Changes in physical and chemical parameters of surface water quality can result from discharge of treated effluent to surface water bodies and land disturbance and clearing can mobilize solids into the aquatic environment	Alternatives that minimize Project footprint and changes in surface water quality and effects on fish, and other ecological receptors, are preferred.
		Fish and Fish Habitat	Changes in fish and fish habitat may develop from Project overprinting of fish habitat (habitat alteration or loss), changes in surface water quantity, surface water quality (physical and chemical parameters), sediment quality, or benthic invertebrates	Alternatives that minimize interaction with fish and fish habitat are preferred.
		Sediment Quality	Changes in sediment quality mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on sediment quality are preferred.
		Benthic Invertebrates	Changes in benthic invertebrate communities and quality from uptake of chemical parameters	Alternatives that minimize effects on benthic invertebrates are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
		Fish Health	Changes in fish health mainly from discharge of treated effluent to surface water bodies	Alternatives that minimize effects on fish health are preferred.
	Terrestrial Environment	Terrain	Changes to terrain	Alternatives that minimize interaction with terrain are preferred.
		Soil	Changes in soil quantity or quality	Alternatives that minimize loss or alteration of soil quantity, and minimize changes in soil quality, are preferred.
		Organic matter/peat	Loss of organic matter/peat	Alternatives that minimize loss or alteration of organic matter/peat are preferred.
		Vegetation and Ecosystems	Change in areal extent of vegetation habitat types and ecosystems	Alternatives that minimize loss vegetation and ecosystems are preferred.
		Listed Plant Species	Change in number of listed plant species	Alternatives that minimize direct and indirect effects on listed plant species are preferred.
		Wetlands	Change in areal extent of wetlands	Alternatives that minimize loss or alteration of wetlands are preferred.
		Ungulates	Changes in ungulate habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize ungulate habitat loss or alteration and minimize ungulate mortality are preferred.
		Furbearers	Changes in furbearer habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize furbearer habitat loss or alteration and minimize furbearer mortality are preferred.
		Woodland caribou	Changes in woodland caribou habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize woodland caribou habitat loss or alteration and minimize woodland caribou mortality are preferred.
		Raptors	Changes in raptor habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize raptor habitat loss or alteration and minimize raptor mortality are preferred.
		Migratory breeding birds	Changes in migratory breeding bird habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize migratory breeding bird habitat loss or alteration and minimize migratory breeding bird mortality are preferred.
		Bird species at risk	Changes in bird species at risk habitat (loss and/or alteration) and indirect or direct mortality of individuals	Alternatives that minimize bird species at risk habitat loss or alteration and minimize bird species at risk mortality are preferred.

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Criteria	Section	Valued Component	Indicator	Metric
Human Environment	Human Health	Human Health	Changes in human health from exposure to non-radiological and radiological constituents in air, water, and food	Alternatives that minimize negative changes in human health are preferred.
		Worker Health	Worker conventional health and safety and radiation exposure	Alternatives that reduce conventional health and safety risks and radiation exposure are preferred.
	Land and Resource Use	Indigenous Land and Resource Use	Changes in the area of land available for Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in Indigenous land and resource use are preferred.
		Other Land and Resource Use	Changes in the area of land available for non-Indigenous land and resource use, as well as resource availability, and perceived suitability of land and resources for safe use	Alternatives that minimize negative changes in other land and resource use are preferred.
		Heritage Resources	Change in the number of known archaeological resources	Alternatives that minimize direct or indirect alteration or loss of archaeological resources are preferred
	Quality of Life	Cultural Expression	Changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet	Alternatives that minimize direct or indirect adverse effects on cultural expression are preferred.
		Community Well-being	Change in income of local workers and community cohesion	Alternatives that minimize direct or indirect adverse effects on community well-being are preferred.
		Infrastructure and Services	Changes in traffic, community infrastructure and services	Alternatives that minimize direct or indirect adverse effects on infrastructure and services are preferred.
	Economics	Economy	Changes in participation in the traditional economy	Alternatives that minimize direct or indirect adverse effects on economy are preferred.
Other Evaluation Factors				
Criteria			Metric	
Technical Factors	Complexity of design, construction, operation, and decommissioning		Simple or straightforward designs, construction techniques, and operational procedures based on tested and proven technologies are preferred. Alternatives that are more amenable to decommissioning and/or reclamation are preferred.	
Cost Factors	Capital, operating, and decommissioning costs		Lower capital costs are preferred to reduce the pre-production costs and influence the project economic viability. Lower operational costs are preferred to maintain project economics. Lower decommissioning costs are preferred to reduce long term liabilities	

**Table 2.10-3: Mining – Methods - Alternative Means Assessment (same as Table 6 in Appendix 2-C)**

Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Biophysical	Atmospheric and Acoustic Environment	Air quality	Less preferred option. Air quality on surface would be influenced by slurry handling, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock. Air quality in the mine workings would be managed with ventilation.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 5. Changes in concentrations of radon in air from well development would be similar to option 5.	Less preferred option. Air quality in the mine workings would be managed with ventilation. Air quality on surface would be influenced by hoisted cuttings or slurry, radon gas, radioactive dust in vent exhaust, dust from surface stockpiles including clean waste rock.	More preferred option. Size of mine rock stockpiles and their influence on air quality would be similar to Option 3. Changes in concentrations of radon in air from well development would be similar to option 3.
		Noise	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 4.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from production drilling from surface includes compressors and mobile equipment would be continual.	No appreciable difference was identified among the alternatives for changes in noise. Continual noise from surface ventilation fans and noise from mobile equipment. Similar to Option 2.	No appreciable difference was identified among the alternatives for changes in noise. No fans, noise from surface drilling equipment includes compressors and mobile equipment would be intermittent as drilling is done only as required.
	Geology and Groundwater	Geology	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.	Less preferred option for changes to geology, compared to options 3 and 5.	More preferred option for geology compared to options 2 and 4 since this is a surface method requiring less excavation.
		Groundwater quantity	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Preferred option with smallest interaction on groundwater quantity compared to options 2, 4 and 5.	Less preferred compared to option 3. Volume of groundwater management during mining would be similar to Option 4.	Less preferred compared to option 3. Use of ground freezing temporarily interacts with groundwater flow during operations.
		Groundwater quality	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Groundwater quality would interact with mine workings in a limited way due to groundwater management during mining.	No appreciable difference was identified among the alternatives for changes to groundwater quality. Mining area remediation during decommissioning would mitigate effects on groundwater quality.



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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
	Aquatic Environment	Surface Water Quantity	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	Less preferred than options 3 and 5. The volume of water requiring treatment and release would be high, because of the groundwater management required for mine development. This could result in a larger effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.	More preferred option compared to options 2 and 4. The volume of water needed treatment and release to a surface waterbody would be minimal, and as such, this option would have a smaller effect on the aquatic environment. Quality of treated effluent expected to be similar among all four options.
		Surface Water Quality				
		Fish and Fish Habitat				
		Sediment Quality				
		Benthic Invertebrates				
		Fish Health				
	Terrestrial Environment	Terrain	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 4 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the second lowest of the four options. This option is more preferred than option 2 and 4, similar to option 5 with regard to potential effects on the terrestrial environment.	This option is less preferred as it may result in a greater potential effect (loss) of terrain, soil, organic matter/peat, vegetation, listed plant species, wetlands and related loss and alteration of wildlife habitat. Largest amount of disturbance due to underground waste rock creating stockpiles of acid generating, contaminated and clean waste rock. Footprint estimated to be similar to Option 2 and double the total disturbance of Option 5.	Direct surface footprint/mining disturbance expected to be the lowest of the four options. This option is more preferred than option 2 and 4, similar to option 3 with regard to potential effects on the terrestrial environment.
		Soil				
		Organic matter/peat				
		Vegetation and Ecosystems				
		Listed Plant Species				
		Wetlands				
		Ungulates				
		Furbearers				
		Woodland caribou				
		Raptors				
		Migratory breeding birds				
		Bird species at risk				
	Human Environment	Human Health	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release	Less preferred. Potential exposure to non-radiological and radiological constituents in air, water, and food may be higher with this option compared to options 3 and 5 due to 1. changes in air quality from mine rock,	More preferred compared to option 2 and 4 due to smaller changes in air quality and smaller volume of treated effluent release

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			rock, slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.		slurry handling, and mine ventilation and 2. larger volume of treated effluent release to the aquatic environment.	
		Worker Health	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Surface operation with specialized surface equipment to drill horizontal cavities at ore depth. Physical ore cuttings will need to be rehandled on surface to either slurry for wet transport or dewater for dry transport increasing dose relative to Option 5 (which has a fraction of the drill cuttings to handle). Good conventional H&S as there is minimal mobile surface equipment.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Within this context, this option has potentially the highest dose as workers will have greater potential exposure to radiation while servicing equipment that is working within the ore zone. Underground work is higher risk than surface due to confined working area with heavy equipment underground and higher contaminates in underground atmosphere compared to open air conditions on surface.	No appreciable difference was identified between alternatives because with application of mitigation measures and monitoring, all options would protect worker health and maintain radiation exposure within limits for nuclear workers. Lowest dose of the four mining options evaluated in terms of dose associated with drill cuttings. The main contributor to worker dose would be radon associated with drilling the ISR wells. Surface piping of UBS, pumphouses, and well maintenance will also be a source of dose during pipeline repairs and inspection of equipment.
	Land and Resource Use	Indigenous Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for

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Table Criteria	Section	Valued Component	Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
			resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	and resources for safe use expected to be similar for all options.	safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Other Land and Resource Use	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (and changes to terrestrial environment) and 2. lower volume of treated effluent (and changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	Less preferred compared to options 3 and 5 because of larger potential changes in resource availability linked to: 1. Larger footprint (changes to terrestrial environment) and 2. Higher volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.	More preferred compared to options 2 and 4 because of smaller potential changes in resource availability linked to: 1. smaller footprint (changes to terrestrial environment) and 2. lower volume of treated effluent (changes to aquatic environment). For all options, the area immediately around the mining activity would not be available for Indigenous land and resource use activities during operations for safety reasons. Perceived suitability of land and resources for safe use expected to be similar for all options.
		Heritage Resources	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.	Less preferred compared to options 3 and 5. Larger area of surface disturbance increases potential interaction with archaeological resources.	More preferred compared to options 2 and 4. Smaller area of surface disturbance reduces potential interaction with archaeological resources.
	Quality of Life	Cultural Expression	No appreciable difference was identified between alternatives for changes to knowledge transmission and traditional diet, including perceived changes in the suitability and safety of resources that support a traditional diet.			
		Community Well-being	No appreciable difference was identified between alternatives for change in income of local workers and community cohesion.			
		Infrastructure and Services	No appreciable difference was identified between alternatives for changes in traffic, community infrastructure and services.			
	Economics	Economy	No appreciable difference was identified between alternatives for changes in participation in the traditional economy.			

Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Technical Factors	Complexity of design, construction, operation, and decommissioning	<p>Potential advantages: technology currently in use in Canadian uranium industry; mine layouts do not require development at or above the unconformity; remote system – safe for radiological risks.</p> <p>Potential technical weaknesses: Long duration development timeline; low production rate with limited ability to increase; currently used at only one mine with limited experience outside of that operation; may require extensive research and development; high technical risk including underground operating risks, inflow risk, design and operating risk; may require bulk freezing approach versus perimeter freeze design as assumed in the PEA. This would increase freeze cost and time significantly.</p>	<p>Potential advantages: technology in widespread use in oil and gas industry; reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (weeks); good production rate with scalability; similar technique under evaluation in Canadian uranium industry (Orano’s SABRE mining method).</p> <p>Potential technical weaknesses: Drilling accuracy is paramount and needs additional testing; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in civil / municipal applications; remote system – safe for radiological risks under normal operating conditions; self-supported tunnels, thus risk of ground failure or inflow in tunnels reduced; simple concept and operation, variety of knowledgeable contractors/personnel; moderate production rate (approximately 4M lbs/yr per machine); ability to apply multiple units (scalability).</p> <p>Potential technical weaknesses: Recovery of ore may be limited to 90% at best due to configuration of the tunnels; congested working space in the launch stations; not currently in use in Canadian uranium industry.</p>	<p>Potential advantages: technology in widespread use in international uranium operations (USA, Kazakhstan, Australia); reduced safety and environmental risks with elimination of underground excavations; completely remote system – safe for radiological risks; reduced number of employees on site; short timeframe to production (months); reduced technical risk with majority of remaining risks tested during feasibility stage; toll milling not required.</p> <p>Potential technical weaknesses: Not currently in use in Canadian uranium industry; mining solution permeability requires additional testing to increase confidence; low production rate – based on production rate at US operations (future testing may allow for higher production rates).</p>

Other Evaluation Factors					
Criteria		Option 2: Jet Boring	Option 3: Surface Boring	Option 4: Micro Tunnel Boring	Option 5: ISR
Cost Factors	Capital, operating, and decommissioning costs	Option 2 has high operating cost relative to the grade of the ore body, high capital costs and long duration development timeline, although the technology is in use at an existing uranium operation in Canada.	Option 3 has low capital and operating costs compared to jet boring.	Option 4 has the lowest ore recovery and high capital costs and long duration development timeline. Technology is commonly used in civil engineering.	Option 5 has low capital and operating costs. The technology is in widespread use at international uranium operations. ISR mining operations often have comparatively low capital and operating costs, as well as shorter timelines to first production and greater flexibility to allow production to be scaled to meet market demands.
<p>Input received from Interested Parties:</p> <p>Denison discussed potential mining methods early in the engagement process. As part of the engagement program for the Project, Denison organized a series of in-person workshops with Indigenous and non-Indigenous communities of interest (COI) and other Interested Parties in 2018. The workshops gathered community and student input in relation to potential mining methods for the Phoenix deposit. Given the history of uranium mining in the Athabasca Basin, there is a wealth of knowledge on various mining methods, and Denison sought input for which method would be best suited to efficiently and safety mining the Phoenix deposit.</p> <p>The following mining methods were evaluated for effectiveness in mining the Phoenix deposit at the Project: Jet Boring, Surface Boring, Micro Tunnel Boring and In Situ Recovery. There was no specific engagement data collected related to surface boring or micro tunnel boring. Workshop participants noted that while jet boring was a relatively well-known method of mining, the high economic costs may make it undesirable for the Phoenix deposit (18-EN-VPL-2.38) (18-EN-ERFN-5.44). ISR mining is new to northern Saskatchewan and Canada. Some workshop participants were unsure how to evaluate the potential benefits and/or drawbacks of this mining method (18-EN-VILX-3.69), however other participants were confident in the method, saying they know it works in other locations, there are minimal waste streams, and method is more economically feasible than other methods (18-EN-VILX-3.68). A participant in the Village of Beauval workshop preferred the small footprint and lesser environmental impacts of ISR and viewed this method as a new opportunity for northern Saskatchewan (18-EN-VB-4.51). New opportunities are welcomed in the area, as they can support local businesses, provide training and learning opportunities, and keep money within the local economy (16-EN-MLA-109.26).</p>					
<p>Selected alternative for mining method = Option 5: ISR</p> <p>Rationale: Mining methods were evaluated through an increasingly rigorous process and considered factors such as: safety, environment, production rates, capital costs, operating costs, schedule, operational flexibility, and risk. The top four mining methods considered for the Phoenix deposit were: jet boring, surface boring, micro tunnel boring, and ISR. Independent preliminary economic assessment or class 5 level assessments were completed on each of these four options in 2017. The parameters evaluated included safety, environmental impacts, radiological safety, capital cost, operating cost, development timeframe, production rate, economic results (net present value, internal rate of return), regulatory risk, technology risk, equipment and contractor availability, and operating flexibility; this information has been summarized above in the alternatives means assessment cells. In addition, workshops were held in local Indigenous and non-Indigenous communities to capture community input into the selection of a preferred mining method once the options were narrowed down. Ultimately, based on the alternatives evaluated and feedback from Communities of Interest, Denison included the ISR method in the prefeasibility study (PFS; Denison 2018) and this mining method was selected as the basis for the EA.</p>					

Less Preferred

Neutral

More preferred

**Table 2.10-4: Summary of Alternative Means Carried Forward into the Environmental Assessment**

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Mining	Method	Table 6	<del>Open-pit</del>	Jet Boring	Surface Boring	Micro Tunnel Boring	ISR		
	Freeze design for tertiary containment of mining solution	Table 7	Freeze dome	Freeze wall					
	Permeability enhancement	Table 8	Hydraulics	Propellant	Mechanical				
	Mining solution	Not applicable. Option 1 basic solution was deemed not technically feasible, economically feasible, and passed the land use screening are carried forward in the evaluation.	<del>Basic solution</del>	Acidic solution					
Processing	Location of processing	Table 9	Off-site processing at an existing mill	On-site processing in purpose built processing plant					
	On-site processing method	Table 10	Ion exchange	Solvent extraction	Direct precipitation				
Water management	Freshwater supply	Table 11	Groundwater	Surface water					
	Drinking water	Table 12	Truck drinking water to site	Generate drinking water on site with a potable water treatment plant					



Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
	Treated effluent discharge location	Table 13	To groundwater	<b>To surface water</b>					
	Treated effluent discharge locations for surface water	Table 14	Kratchkowsky Lake (LA-7)	Whitefish Lake north (LA-6)	<b>Whitefish Lake south (LA-5)</b>	McGowan Lake (LA-1)	Russell Lake	<del>Mardoc Lake (LA-4)</del>	<del>Williams Lake-LB-3</del>
Waste management	Organic waste disposal	Table 15	On-site disposal using an incinerator	On-site disposal in domestic landfill	<b>On-site composting</b>				
	Process precipitate disposal	Table 16	On-site permanent disposal	<b>Off-site reprocessing and final disposal</b>					
	Domestic waste disposal	Table 17	Collection and disposal off site by a third-party contractor	<b>Collection and disposal in an on-site domestic landfill</b>					
Access and transportation	Access road alignment	Table 18	Direct route	Direct route to reduce cut volumes	<b>Follows part of the existing exploration access road</b>				
	Stream crossing structures	Table 19	Culverts	<b>Clear span bridges</b>					
	Worker transportation	Table 20	Ground transport	<b>Air transport to existing airstrip at nearby Cameco operations</b>	<b>Air transport to new airstrip constructed and operated by Denison</b>				
Power	Primary power supply	Table 21	Liquefied natural gas power plant	<del>Solar photovoltaic power plant</del>	Diesel generators	<b>Provincial power grid</b>			

Project Component		Reference to Detailed Alternative Means Assessment Table in Appendix 2-C	Alternative Means						
			Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Support facilities	Camp location optimization	Table 22	First location - Prefeasibility	Second location – Reduce fill volumes	Third location - Southwest from second location				

**Selected alternative**

~~Strike through~~ option was eliminated at an earlier step due to technical, economic, or land use factors (see Appendix 2-C)

## Attachment: IR-28

Number	IR-28
Dept.	CNSC
Project effects link	Current use of lands and resources for traditional purposes
Reference to EIS, appendices, or supporting documentation	<p>Section 4, IER and engagement appendices, including:</p> <ul style="list-style-type: none"> <li>• Appendix 2-A</li> <li>• Appendix 6-B</li> <li>• Appendix 7-B</li> <li>• Appendix 8-A</li> <li>• Appendix 9-A</li> <li>• Appendix 10-B</li> <li>• Appendix 11-A</li> <li>• Appendix 12-A</li> <li>• Appendix 13-A</li> <li>• Appendix 14-B</li> </ul>
Context and Rationale	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>
Information Requirement	<p>1) Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p>

	<p>2) Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3) Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>4) Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>
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Response:

This response has broken up information into two sections – the information requirement in relation to Section 4 and the associated related sections in the Indigenous Engagement Report (IER), and the engagement appendices that are associated with various sections of the EIS.

**Section 4 and the IER: Context**

Engagement with Indigenous and non-Indigenous Communities of Interest and Other Communities has been ongoing since 2016 and has evolved over time. Some changes have occurred from the beginning of engagement activities in 2016 to today, such as:

- early engagement occurring with the Northern Village of Pinehouse Lake, to the current state where Kineepik Métis Local #9 (KML) now generally represents the interests of the Métis citizens of the Northern Village of Pinehouse Lake together, along with general non-Indigenous residents;
- the Duty to Consult delegated to the Métis Nation – Saskatchewan from the A La Baie Métis Local #21, the Sipishik Métis Local #37, Patuanak Métis Local #82, and the Sled Lake / Dore Lake Métis Local #67; and
- interest expressed in the Project by Peter Ballantyne Cree Nation, who had not been previously identified by Denison, the CNSC nor the Province of Saskatchewan as having potential interests in the Project.

**Section 4 and the IER: Interests, Issues and Concerns**

Denison has worked to adapt to the changes as they have arisen. As such, we recognize that some of the *Interests, Issues and Concerns* tables (“Issues Tables”) can be further updated with new information

about potential issues that have arisen in relation to the Project, of which both the issue and Denison's response to the issue will be further subject to validation by the Indigenous Nation or community.

It is important to note that not all issue or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response—but mitigation and monitoring measures will be included where it makes sense to do so.

In respect of understanding and enhancing the identification of issues by an Indigenous nation or community, we can advise the CNSC that presently we have:

- 1) reviewed each Issues Table to determine any engagement data gaps evident as presented in the draft EIS, which may have occurred due to the changing nature of engagement over time as specified above;
- 2) updated each Issues Table with the key issues raised by the Indigenous Nation and community as a result of comments made on the draft EIS;
- 3) have developed a plan for validation and positive resolution of the Issues Table with each Indigenous Nation and community and are presently seeking confirmation with each group accordingly; and
- 4) (in the near future) seek confirmation on acceptable path forward in relation to validation of issues and/or resolution, where it is mutually agreed upon. Where it is not mutually agreed upon, Denison will identify a proposed rationale for potential next steps.

As an important note on this, Denison received permission to use three Indigenous Knowledge reports in the EIS, to provide additional comprehensive information in relation to the relationship to the land and connection to the environment from the Indigenous nations who shared this information. Information from these reports was used accordingly in the draft EIS to inform the environmental assessment and methodology. At the request of these Indigenous nations, these reports have been provided to the regulators under confidential cover. Denison did not carry forward items into the draft EIS that were outside the scope of the agreed-upon nature of the information exchange between Denison and the Indigenous nation. As such, at the time, Denison did not bring forward concerns raised in these reports through to Section 4 of the draft EIS.

Each of the Indigenous nation for whom these reports were prepared has now provided publicly available comments on the draft EIS where they have summarized their own issues and concerns about the Project, *some* of which arise from the confidential materials they have provided to the regulator. As such, Denison can now confidently update the Issues Table with these comments provided on the public record, which will enable a transparent accounting of issues from the worldview.

#### **Section 4 and the IER: Clear Documentation in Issues Tables**

Denison understands the importance of demonstrating to the CNSC how issues and concerns raised by Indigenous nations and communities have been resolved, or where this has not been achieved, how Denison can demonstrate its efforts towards doing so and/or rationale for where agreement has not been reached.

We can advise that the steps identified above have been successfully achieved with KML, and as such, Appendix A to this submission includes the Issues Table that will be inserted into the final EIS for KML (Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 [and corresponding table in the IER])

and serves as an example of the Issues Table that will be generated for all the other Indigenous nations and communities.

In this table Denison has added additional information in relation to *How Comment was Addressed / Considered in the Draft EIS* as requested by the CNSC, including any specific mitigation and/or monitoring measures pertinent if appropriate. Additionally, the *Status* column includes whether the issue is complete or ongoing, and the *Justification of Status* column now includes the evidence to support the status conclusion, and if necessary, additional details are provided in the *Ongoing Resolution of Concerns (if Required)* column. The *Ongoing Resolution of Concerns* column will outline the planned process to be followed with the Indigenous nation or community in respect of validation and/or resolution of the issue.

It is Denison's objective to successfully validate and resolve concerns with Indigenous nations and communities prior to the finalization of the EIS. As per Denison's outlined engagement strategy, a focussed approach will occur, first with respect to Indigenous and non-Indigenous Communities of Interest, and then with other Interested Parties.

Where Denison is unable to demonstrate that positive validation and resolution have been attained, clear information will be provided in the relevant table for the Indigenous nation or community in Section 4 of the final EIS (and if required, the IER) outlining the efforts undertaken to do so, planned next steps, or clear rationale for why a positive resolution has not been found to date.

#### **Section 4 and the IER: Planned Engagement and Next Steps**

Denison understands the importance of outlining to the CNSC the planned engagement activities to occur with Indigenous nations and communities. As identified above, part of engagement activities is in relation to positive validation and resolution of key issues. Additionally, Denison will be undertaking additional engagement activities that are outlined as follows as of June 30, 2023.

#### **English River First Nation ("ERFN")**

##### **Interests, Issues and Concerns:**

- 1) Denison has reviewed ERFN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with ERFN regarding a process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators will be included as part of this process.
- 4) Status of successful validation by ERFN of Denison responses to Issues Table—in progress.

##### **Engagement activities**

- 1) Site tour is planned for summer 2023 with ERFN Leadership, Technical team and Members.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - a. mitigation, monitoring and residual effects
  - b. forthcoming licensing actions

##### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the EIS and the associated section in the IER.



### **Kineepik Métis Local #9 (“KML”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed KML comments provided on the draft EIS.
- 2) Issues, Interests and Concerns table from Section 4 of draft EIS was revised according to Appendix A of this IR to be updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions actively occurring with KML regarding process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised since engagement commenced 2016. Items of interest raised by regulators were included as part of this process.
- 4) On June 10, 2023, Denison received positive validation that Denison's responses to KML issues, as described in the Issues Table, were acceptable to KML.
- 5) Status of successful validation by KML of Denison responses to KML Issues Table—**complete**.

**\*\*It is important to note that KML and the Northern Village of Pinehouse are working on the above matters together as a collective\*\***

#### **Engagement activities**

- 1) Site tour is planned for summer 2023 with KML Leadership, Technical team and Citizens.
- 2) Community and Leadership engagement—planned for fall 2023 to discuss:
  - c. mitigation, monitoring and residual effects
  - d. forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Ya'thi Nene Lands and Resources Office (“YNLR”) (Representing the Athabasca Basin First Nations and the Athabasca Basin Communities)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed YNLR comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Discussions are actively occurring with YNLR regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) Status of successful validation by YNLR of Denison responses to YNLR Issues, Interests and Concerns—**in progress**.

#### **Engagement activities**

- 1) Undertook in-person community meetings in January 2023 in coordination with the YNLR in Black Lake, Fond du Lac, Hatchet Lake and Uranium City.
- 2) Coordinating process for additional engagement with YNLR for fall 2023 as they deem appropriate to discuss:
  - a) mitigation, monitoring and residual effects
  - b) forthcoming licensing actions

#### **Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

### **Métis Nation – Saskatchewan (“MN-S”)**

#### **Interests, Issues and Concerns:**

- 1) Denison has reviewed MN-S comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.

- 3) Denison has offered to meet to discuss the process toward resolution of draft EIS comments with MN-S as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 4) MN-S and Denison met on June 12, 2023, to provide a status update on completion of deliverables with respect to Capacity Funding Agreement, and in particular, the Métis Knowledge Study. MN-S outlined steps being followed in respect of this work. Denison indicated its willingness to meet regularly to support the efforts of MN-S in this regard. A tentative meeting has been set for the week of June 26-29, 2023.
- 5) Status of successful validation by MN-S of Denison responses to MN-S Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Undertook in-person community NR1 and NR3 meetings in February 2023, as coordinated and led by MN-S.
- 2) Will take direction from MN-S about coordinating additional meetings with MN-S as they deem appropriate to discuss matters of interest.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Birch Narrows Dene Nation (“BNDN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed BNDN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested the BNDN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project, as indicated by BNDN as existing. To facilitate this, Denison has shared a proposed confidentiality agreement with BNDN to facilitate the sharing of such information.
- 4) Discussions are actively occurring with BNDN regarding the process to resolve issues and concerns raised about the draft EIS, as well as successful validation of Denison's responses to historical issues and concerns raised over time.
- 5) Status of successful validation by BNDN of Denison responses to BNDN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with BNDN on February 14, 2023, to provide an overview of the Wheeler River Project. During the meeting, BNDN indicated they would share a traditional territory map and land and occupancy information in relation to the Wheeler River Project subject to reaching suitable confidentiality provisions.
- 2) On April 25, 2023, Denison shared a draft confidentiality agreement with BNDN.
- 3) On May 10, 2023, Denison met with BNDN, to discuss the process going forward. During the meeting, Denison was advised that BNDN had proposed revisions to the confidentiality agreement, which they would provide to Denison. Also identified in the meeting was that Denison's access to data BNDN has referenced regarding land use activities in and around the Wheeler River Project would be limited and subject to additional funding from Denison to BNDN. Denison continued to request the available site-specific information to better understand the potential for adverse impacts to rights from the Wheeler River Project to BNDN to potentially adjust engagement approaches with BNDN.

- 4) On May 11, 2023, Denison was advised to communicate directly with the Chief of BNDN and was provided additional information from BNDN that BNDN would connect with Denison in the future to determine next steps together.
- 5) On June 16, 2023, BNDN contacted Denison to request a meeting toward the latter part of July 2023. Denison responded positively to this request and will be following up with BNDN accordingly.
- 6) Subject to process set between Denison and BNDN as identified above, engagement process to be determined.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Peter Ballantyne Cree Nation (“PBCN”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed PBCN comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS.
- 3) Denison has requested PBCN traditional territory map along with relevant land and occupancy information in relation to the Wheeler River Project.
- 4) To facilitate this, PBCN has directed Denison to access the traditional territory map in a confidential fashion from the CNSC.
- 5) On May 30, 2023, Denison has made this request of the CNSC.
- 6) Per below, Denison intends to provide materials to PBCN responding to the concerns raised in the EIS.
- 7) Status of successful validation by PBCN of Denison responses to PBCN Issues, Interests and Concerns—in progress.

**Engagement activities**

- 1) Denison had a meeting with PBCN on May 16, 2023, to provide an overview of the Wheeler River Project. During the meeting, PBCN indicated they would share a traditional territory map and had land and occupancy information in relation to the Wheeler River Project. PBCN indicated they desired another meeting to discuss their interests in the Wheeler River Project further. During this meeting Denison and PBCN acknowledged the challenges of meeting immediately, but committed to doing so.
- 2) As of June 30, 2023, Denison and PBCN have not met, but have intent to do so. Generally, the purpose of the next meeting would be for PBCN to provide more detail on their interests in the Wheeler River Project, and Denison would provide responses to the high-level issues raised by PBCN in their draft EIS comments.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Lac La Ronge Indian Band (“LLRIB”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments—for the final EIS:
  - a) Denison has confirmed that the Wheeler River Project is not located within the Lac La Ronge Indian Band Traditionally Occupied Territory as described in <https://pubsaskdev.blob.core.windows.net/pubsask-prod/86730/86730-English.pdf> (page 84) (email to Ty Roberts, LLRIB - date February 14, 2023).

- b) Denison has confirmed that the Trapping furblock in which the Wheeler River Project is located is N-18 (ERFN) (email to Ty Roberts, LLRIB - date February 14, 2023).
- 3) Per below, Denison is providing materials to LLRIB responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by LLRIB of Denison responses to LLRIB Issues, Interests and Concerns–**in progress**

**Engagement activities**

- 1) Denison will send correspondence to LLRIB regarding the issues raised in the letter sent to the CNSC on the draft EIS in the coming months. In this correspondence, Denison will reiterate its interest in participating in a meeting of the LLRIB Land and Resources Board at a time that is mutually convenient. Denison has also requested the information from the LLRIB that indicates there is some trapping activity near the Project, to better understand the nature of these activities in relation to the Project.
- 2) As of June 30, 2023, Denison and LLRIB have not met, but have intent to do so at a mutually convenient time.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Prince Albert Grand Council (“PAGC”)**

**Interests, Issues and Concerns:**

- 1) Denison has reviewed comments provided on the draft EIS.
- 2) Issues Table from Section 4 of the draft EIS will be revised according to the example found in Appendix A of this IR and updated with summarized draft EIS comments–for the final EIS.
- 3) Per below, Denison is providing materials to PAGC responding to the concerns raised on the Project in relation to the draft EIS.
- 4) Status of successful validation by PAGC of Denison responses to PAGC Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Denison will be sending correspondence to PAGC regarding the issues raised in the draft EIS with a response to issues raised by PAGC.
- 2) Based on the outcome of the effort above, Denison will undertake next steps accordingly.

**Future Documentation in updated EIS and updated IER**

- 1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Northern Village of Beauval & Northern Village of Ile a la Crosse (“NVB” & “NVILX”)**

**Interests, Issues and Concerns:**

- 1) No comments were received on the draft EIS by these Interested Parties.
- 2) The format of the Issues Tables for NVB and NVILX will be formatted according to Appendix A of this IR–for the final EIS.
- 3) Denison will develop a process with NVB and NVILX in relation to the Issues Tables for each of these Interested Parties to seek successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns.
- 4) Status of successful validation by NVB and NVILX of Denison responses to NVB and NVILX Issues, Interests and Concerns–**in progress**.

**Engagement activities**

- 1) Community and Leadership engagement–planned for fall 2023 to discuss:
  - a) mitigation, monitoring and residual effects

b) forthcoming licensing actions

**\*\*NVILX subject to discussions with MN-S\*\***

**Future Documentation in updated EIS and updated IER**

1) All records per the above will be updated in Section 4 of the final EIS and the IER.

**Section 4 and the IER: Updates Planned for the Final EIS**

The following will be updated for the final EIS:

- Section 4 general updates since submission of the draft EIS, including updates to clarify the purpose of the Key Issues and Concerns tables and the Engagement Database Summary tables in various appendices
- Table 4.3-2: Key Issues and Concerns from English River First Nation (and corresponding table in the IER)
- Table 4.3-3: Key Issues and Concerns from Kineepik Métis Local #9 (and corresponding table in the IER)
- Table 4.3-4: Key Issues and Concerns from Sipishik Métis Local #37 (and corresponding table in the IER)
- Table 4.3-5: Key Issues and Concerns from Patuanak Métis Local #82 (and corresponding table in the IER)
- Table 4.3-6: Key Issues and Concerns from Birch Narrows Dene Nation (and corresponding table in the IER)
- Table 4.3-7: Key Issues and Concerns from Lac La Ronge Indian Band (and corresponding table in the IER)
- Table 4.3-8: Key Issues and Concerns from A La Baie Métis Local #21 (and corresponding table in the IER)
- Table 4.3-9: Key Issues and Concerns from Métis Nation – Saskatchewan (and corresponding table in the IER)
- Table 4.3-10: Key Issues and Concerns from Ya'thi Néné Lands and Resources Office (and corresponding table in the IER)
- Table 4.4-1: Key Issues and Concerns from the Northern Village of Pinehouse
- Table 4.4-2: Key Issues and Concerns from the Northern Village of Beauval
- Table 4.4-3: Key Issues and Concerns from the Northern Village of Île-à-la-Crosse

A new table will also be included for Peter Ballantyne Cree Nation in the final EIS and in the IER.

### **Engagement Database Summary Tables in Various Appendices: Context**

Denison's overall approach to respecting the information shared with Denison, as a result of engagement interactions from 2016 onwards, was to aspire to interweave the data outcomes throughout the entire assessment, rather than providing a single summary chapter in the draft EIS. To do this, Denison's Subject Matter Experts reviewed the over 2,000 lines of engagement data collected from 2016 onwards, and determined what and which information could meaningfully inform their assessment approach. This resulted in engagement data being reflected throughout the entire draft EIS, informing almost all aspects of the assessment. To make sure the reviewer could reasonably understand the context in which the engagement data was collected, Denison created an Engagement Database Summary Table as an Appendix item for each section of the draft EIS where engagement data were used. Each Engagement Database Summary Table identifies the *Unique ID* referenced in the chapter, the *Record of Contact* ("ROC") number that can be used to look up the original source materials in the EIS Appendix 4-A: Supporting Materials, the *Event Type*, the *Date*, the *Event Summary*, the *Interested Parties* with which the engagement occurred, the *Comment* made, and the *Response* from Denison. Denison has now added a final column called *Context*, which provides specifics about how the comment was used in the section.

It is important to note that not all issues or concern raised by an Indigenous nation or community will necessarily have a specific mitigation measure and/or monitoring associated with Denison's response, but mitigation and monitoring measures will be included where it makes sense to do so.

It is also important to note that these engagement data are not intended to be representative of the Indigenous nation or community perspective, as the comment may have been made by an individual from the Indigenous nation or community, and not specifically by the leadership. The Issues Tables (as discussed in this IR) are those Tables that summarize the collective interests, issues and concerns by the leadership, which Denison has identified will be subject to the validation process as outlined above. These appendices are simply intended to provide transparency around the engagement data points that had been used in the draft EIS in some manner, and are, therefore, not part of the validation process designed for Indigenous nations and communities.

### **Engagement Database Summary Tables in Various Appendices: Updates Planned for the Final EIS**

Please see Appendix B to this IR for an example of the new format for the Engagement Appendices. The following in the EIS will be updated:

- Section 2 Project Description – Appendix 2-A: Engagement Database Summary Table for Project Description
- Section 6 Atmospheric and Acoustic Environment – Appendix 6-B: Engagement Database Summary Table for Project Description
- Section 7 Geology and Groundwater – Appendix 7-B: Engagement Database Summary Table for Geology and Groundwater
- Section 8 Aquatic Environment – Appendix 8-A: Engagement Database Summary Table for Aquatic Environment
- Section 9 Terrestrial Environment – Appendix 9-A: Engagement Database Summary Table for Terrestrial Environment
- Section 10 Human Health – Appendix 10-B: Engagement Database Summary Table for Human Health



- Section 11 Land and Resource Use – Appendix 11-A: Engagement Database Summary Table for Land and Resource Use
- Section 12 Quality of Life – Appendix 12- A: Engagement Database Summary Table for Quality of Life
- Section 13 Economics – Appendix 13-A: Engagement Database Summary Table for Economics
- Section 14 Accidents and Malfunctions – Appendix 14-B: Engagement Database Summary Table for Accidents and Malfunctions
- Section 15 Effects of the Environment – Appendix 15-A: Engagement Database Summary Table for Effects of the Environment on the Project

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
<b>Monitoring</b>	<p>Interest in information and direct participation in monitoring baseline and effects.</p> <p>Concern that project should have independent monitoring for the Project and that information from this be shared with communities.</p>	ROC 2 ROC 105 ROC 444	<p>An Environmental Protection Program will be established to provide an overarching framework for key environmental monitoring and management plans and to ensure a means to demonstrate compliance with applicable environmental regulatory requirements and other performance targets that Denison may set. The program would be developed in a manner that aligns with the ISO 14001 EMS Standard. Aspects of the Environmental Protection Plan will include:</p> <ul style="list-style-type: none"> <li>-Management and Monitoring of Emissions</li> <li>-Liquid Effluent Monitoring Plan</li> <li>- Air Emissions Monitoring Plan</li> <li>- Groundwater Monitoring Plan</li> <li>- Environmental Monitoring Plan</li> <li>- Woodland Caribou Management Plan</li> </ul> <p>As the Indigenous Community of Interest with a residential community most proximal to the Project, Denison has committed to collaborating with Kineepik Métis Local on a community specific monitoring regime, suited to their interests and needs in order to provide transparent information to discourage avoidance of the area and alleviate perceived concerns about potential impacts. As part of this program, Denison and KML will be sharing information in an agreed-upon fashion, about agreed-upon species of interest. Denison expects that important country foods harvested for food and cultural purposes (i.e moose, fish species, etc), surface water quality, and other areas of interest will form part of this monitoring program, including the potential to report on wildlife-vehicle mortality or other such areas of potential concern as they evolve over time.</p> <p>See Section 16 for a summary of monitoring and follow-up programs.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Economics</b>	Concern and interest in economic opportunities associated with Project and education and training to facilitate access and participation by community members.	ROC 62 ROC 105 ROC 388 ROC 444 ROC 620 ROC 623	Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Mitigation and enhancement measures will be implemented by Denison to enhance the positive effects of the Project on employment and training, income, traditional economy, and business opportunities and minimize adverse effects including:</p> <ul style="list-style-type: none"> <li>-A Human Resource Development Plan to initially prioritize Indigenous and non-Indigenous communities in the LSA in terms of employment and training opportunities;</li> <li>-Establishment of a procurement approach through all phases of the Project, focusing on businesses based within the LSA communities, followed by Indigenous and / or businesses in the RSA;</li> <li>-Negotiation with the Province of Saskatchewan to develop the Project's Surface Lease Agreement and Human Resource Development Agreement.</li> </ul> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including in relation to ongoing education and training as deemed appropriate by KML.</p> <p>See Section 13 for a summary on local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p> <p>See Section 13 for information regarding employment, employment opportunities, and career growth for community members.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Economics</b>	Interest with potential contracts and business opportunities for northern Indigenous companies.	ROC 105 ROC 114 ROC 118 ROC 444	The Project will create employment and business opportunities and increase income for workers and businesses in the LSA, RSA, and beyond the RSA during all phases of the Project. Denison has estimated a workforce during the two-year Construction period of 300 people and during the Operation phase 180 people are expected to be employed to operate the ISR wellfield and processing plant, including	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>supporting activities. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA will be given first priority for employment and training and business opportunities, followed by Indigenous and / or other communities in the RSA.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including business opportunities as deemed appropriate by KML.</p> <p>See Section 13 for a summary of local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.</p>		<ul style="list-style-type: none"> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	
<b>Engagement</b>	<p>Interest in implementation of appropriate engagement process activities.</p> <p>Concern was raised over the approach to consultation with others (other communities) and questions raised on whether a Collaborative Agreement was possible during operations.</p>	ROC 106 ROC 114 ROC 118 ROC 135 ROC 388 ROC 444	<p>Denison has identified key objectives respecting Indigenous engagement associated with the Project:</p> <ul style="list-style-type: none"> <li>-Build and maintain authentic relationships based on a foundation of trust, good faith, and transparency.</li> <li>-Create a respectful dialogue process that promotes communication and collaboration among Denison and Indigenous communities, in a timely and accurate fashion.</li> <li>-Understand how the proposed development of the Project may affect the interests of Indigenous peoples (including Indigenous and/or Treaty Rights), and work with Indigenous peoples to avoid, mitigate, or otherwise address effects, while also collaborating to maximize potential positive effects.</li> </ul> <p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML and continues to engage with KML and NVP with respect to the Wheeler River Project.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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			<p>The Agreement negotiated between Denison and KML is demonstrative of Denison's responsiveness to the request from KML for such an agreement.</p> <p>See Section 4 for additional information on the consultation process.</p>			
<b>Cumulative Effects</b>	Concern was expressed over cumulative effects in the region.	ROC 105	<p>Denison conducted a cumulative effects assessment, which included the Highway 914 extension project, on categories:</p> <ul style="list-style-type: none"> <li>-The Atmospheric and Acoustic Environment.</li> <li>-Geology and Groundwater.</li> <li>-The Aquatic Environment.</li> <li>-The Terrestrial Environment.</li> <li>-Human Health.</li> <li>-Land and Resource Use.</li> <li>-Quality of Life.</li> <li>-Economics.</li> </ul> <p>Denison respects and understands KML's concern about the cumulative effects in the region, particularly in relation to access to traditional lands and resources in correlation with industrial and mining developments. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the ILRU RSA, resulting in potential cumulative effects to Indigenous land use activity in the area. This is largely due to the proposed Highway 914 extension project.</p> <p>See Section 16 for a summary of the cumulative effects assessments for each category above.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest in information about current market conditions and overall viability of the Project.	ROC 105	Denison has identified that there is current and future market demand for uranium, the primary raw material for nuclear fuel generation. The Project can address gaps in annual global uranium supply and the use of uranium in nuclear power plants can contribute to net-zero goals, and this can be achieved while making a meaningful contribution to the Canadian economy. The Project was considered in relation to technical feasibility, economic feasibility, and land use criteria to determine viability of the Project.	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>• Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>• Confirmation of positive</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			See Section 2 for information about Project components and purpose.		validation by KML received by email on <b>June 10, 2023</b>	
<b>Project Description</b>	<p>Feedback on mining options and technical questions were asked on the different methods of mining.</p> <p>The community provided comments on the different on-site road options.</p>	ROC 2	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>Through an alternative means assessment, Denison considered options in relation to access and transportation. The access road alignment will follow part of the existing exploration access road, stream crossing structures will use clear span bridges, and worker transportation will be air transport to a) nearby Cameco operations or, b) a new airstrip constructed and operated by Denison.</p> <p>Denison incorporated the feedback provided on road options select the <b>current</b> road alignment for the Project.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Interest for information about type and how chemicals and other hazardous products would be transported, and whether an emergency response team would be ready to respond.	ROC 444	<p>Denison will establish a Transportation of Dangerous Good Program, intended to provide for the safe transport of goods by conforming to all applicable laws, regulations, company policies, and procedures. The Transportation of Dangerous Goods Program applies to all modes of transport and all locations where Denison assumes care and control of the materials.</p> <p>Denison will establish an Emergency Preparedness and Response Program to identify how the Project will prepare for and addresses emergencies that may affect the health and safety of persons, the environment, and the protection of property. Emergency</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue



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			<p>Preparedness and Response Program would be developed consistent with guidance provided by CNSC in REGDOC-2.10.1, Nuclear Emergency Preparedness and Response (CNSC 2016).</p> <p>Increased pressure on emergency services is most likely to stem from an accident or malfunction on Highways 914 or 165. The extent to which these changes could affect any given community would depend on the nature of the accident or malfunction. Accidents and malfunctions for the Project were determined to (generally) have a highly unlikely to unlikely probability of occurrence, with an overall risk rating of low to moderate; however, the severity of accidents and malfunctions was determined to be minor to major. If such an event were to occur, local resources may be called upon to provide support, which may result in a call to fire, RCMP, or ambulance services depending on the nature of the event. Denison will provide any necessary training and/or equipment to local first responders to make sure they are sufficiently prepared to deal with an unlikely accident or malfunction.</p> <p>Denison's objective is to utilize existing emergency response teams from other operations prior to drawing on community-based resources. In the unlikely event that this were to occur, and KML resources were drawn upon, the Agreement negotiated between provides the foundation for discussions in respect of such incidents.</p> <p>See Section 2 for information pertaining to the above programs.</p>		email on <b>June 10, 2023</b>	
<b>Land and Resource Use</b>	Russell Lake was noted of particular importance for recreational/commercial fishing.	ROC 2 ROC 620	<p>Denison noted the importance of Russell Lake and considered Russell Lake in the LSA in terms of recreational/commercial fishing.</p> <p>Negligible aquatic habitat loss is predicted in LA-5 (also known as Whitefish Lake) due to the installation of a discharge pipeline and diffuser configuration. The total area of the lake substrate that would be overprinted by the pipeline is expected to be approximately 135 m<sup>2</sup>, which will constitute less than 0.05% of the lake's surface area. No other alteration, disruption, or destruction of aquatic habitat in the aquatic environment LSA is expected. Project-induced changes to the</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>abundance and distribution of fish is, therefore, not expected. The effect, if any, is expected to undetectable to fishers.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in environmental monitoring associated with the Project, including the potential for monitoring fish species harvested by and important to, KML.</p> <p>See Section 11 for information on how the Project will interact with land and resources including how potential effects will be mitigated.</p>		email on <b>June 10, 2023</b>	
<b>Indigenous and Local Knowledge</b>	The community has pre-existing Indigenous Knowledge and will work with Denison on this.	ROC 106	<p>In 2018, KML approached Denison to support a land use mapping initiative in the Project area. The 2018 study builds on existing land use maps, completed in 2011. A verification meeting was held in late 2018 to make sure no geographic data gaps existed and that the results speak for the whole community. In 2022, KML prepared a document to voice their perspectives on Project VCs and to provide a record for EIS development. Based on 12 community engagement sessions and review of the land use maps, KML explained their unique social, cultural, and historical context, expressed a general consensus of support for the Project, and described issues and concerns.</p> <p>See Section 3 for information on IK and LK and how this information was integrated throughout the EIS.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Project Description</b>	Questions and clarifications on ISR mining methodology, including freeze wall technology and Project power requirements.	ROC 62 ROC 604 ROC 620 ROC 623	<p>Project components include: ISR, Drilling, Freeze Wall, Wellfield, Processing, Water Management, Waste Management, Access and Transportation, Power, Support Facilities, Project Area, Project Activities, Ancillary Projects, GHG Emissions, Project Schedule, Project Benefits, Project Design Features, Management System, and Project Alternatives.</p> <p>See Section 2 for information and technical detail pertaining to Project Components and Project alternatives.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

## Appendix A

Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>Engagement activities for the Project can and will evolve over time, as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project. At present, Denison has an Exploration Agreement with KML continues to engage with KML and NVP with respect to the Wheeler River Project.</p> <p>See Section 4 for additional information on the consultation process.</p>		<b>June 10, 2023</b>	
<b>Economics and Local Capacity Building</b>	Expressed a need for building capacity locally in terms of training and education, emergency response, waste management, and additionally expressed a want of local procurement and industry supporting infrastructure.	Draft EIS Comments	<p>As outlined in Denison's Indigenous Peoples Policy, Denison recognizes the critical necessity of advancing reconciliation with Indigenous peoples in Canada and the important role of Canadian business in the reconciliation process. Denison is committed to providing Indigenous people and businesses with sustainable economic opportunities and benefits and sharing the economic benefits of Denison's business activities.</p> <p>The Agreement negotiated between Denison and KML outlines specific commitments for KML participation in economic opportunities associated with the Project, including commitments for ongoing education and training as deemed appropriate by KML, support to the vision of local industry supporting infrastructure.</p> <p>In terms of building capacity locally for emergency response and waste management, Denison supports KML's vision on these items where it makes sense and is possible. The Agreement provides a framework for future possibilities such as these.</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by KML received by email on <b>June 10, 2023</b></li> </ul>	N/A General discussions to continue as part of ongoing dialogue
<b>Access and Transport</b>	Expressed a need for industrial grade improvements between Highway 2 and the Key Lake Gate to support the increase in heavy traffic.	Draft EIS Comments	<p>Highway improvements are not within Denison's jurisdiction and are not considered in the EIS for the Wheeler River Project. However, Denison notes KML's perspective of increased traffic volumes and subsequent desire for highway improvements.</p> <p>On Highway 914 between Key Lake and Pinehouse, Denison anticipated that road users would see an increase between 16% and</p>	<b>Complete</b> (based on KML acceptance of Response)	<ul style="list-style-type: none"> <li>Draft table sent by email from Denison on <b>June 7, 2023</b></li> <li>Confirmation of positive validation by</li> </ul>	N/A General discussions to continue as part of ongoing dialogue

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Topic	Summary of the Issue, Interest, or Concern	Reference	Denison Response & How Comment was Addressed/Considered in the Draft EIS	Status	Justification of Status	Ongoing Resolution of Concerns (if required)
			<p>40% over the life of the mine. Trucks travelling on this section of highway will increase from 35 to 53 at peak operational times.</p> <p>Denison's vision in respect of this concern is that Denison and KML work together as partners in discussions about highways with the Provincial Government.</p> <p>However, in respect of actions Denison can undertake regarding traffic along the road at times important for the undertaking of cultural activities, Denison commits to:</p> <ol style="list-style-type: none"> <li>1) Assisting KML with the clear identification of the forthcoming culture camp along highway 914 (clear signage)</li> <li>2) Having Project vehicle slow down to 40km/hr from mid-August to mid-October, during the times when KML members may be using the portion of the road near the culture camp. To be specific, this includes 2.5km before the entry into the culture camp, and 2.5km after the entry into the culture camp.</li> </ol> <p>See Section 2, Appendix 2-B for more detail pertaining to traffic volumes.</p>		KML received by email on <b>June 10, 2023</b>	

## Appendix B

### Section 9: Engagement Database Summary Table – Vegetation and Ecosystems

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-VILX-3.32	3	Workshop	2018-01-17	As part of the engagement program for the Wheeler River Project, Denison organized a workshop in Ile a la Crosse for community and A La Baie Métis members to attend. The workshop gathered community and student input in relation to road alignment options, treated effluent discharge locations, and mining methods.	Village of Ile a la Crosse	Need to understand impact on groundwater and lakes.	<p>Denison considered this in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in Areal Extent of Habitat Types, Number of Listed Plants, and Areal Extent of Wetlands</p> <p>And in section:</p> <p>Assessment of Project Related Effects, Potential Project Related Effects, Change in the Concentrations of Constituents of Potential Concern in Vegetation</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from an individual who attended workshop in Ile a la Crosse in the year 2018, which reiterates the importance of groundwater and lakes, thereby providing further validity to the inclusion of water quality and water quantity as a potential pathway of influence in terms of areal extent of habitat types, number of listed plants, the areal extent of wetlands, and changes in the concentrations of constituents of potential concern in vegetation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Groundwater impacts were assessed in Section 7 titled Geology and Groundwater. Impacts to lakes were assessed in Section 9 titled Aquatic Environment. Section 7 and 9 provide details to support the conclusion that there is no significant impact in terms of groundwater or lakes.</p>
20-LK-LEASESUR-267.67	267	Survey	2020-02-01	Denison sent all known local cabin and lodge leaseholders a survey in the mail to be completed regarding their interests in Wheeler River. Denison received 6 responses from the survey, which has informed it's understanding of leaseholder uses in the area and interests regarding elements to be assessed as part of the environmental assessment.	Leaseholder, Wheeler River Lodge	Concerns over fishing and hunting pressure [from the mine and people accessing the area].	<p>Denison considered this in section:</p> <p>Cumulative Effects, Potential Cumulative Effects</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the terrestrial section of the EIS serves as a local perspective, documented as coming from a leaseholder who completed a survey in in the year 2020, which reiterates the importance of land use activities, thereby providing further validity to the inclusion of increased access to the terrestrial RSA as a potential pathway for cumulative effects in terms of invasive plant introduction and increased dust deposition.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Both fishing and hunting were assessed in Section 11 titled Land and Resource Use. The assessment considers both terrestrial and aquatic resource availability, as well as the health and abundance of resource, in terms of both Indigenous Land and Resource Use and Other Land and Resource Use. The assessment in Section 11 additionally incorporates increased access owing to the extension of highway 914 as part of the cumulative effects assessment while existing projects were captured and assessed within baseline conditions. Section 11 provides details to support the conclusion that there is no significant impact in terms of fishing and hunting.</p>

## Appendix B

### Section 11: Engagement Database Summary Table – Indigenous Land and Resource Use

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
18-EN-ERFN-5.1	5	Workshop	2018-05-03	<p>As part of the engagement program for the Wheeler River Project, Denison organized a workshop for ERFN at their Patuanak Reserve location for ERFN and Patuanak members to attend. The workshop aimed to gather community input in relation to road alignment options, treated effluent</p> <p>discharge locations, and mining methods. The meeting had been delayed many times, and was held in the Health Clinic because there was a regional power outage.</p>	English River First Nation	<p>I always come from the elders' perspective. Since 1906, the area where you're working has been Treaty 10 land. Those lands were the primary area of ERFN and contain burial sites and birth sites of ERFN members. The Dené name of the Wheeler River, Russell Lake and Cree Lake all come from the Denésuliné of English River. The elders have always expressed that it's a primary area of ERFN. One of our late elders was born north of there in 1922. Our traditional gathering place is there.</p>	<p>Denison considered this in section:</p> <p>Existing Environment, Contemporary Indigenous Land and Resource Use in the Region, English River / Patuanak</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the land and resource use section of the EIS serves as a local perspective, documented as coming from a member of English River First Nation who attended a workshop in the year 2018. Existing conditions are based on available information and are accompanied by supporting information including available IK, LK, and results of engagement activities of specific relevance to the particular VC/KI. As such, the direct quote was incorporated into the characterization of the existing environment as it relates to occupancy, cultural sites, and navigation pertinent to English River First Nation.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>English River First Nation is categorized as an Indigenous Community of Interest. Detail on Indigenous COI criteria is provided in detail in EIS Section 4 titled Engagement. Consideration of ERFN territory, as well as ERFN perspectives, has been interwoven throughout the EIS wherever pertinent.</p> <p>Potential impacts to heritage resources were assessed in Section 11 in the subsection titled Heritage Resources. Section 11 provides details to support the conclusion that there is no significant impact in terms of heritage resources. This section also provides detail on the Heritage Resource Management Plan.</p>



## Appendix B

### Section 13: Engagement Database Summary Table – Economics

#### Examples

Unique ID	ROC	Event Type	Date	Event Summary	Interested Parties	Comments (from interested party)	Response (from Denison)	Context
21-EN-VPL-444.16	444	Virtual Meeting	2021-02-11	Denison hosted a virtual meeting for the municipality of Pinehouse Lake. The public meetings were focused on the Project generally, and did not seek input or comments on the distinct interests of the Métis in respect of the Project or Métis land use. This was expressly stated at the outset of each of the public meetings. Included in the discussion was an overview on the Valued Components for the Wheeler River Project, with a request to provide feedback to Denison via an online survey with specific questions pertaining to Valued Components.	Village of Pinehouse Lake	Will there be opportunities for people from Pinehouse to be employed?	<p>Denison considered this in section:</p> <p>Existing Environment, Key Indicator: Employment and Training, Employment Rate</p>	<p><b>How comment was used in this section:</b></p> <p>The context in which this comment was used within the economics section of the EIS serves as a local perspective, documented as coming from a resident of Pinehouse Lake who attended a virtual meeting in the year 2021, which reiterates the importance of employment, thereby providing further validity to the inclusion of employment and training as a key indicator and additionally providing substance to the characterization of local perspectives on the existing environment as it relates to an emphasis on employment.</p> <p><b>How comment would be answered through EIS information:</b></p> <p>Denison has estimated a workforce of 300 during the two-year Construction phase and 180 during the Operation phase. Mineral sector positions are typically considered to be higher paying than many other industrial positions. Residents and communities in the LSA (ERFN (including Indian Reserve Wapachewunak 192D and Indian Reserve La Plonge 192) and Patuanak, Northern Hamlet (Patuanak); Pinehouse Lake, Northern Village; and Beauval, Northern Village) will be given first priority for employment, training, and business opportunities, followed by residents and communities in the RSA (Northern Saskatchewan Administrative District).</p> <p>Employment was assessed in Section 13 which provides detail related to all facets of the Economic assessments including detail on how the Project will create employment opportunities and increase income for workers and businesses in the LSA, RSA and beyond the RSA during all phases of the Project.</p>

## Attachment: IR-35

Number	IR-35
Dept.	CNSC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6, Chemicals of Potential Concern
Context and Rationale	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>
Information Requirement	Please consider acrolein in the assessment or provide a rationale for its exclusion.

### Response:

The air quality assessment in the draft EIS considered combustion emissions (i.e., NO<sub>x</sub>, SO<sub>2</sub>, CO, and fine particulate matter) from diesel-powered equipment/vehicles and the standby diesel generators. While acrolein is a component of diesel exhaust, it was not identified as a contaminant of potential concern (COPC) given that the use of diesel equipment/vehicles and generators at the Wheeler River Project will be limited. To demonstrate this, a quantitative screening level assessment of acrolein emissions from diesel combustion was carried out here to address this IR. Because there is no acrolein criterion or standard in Saskatchewan, Ambient Air Quality Criteria (AAQC) from Ontario were used. These criteria have also been adopted in Alberta. The screening level assessment is described in the following text.

Using the nitrogen oxide (NO<sub>x</sub>) results from the air quality modelling assessment in Appendix 6-A, 1-hour and 24-hour dispersion factors (i.e., µg/m<sup>3</sup> per g/s emitted) were calculated for each assessment scenario. A dispersion factor was calculated for both the worker camp receptor, and the off-property receptor with the highest predicted NO<sub>x</sub> concentration. These dispersion factors were then applied to estimates of acrolein emissions to predict 1-hour and 24-hour concentrations of acrolein at both locations. The acrolein emission rate from the standby diesel generators were estimated using fuel flow

rates from manufacturer’s specifications and emission factors from Chapters 3.3 and 3.4 of the U.S. EPA AP-42 Compilation of Emission Factors, depending on the generator size. For mobile equipment and vehicles, a ratio of acrolein to non-methane hydrocarbons (NMHC) was applied to the total HC emission factors (see Section A.9 and A.10 of Appendix 6-A), conservatively assuming total HC equals NMHC. The ratio of acrolein to NMHC was obtained from the U.S. EPA document “*Speciation Profiles and Toxic Emission Factors for Non-road Engines in MOVES3*” (2022) and assumed Tier II engines. The site-wide emission rates for acrolein were estimated to be 1.89E-03 g/s for Construction, 1.04E-03 g/s for Operation, and 1.53E-03 g/s for Decommissioning. In all scenarios, the generators were assumed to operate 24-hours per day and increased equipment usage during Construction and Decommissioning resulted in higher acrolein emissions compared to the Operation scenario.

The results of the screening level assessment are outlined in the table below. Calculated acrolein concentrations are compared against Ontario AAQC, which are based on health as the limiting effect. As can be seen in the table, acrolein concentrations are expected to be well below the applicable criteria for all scenarios. The highest estimated concentrations will occur for the Decommissioning scenario and are 6.7% of the 24-hour AAQC, and 1.8% of the 1-hour AAQC at the worker camp. At the maximum off-property receptor, the estimated acrolein concentrations for Decommissioning are predicted to be 0.9% and 2.0% of the 1-hour and 24-hour AAQC, respectively.

Based on the results of the screening level assessment, acrolein is not considered a COPC.

#### Calculated Dispersion Factors and Resulting Acrolein Concentrations

Scenario	Averaging Period	Ontario AAQC (µg/m³)	Emission Rate (g/s)	Dispersion Factor <sup>[1]</sup> (µg/m³ per g/s)		Concentration <sup>[2]</sup> (µg/m³)		% of Ontario AAQC	
				Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor	Camp Receptor	Max Off-Property Receptor
Construction	1-hour	4.5	1.89E-03	25.5	24.9	4.84E-02	4.71E-02	1.1%	1.0%
	24-hour	0.4		9.2	5.0	1.75E-02	9.56E-03	4.4%	2.4%
Operations	1-hour	4.5	1.04E-03	37.5	23.6	3.91E-02	2.47E-02	0.9%	0.5%
	24-hour	0.4		12.9	5.3	1.35E-02	5.55E-03	3.4%	1.4%
Decomm.	1-hour	4.5	1.53E-03	54.1	26.2	8.29E-02	4.01E-02	1.8%	0.9%
	24-hour	0.4		17.4	5.2	2.66E-02	8.02E-03	6.7%	2.0%

**Notes:**

[1] Based on the incremental NOx predictions at the worker camp receptor and the off-property receptor where maximum NOx concentrations were predicted.

[2] Concentrations are incremental and do not include the addition of a background. Background is expected to be negligible.

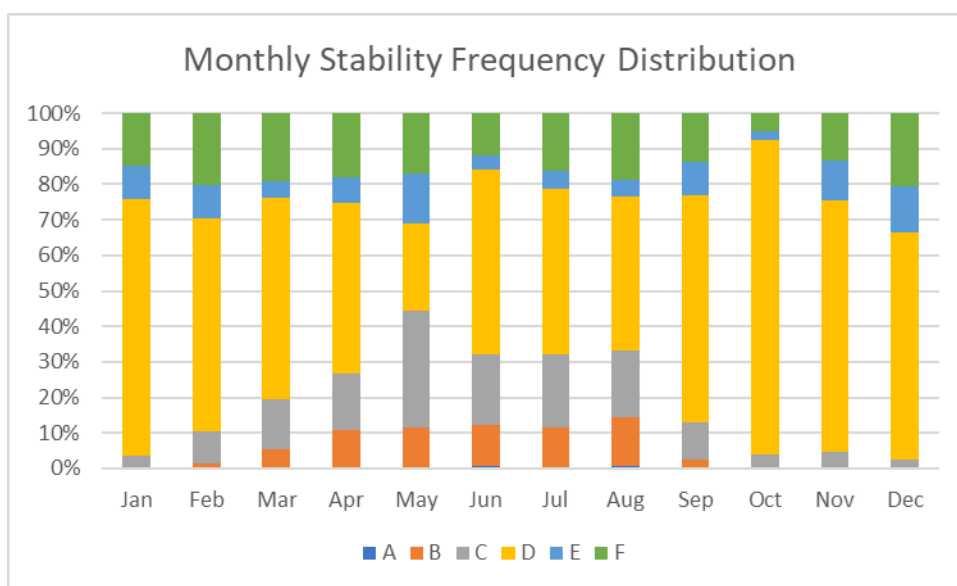
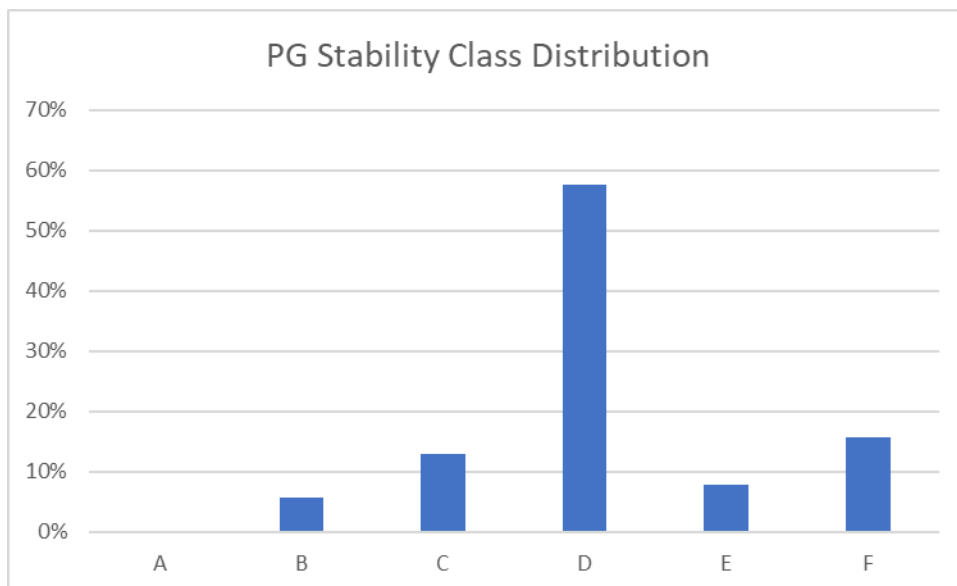
## Attachment: IR-39

Number	IR-39
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6.1.4.2, Potential Project- Related Effects
Context and Rationale	<p><b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent’s CALPUFF model runs indicated exceedances for 24- hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.</p> <p><b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.</p>
Information Requirement	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.

### Response:

The draft EIS aggregated the total number of exceedances predicted over the one-year CALMET data set to determine the maximum frequency of exceedances. While information on diurnal and seasonal patterns of exceedances is useful for developing air emissions management and monitoring plans, the total number of exceedances was required to identify and evaluate potential residual effects in the EIS.

Information regarding the presence of inversions in the CALMET data set was presented during the Meteorology Technical Meeting held on January 27, 2023. As shown in the figures below, stable conditions (PG stability class categories E and F) occur about 24% of the time and are most prominent during December (33% of the time).

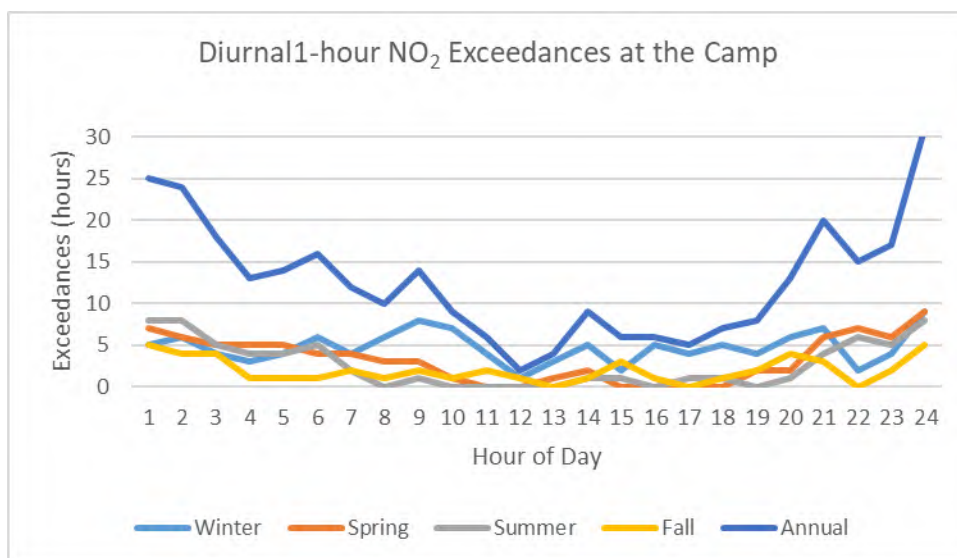
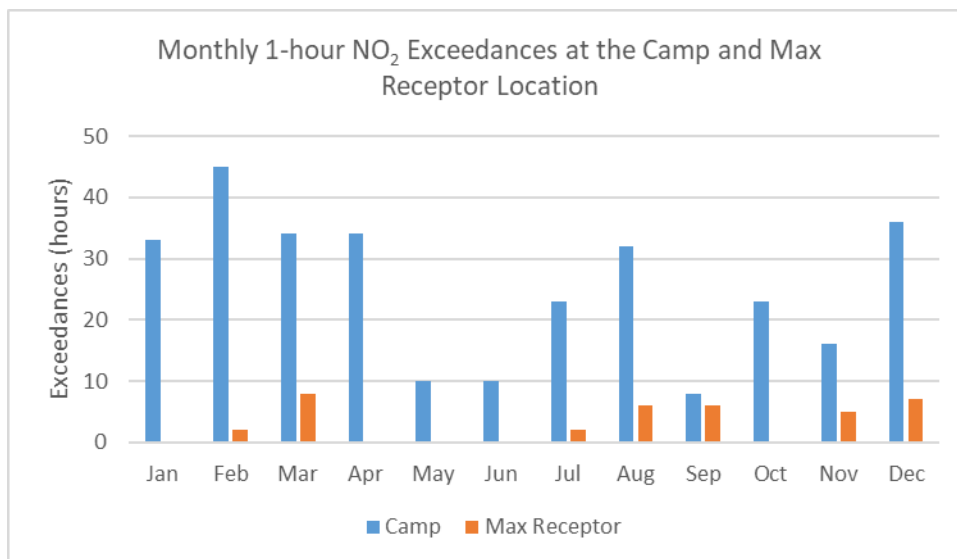


In addition to the previous information, the temporal patterns of the predicted exceedances for 1-hour NO<sub>2</sub>, and 24-hour TSP, PM<sub>10</sub>, and uranium for each of the assessment scenarios have been evaluated at the camp receptor and at the receptor with the maximum predicted concentration. The results of this analysis are presented in a series of figures below. While NO<sub>2</sub> exceedances are limited (i.e., < 5% of the time), some temporal patterns do emerge. Namely, 1-hour NO<sub>2</sub> exceedances are primarily expected to occur during the coldest months (January, February, and December) and during the morning and overnight hours when inversions are more likely to occur. For 24-hour TSP and PM<sub>10</sub>, exceedances are predicted to be most frequent during the May to October period, corresponding to higher emission rates compared to the November to April period (see Section 4.0 of Appendix 6-A). Being that there are so few 24-hour uranium exceedances, no obvious temporal pattern was identified, but the months with the highest number of exceedances at the camp receptor are expected to be April, October, and

December and only one exceedance is predicted from May to September. This suggests that exceedances of the 24-hour uranium criteria are more likely to occur during the colder months, possibly due to the increased presence of inversions.

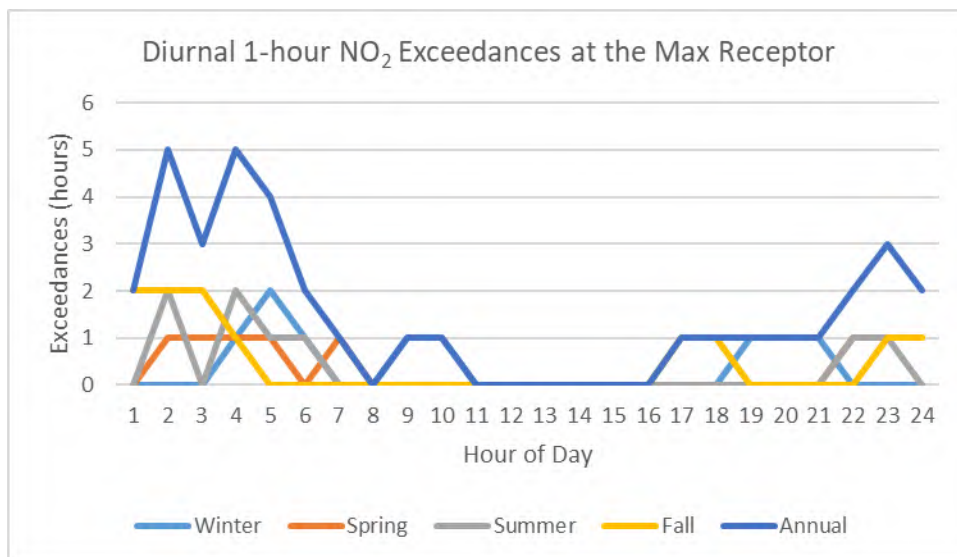
The aforementioned information will be considered as mitigation and monitoring plans are developed.

*Figures for Construction Exceedances*

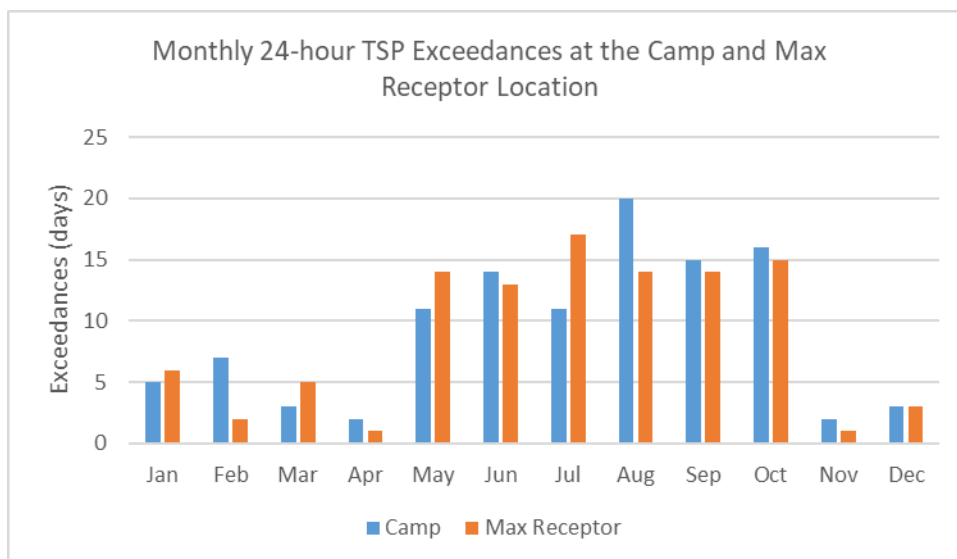


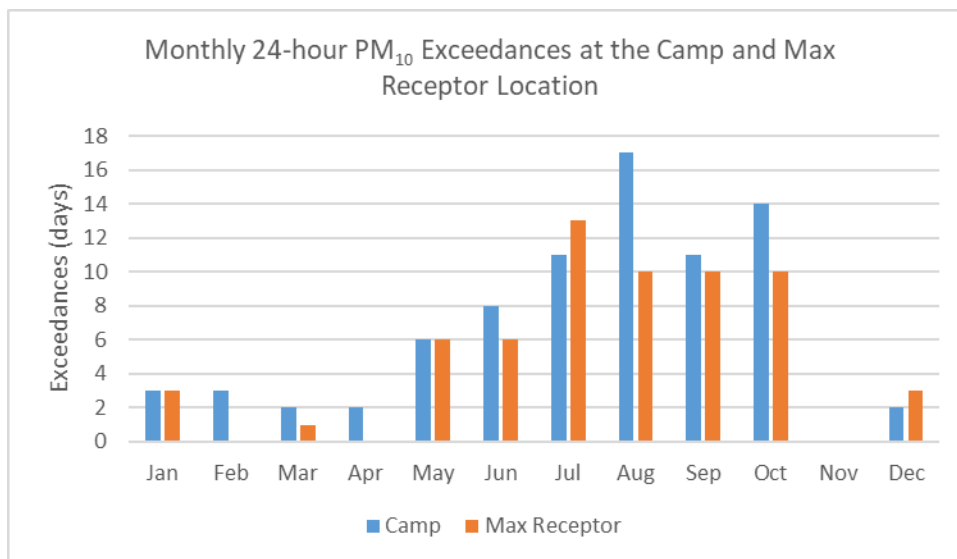
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



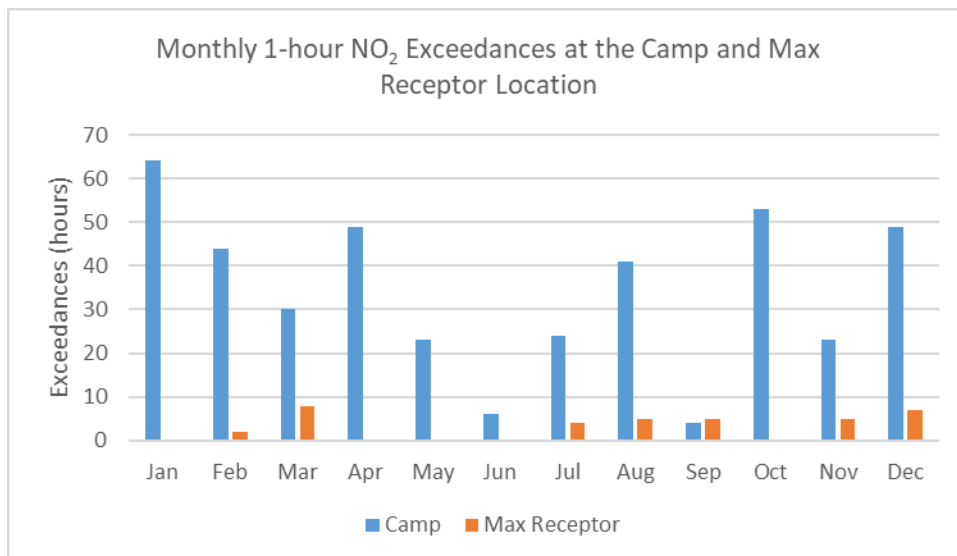


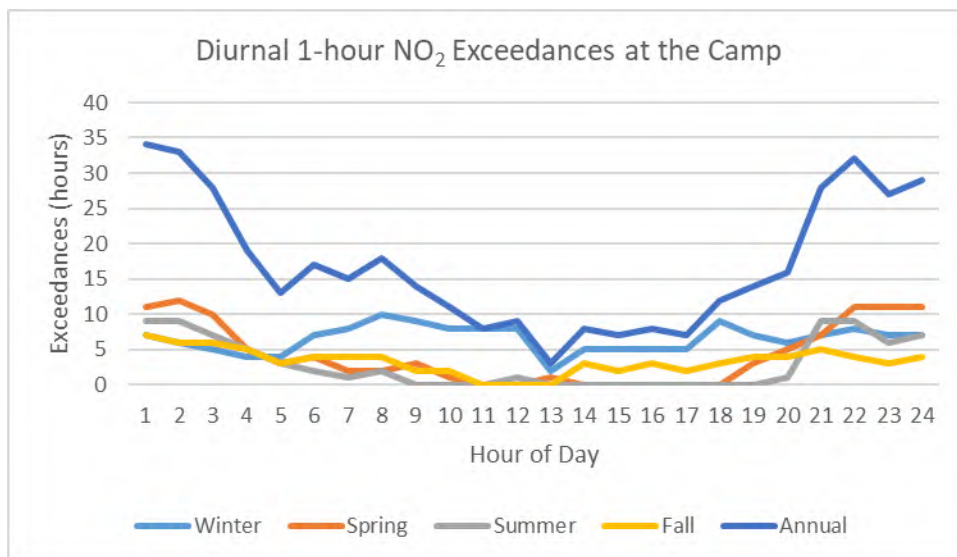
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



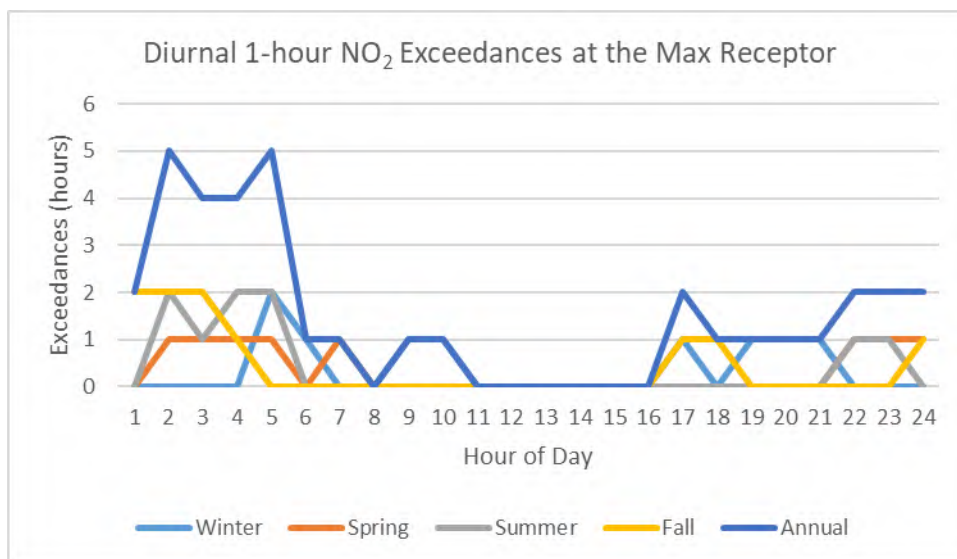


*Figure for Operation Exceedances*

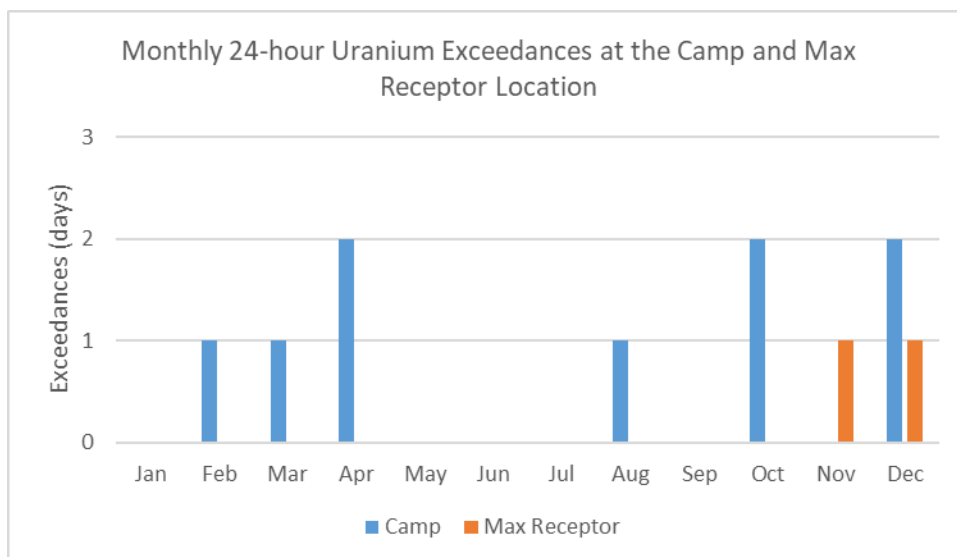
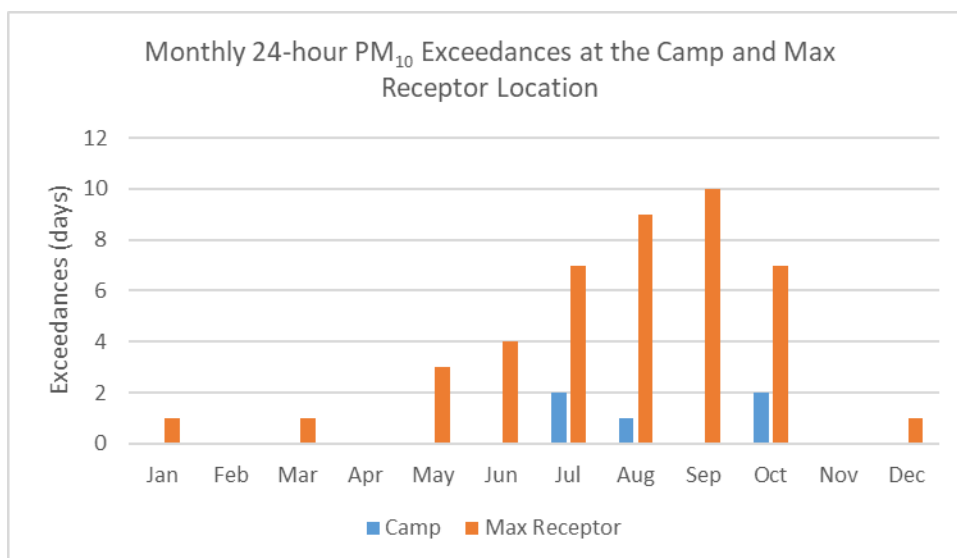
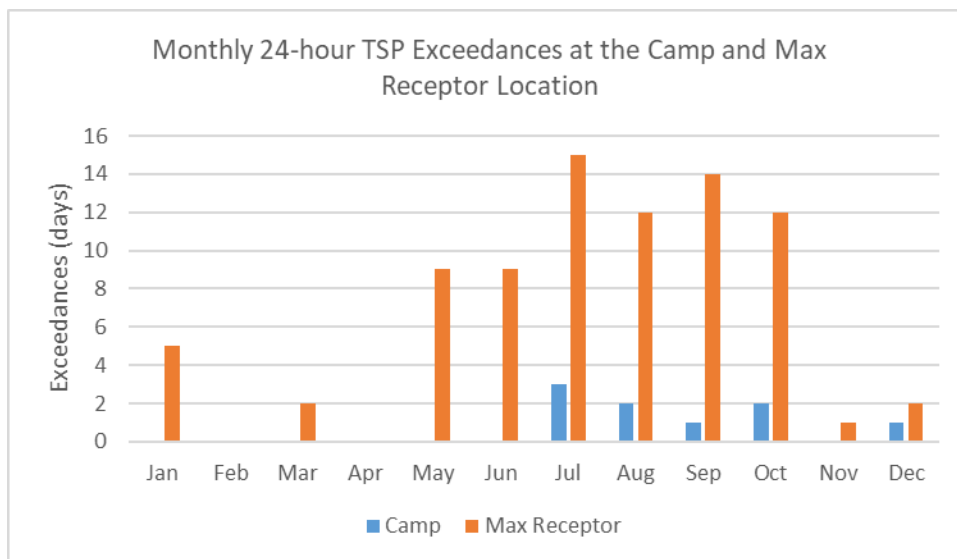




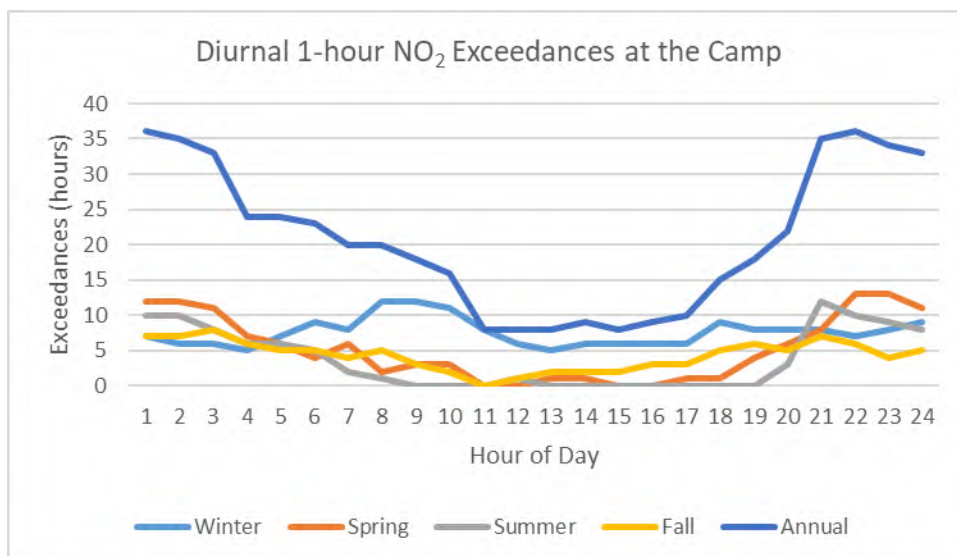
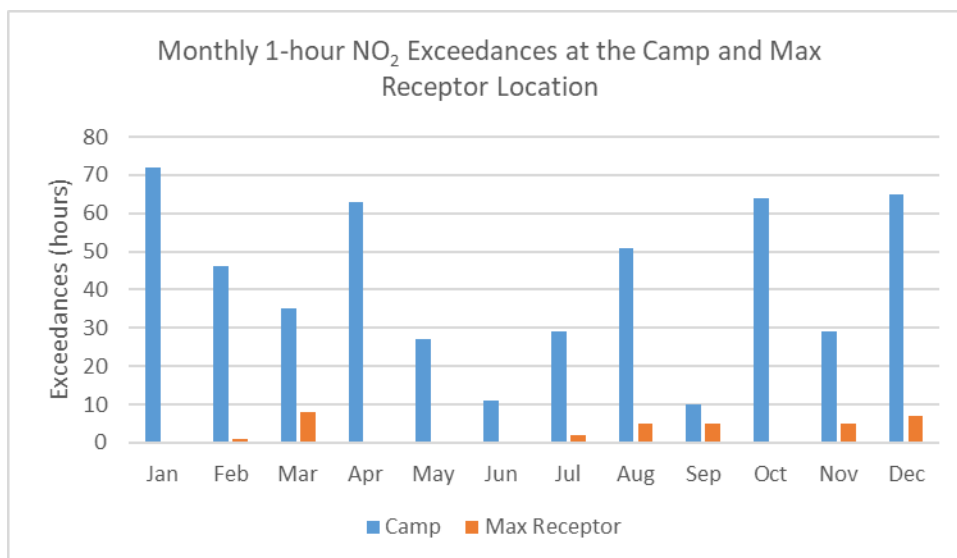
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



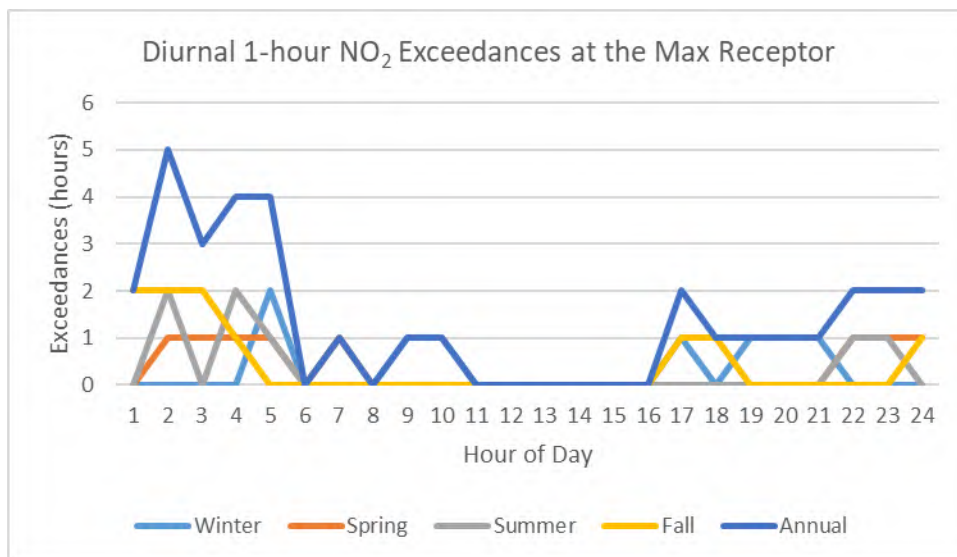
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



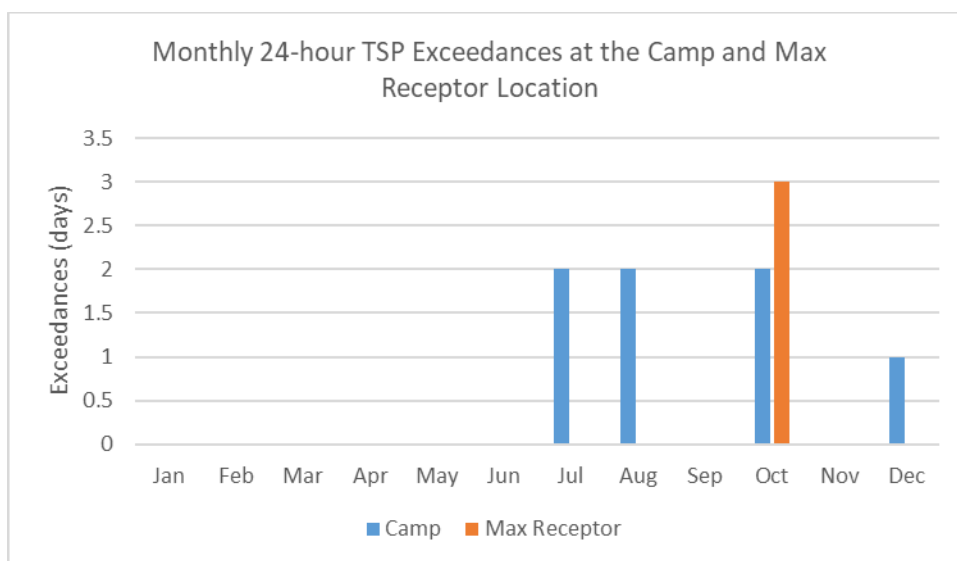
*Figures for Decommissioning Exceedances*



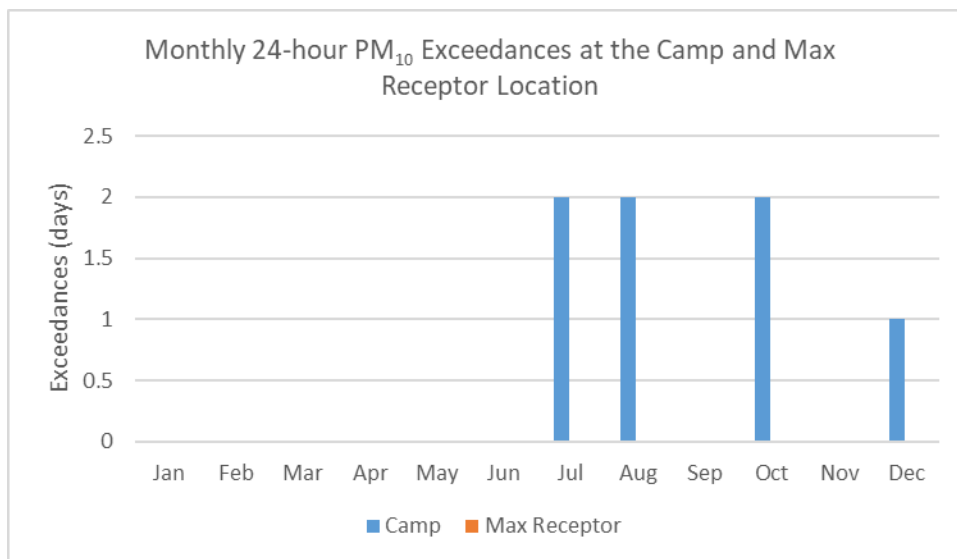
Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov



Note: Winter = Jan, Feb, Dec; Spring = Mar, Apr, May; Summer = Jun, Jul, Aug; Fall = Sep, Oct, Nov







Note: There were no exceedances predicted at the maximum off-property receptor in the Decommissioning Scenario

## Attachment: IR-45

Number	IR-45
Dept.	HC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 6 Air Quality Technical Supporting Document Section 6.3.1
Context and Rationale	<p>The carcinogenic risks of diesel exhaust from the project should be assessed.</p> <p>Context: Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: "concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel". However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p>Rationale: Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p>References:</p> <p>[1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p> <p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>

Information Requirement	1. Evaluate the carcinogenic risk of all potential diesel exhaust from the project based on the approach proposed by Health Canada (2022). Additional guidance ("Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation") is provided as an appendix to this comment table.[i]
	[i] Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation
	Health Canada, Water and Air Quality Bureau, October 2022
	Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m³ increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = \text{pooled hazard ratio per } 10 \mu\text{g}/\text{m}^3$
	$e^{(\beta \times 10 \mu\text{g}/\text{m}^3)} = 1.127$
	$\beta \times 10 \mu\text{g}/\text{m}^3 = \ln 1.127$
	$\beta = (\ln 1.127)/(10 \mu\text{g}/\text{m}^3) \text{ ,}$
	$\beta = 0.01196$
	The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):
	$ALCM = \left[ \frac{(e^{\beta \cdot \text{Exposure}} - 1)}{e^{\beta \cdot \text{Exposure}}} \right] \cdot \text{Baseline rate} \cdot \text{Years}$

ALCM = additional lung cancer mortality cases per 100,000 population
β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))
Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)
Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation
Years = years of project or project phase
Sample calculation:

	<p>Project estimates an exposure from relevant source(s) of 0.067 µg/m<sup>3</sup> over 50 years of operation</p> $ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$ $ALCM = \left[ \frac{(e^{0.01196 \cdot 0.067} - 1)}{e^{0.01196 \cdot 0.067}} \right] \cdot 45.5 \cdot 50$ <p>ALCM = 1.8 additional lung cancer mortality cases per 100,000</p> <p><b>References:</b></p> <p>[1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: <a href="https://cancer.ca/Canadian-Cancer-Statistics-2021-EN">cancer.ca/Canadian-Cancer-Statistics-2021-EN</a></p> <p>[2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <a href="https://doi.org/10.1186/s12889-020-08771-w">https://doi.org/10.1186/s12889-020-08771-w</a></p> <p>[3] Health Canada. Lung cancer and ambient PM<sub>2.5</sub> in Canada: a systematic review and meta-analysis.</p> <p>[4] Health Canada, 2022. Available online at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>
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Response:

#### **Sources of Diesel Emissions from the Project**

The Project-related atmospheric releases considered in the Environmental Risk Assessment (ERA) in the draft EIS Appendix 10-A were consistent with the air emissions inventory detailed in the Air Quality Assessment (draft EIS Section 6 and Appendix 6-A). The emissions will vary over time based on the schedule of Project activities and the air quality assessment scenarios were developed based on the year with the maximum activity occurring in each Project phase. There are several combustion sources at the site, which would be expected to contribute diesel emissions during the relevant phases of the Project. Combustion sources at the site include:

- diesel generators;
- propane heaters; and
- diesel and gasoline combustion associated with construction equipment and vehicles utilizing the on-site roads.

These combustion sources would contribute particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), NO<sub>x</sub>, SO<sub>2</sub> and CO to the atmospheric environment. Concentrations of these parameters were predicted in the Air Quality TSD

(Appendix 6-A) at several receptor locations within the Local Study Area and were used as surrogates for diesel emissions from the Project. It is important to note that scoping of the air quality assessment followed a conservative approach. For instance, and of relevance to this IR, although Denison expects the site will be powered by the provincial grid during Operations, the air quality assessment conservatively assumed that the back-up diesel generators would run continuously (24/7) during Operation and Decommissioning in order to predict worst-case concentrations and bound the evaluation of Project residual effects.

#### **Assessment of Diesel Emissions in the ERA**

Particulate matter, of which diesel particulate matter would be a subset and in particular a subset of or associated with the PM<sub>2.5</sub> fraction, was assessed in the ERA in Appendix 10-A based upon predicted concentrations at receptor locations as documented in the Air Quality Assessment (EIS Section 6 and Appendix 6-A). As discussed in Section 3.2.1.3.2 of the ERA (Appendix 10-A), predicted concentrations of particulate matter (including TSP and PM<sub>2.5</sub>) during Construction, Operation, and Decommissioning all met their respective annual screening values of 60 µg/m<sup>3</sup> for TSP and 8.8 µg/m<sup>3</sup> for PM<sub>2.5</sub>. Exceedances were predicted for TSP and PM<sub>10</sub> of the 24 hour screening values in all Project Phases, attributable to fugitive dust from earthworks and unpaved roads and not operation of generators. There were, however, no exceedances of the 24 hour screening value for PM<sub>2.5</sub>, the fraction of particulate matter most likely to be associated with diesel emissions.

#### **Assessment of Diesel Emissions using HC New Approach**

The method recommended by HC in this IR was used to calculate the additional lung cancer mortality (ALCM) over the baseline rate from PM<sub>2.5</sub> using the predicted PM<sub>2.5</sub> concentrations presented in the EIS. The same human receptor locations assessed in the ERA (Risk2 through Risk5, Table 3-7 in Appendix 10-A) were considered including the residency times for each receptor type consistent with Table 4-2 in Appendix 10-A, and shown in Table IR45-1 below.

**Table IR45-1: Summary of Human Receptor Locations and Residency Assumptions**

Receptor ID	Receptor Location Description	Receptor Type	Residency Assumption
Risk2	Human Location Trapper	Fisher/Trapper	50% at Risk2, 50% at Risk5
Risk3	Human Location Camp Worker	Camp Worker	50% at Risk3, 50% at Risk5
Risk4	Human Location Seasonal Resident	Seasonal Resident	30% at Risk2, 70% at Risk5

Baseline concentrations for PM<sub>2.5</sub> are 3.1 µg/m<sup>3</sup>. The following equation (Greco et al., 2020) was used to calculate the ALCM.

$$ALCM = \left[ \frac{(e^{\beta \cdot Exposure} - 1)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline\ rate \cdot Years$$

Where  $\beta = 0.01196$

Exposure = estimated PM<sub>2.5</sub> exposure concentration with background removed

Baseline rate = 45.5 per 100,000

Years = years of project or project phase (construction = 2 years, operation = 15 years, decommissioning = 5 years)

The exposure concentrations for PM<sub>2.5</sub> were scaled to consider the fraction attributable to diesel sources, consistent with Section 4.0 in Appendix 6-A (Construction = 22.8%, Operation = 26.8%, and Decommissioning = 36.2%). Considering these assumptions, the following table provides the ALCM for each project phase:

**Table IR45-2: Summary of Additional Lung Cancer Mortality Rates at Human Receptor Locations**

Receptor ID	Construction	Operation	Decommissioning
Risk2	0	0	0
Risk3	0	0	0
Risk4	0	0	0

Note: Results are interpreted per 100,000 people.

As shown above, the risks for the general public at Risk2, Risk 3 and Risk4 demonstrate that no additional lung cancer mortality cases are expected per 100,000 population as a result of exposure to diesel particulate matter (using PM<sub>2.5</sub> as a surrogate) due to the Project. Therefore, there is unlikely to be an increased incidence of lung cancer mortality due to exposure to diesel particulate matter generated by the Project activities.

#### **Mitigation measures to limit diesel emissions and exposure**

Various mitigation measures will be implemented to control or reduce the impacts to the atmospheric environment from the Project. These include administrative and physical controls based on best industry practices, as listed below and outlined in the draft EIS Section 6 and Appendix 6-A and in IR responses:

##### **Administrative controls**

- Create and implement a dust management plan, including the application of water and/or chemical suppressant to control fugitive dust, in addition to other operational strategies to assist in dust control;
- Planning vehicle and equipment routes to minimize travel distances, where possible; and
- Employ standard operating procedures and complete regular inspections of equipment machinery to ensure it is in good working order.
- Vehicles and equipment will be equipped with Tier 4 engines where feasible (IR-139).

##### **Physical controls**

- Avoid dust-generating activities (e.g., earthworks, material handling) during dry or high wind conditions;
- Avoid dropping material from height;



- Ensure all exhausts (e.g., mobile equipment, generators) are in good working condition;
- Turn off vehicles and equipment when not being used;
- Minimize or reduce vehicle and equipment speed by enforcing speed limits;
- Apply water at least twice per day to unpaved roads and surfaces; and
- Maintain unpaved road surfaces via grading or other maintenance practices to reduce the amount of silt (i.e., fines) present in the roadbed material.

### Conclusions

Considering PM<sub>2.5</sub> as a surrogate for diesel particulate matter, the modelled concentrations of PM<sub>2.5</sub> are not expected to result in any additional lung cancer mortality cases per 100,000 at the receptor locations that are relevant for members of the public (i.e., hunters, trappers, fishers, recreational users, seasonal residents) and the camp worker. The overall risk is expected to be negligible; however, monitoring of particulate matter will be carried out throughout the Project and compared to risk-based criteria. Therefore, no further Project controls beyond those identified are proposed for the protection of human health due to diesel particulate matter.

### References

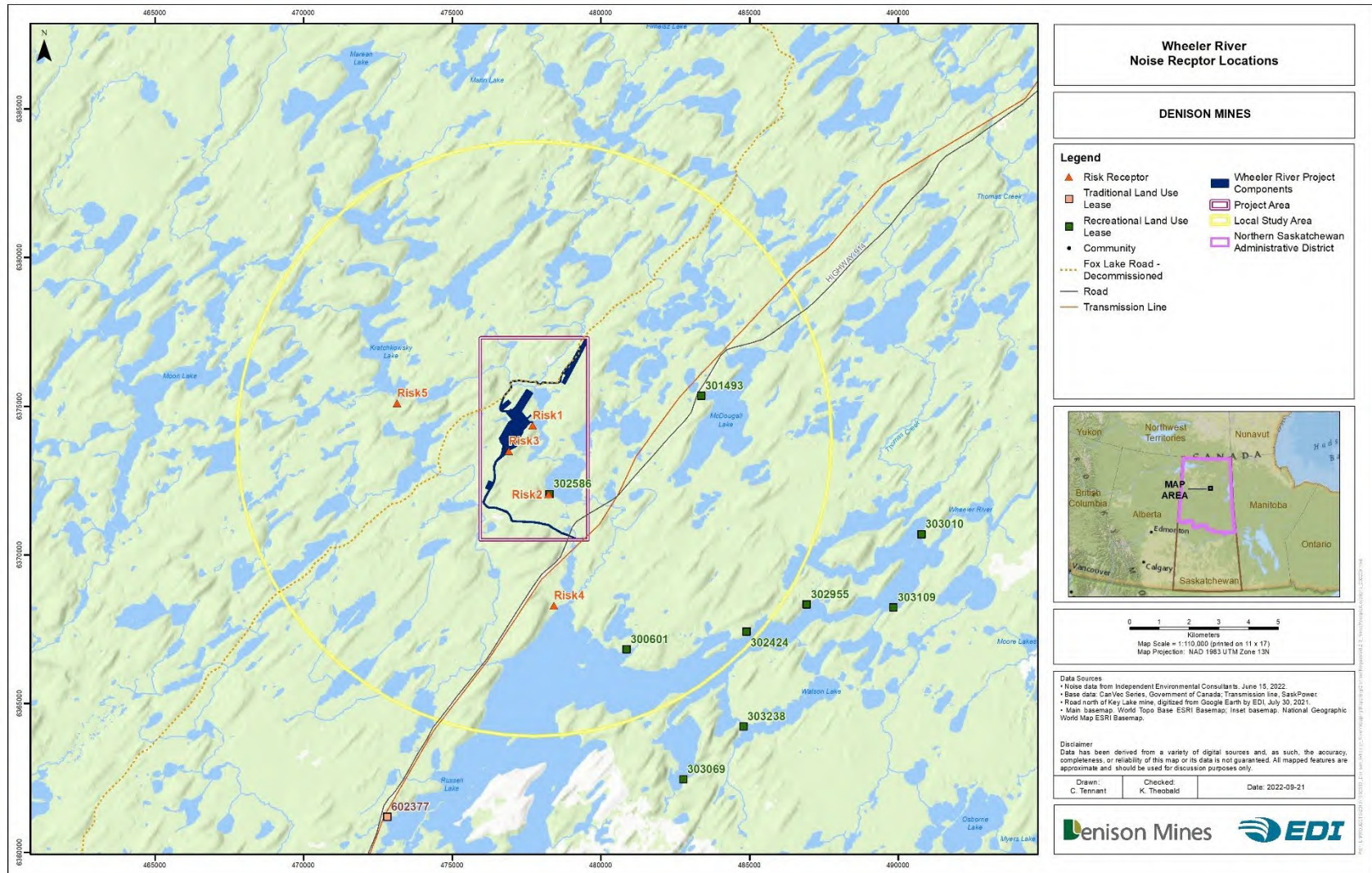
CCME (Canadian Council of Ministers of the Environment). 2023. Canadian Ambient Air Quality Standards. Last accessed online 2023/06/27 from <https://ccme.ca/en/air-quality-report>.

Greco, S.L., MacIntyre, E., Young, S. et al. 2020. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017

## Attachment: IR-48

Number	IR-48
Dept.	HC
Project effects link	Physical stressors (noise and vibration)
Reference to EIS, appendices, or supporting documentation	Appendix 6-E, Figure 6.2.3, p. 6-57
Context and Rationale	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p>Context: Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p>Rationale: The noise assessment typically includes a map illustrating modelled noise levels from the project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>
Information Requirement	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.

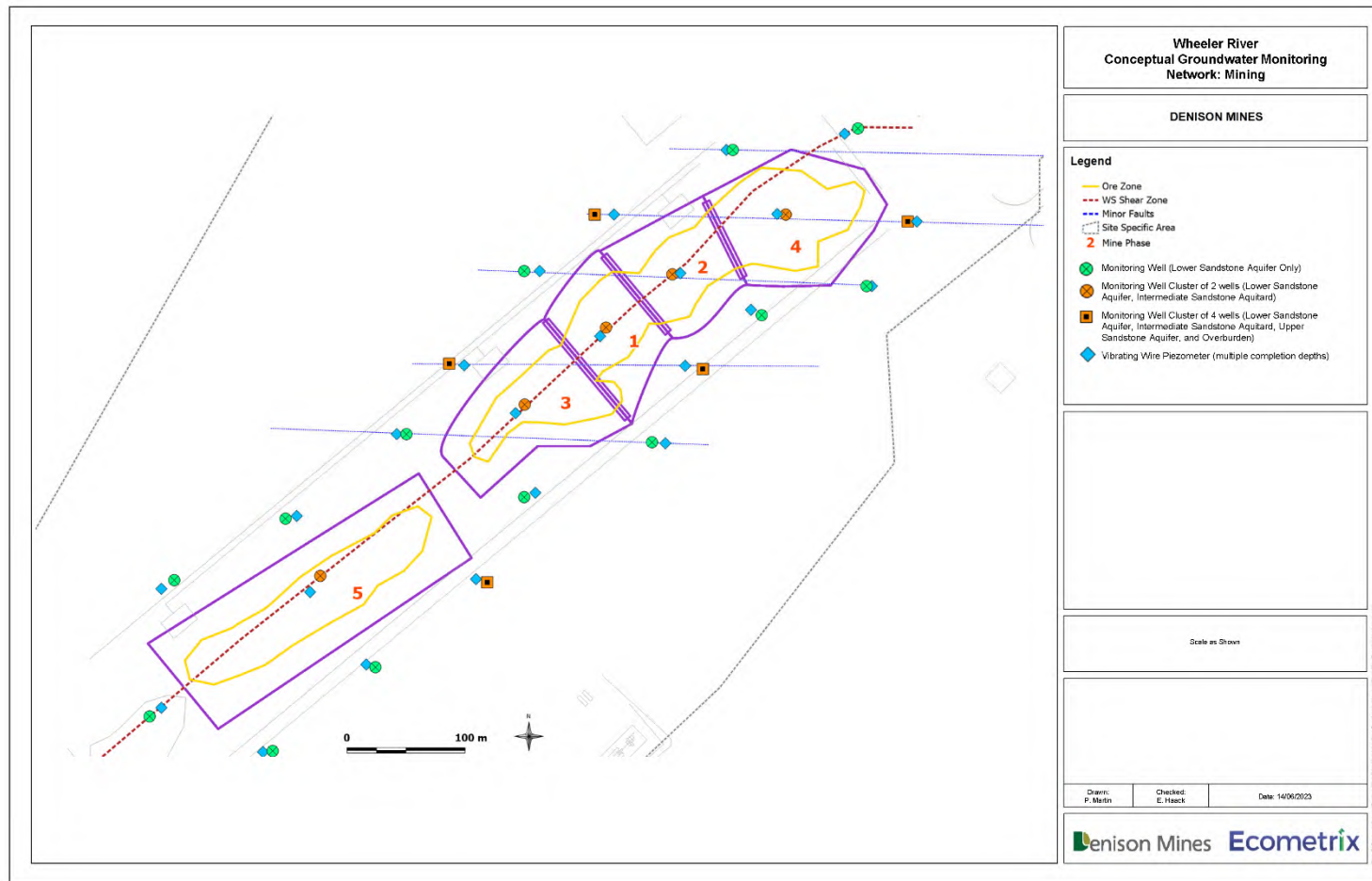
Supporting figure to the response provided in IR table:



## Attachment: IR-51

Number	IR-51
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Section 7, Figure 7.8-1  Appendix 7-C
Context and Rationale	<p><b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.</p> <p><b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?</p>
Information Requirement	<p>Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).</p> <p>Please clarify how the establishment of a continuous freeze wall will be monitored.</p>

Supporting figure to the response provided in table:



## Attachment: IR-57

Number	IR-57
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.3.3.2 Appendix 7-A, Sections 3.1.2 and 3.7, Appendix 7-C, section 2.5.2
Context and Rationale	<p><b>Context:</b> The proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>
Information Requirement	In section 2.5.2 of Appendix 7-C (Calibration Results), the proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).

### **Response:**

Vertical gradients are presented in Table 3-5, Section 3.7 of Appendix 7-A, while Table 3-1 presents water levels observed at individual groundwater monitoring wells. Discussion of



vertical gradients is limited to groups of wells which are close together (e.g., GWR-036 and GWR-037 which are approximately 10 m apart) rather than clusters of wells which are further apart (e.g., the upgradient cluster, where wells are approximately 400 m apart).

Vertical gradients are implicitly calculated as water levels from all observation wells are incorporated as calibration targets using their coordinates in 3D space. Recognizing that all water level observations are subject to human error, and as such values that are very close to one another (e.g., as observed at GWR-008 and GWR-009) are treated as essentially the same value.

As requested, the table below presents observed and simulated vertical gradients at the well clusters presented in Table 3-1, Appendix 7-A. Observed static water levels are presented as there were issues with the barometric pressure correction for transient water levels.

Cluster	Well	Unit	Observed Water Level (static)	Simulated Water Level	Screen mid-point Elevation	Observed Gradient	Simulated Gradient	Notes
<b>NW</b>	GWR-003	OVB	503.97	503.87	467.8			
	GWR-027	ISA	500.91	501.00	246.3	0.0065	0.0061	
	GWR-025	LSA	502.34	502.40	146.3	-0.0058	-0.0057	
<b>SE</b>	GWR-007	OVB	514.12	503.48	515.2			perched aquifer at GWR-007 impacts gradient calculation
	GWR-009	ISA	502.20	502.57	285.5	0.0231	0.0018	
	GWR-008	LSA	502.40	502.37	166.2	-0.0007	0.0007	
<b>Up-gradient</b>	GWR-006	OVB	514.70	515.81	504.75			
	GWR-028	ISA	511.00	510.40	241	0.0073	0.0107	
	GWR-029	LSA	514.80	515.07	172.25	-0.0158	-0.0194	
<b>Down-gradient</b>	GWR-005	OVB	501.99	500.94	382.55			
	GWR-014	ISA	501.60	501.21	348.05	0.0010	-0.0007	
	GWR-012	LSA	501.27	501.40	166.5	0.0009	-0.0005	

As indicated in this table, the model provides an excellent representation of the observed gradients estimated using these monitoring well clusters.

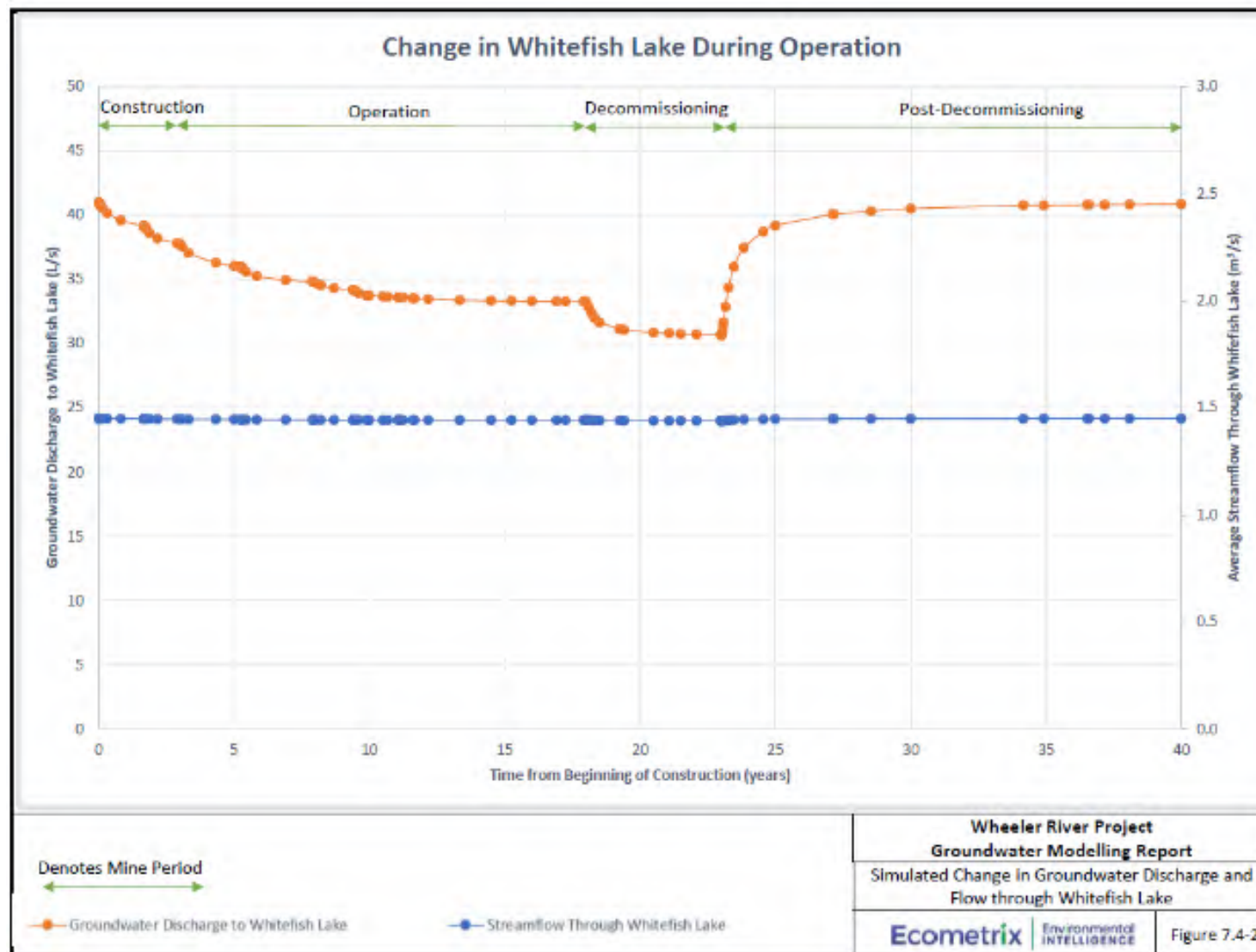
- At the northwest (NW) cluster, the observed and simulated gradients are virtually identical.
- At the southeast (SE) cluster, the gradient from the shallow overburden (OVB) to the intermediate sandstone aquitard (ISA) is under-estimated in the model, however the water level at GWR-007 is believed to be perched above the regional water table, and therefore not a good representation of vertical gradients; regardless both the model and observed data indicate a downward vertical gradient. The gradient between the ISA and the lower sandstone aquifer (LSA) is negligible, which is replicated by the model.
- At the up-gradient cluster, the observed are very well represented by the simulated gradients, including the flow directions.

- At the down-gradient cluster, the gradient between the ISA and the LSA is negligible, which is replicated by the model. The gradient between the OVB and ISA is observed to be downward but given the location of GWR-005 at the shore of Whitefish Lake, the natural hydraulic gradient is expected to generally be upward, as simulated.

## Attachment: IR-59

Number	IR-59
Dept.	CNSC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)
Context and Rationale	<p><b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.</p> <p><b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.</p>
Information Requirement	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.

Supporting figure to the response provided in table:



## Attachment: IR-63

Number	IR-63
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning; Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations
Context and Rationale	<p><b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.</p> <p><b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.</p>
Information Requirement	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.

### Response:

The impact of the freeze wall on the local and semi-regional groundwater flow regimes is minor. The footprint of the freeze walled area represents < 0.04% of the area of the regional groundwater flow model, and as such the freeze walled area is a relatively small disruption to the regional groundwater flow system.

The effect of the freeze wall was simulated using the regional groundwater flow model, with results shown below. Hydraulic conductivity of the freeze wall was simulated as a reduction of the baseline hydraulic conductivity by four (4) orders of magnitude, which was consistent with expected hydraulic conductivity changes as reported by

Newmans (2020). The recharge reduction on top of the ore zone was estimated at 50% of the pre-development recharge based on the expected regrading and surface drainage at the site to accommodate all of the surficial operations. The simulated effect of the active freeze walls is illustrated through Figures 1 and 2, which illustrate the change in groundwater flow paths resulting from the freeze wall and operational groundwater pumping.

Figure 1 illustrates the pre-mining (and pre-pumping) groundwater flow paths toward Whitefish Lake. The particle traces shown were released at Whitefish Lake and tracked backward in time / space to their recharge area. The provide an understanding of the west-east groundwater flow toward Whitefish Lake, with local recharge creating the driving force for that groundwater flow. On this figure, the groundwater level contours are shown in black, while the flowlines (particle traces) are shown in blue. Note the flowlines closest to the pumping wells (red circles) and the ore body (light brown outline). The colours in the background reflect the shallow hydraulic conductivity zones, which help to explain inflections in the hydraulic head contours and flowlines.

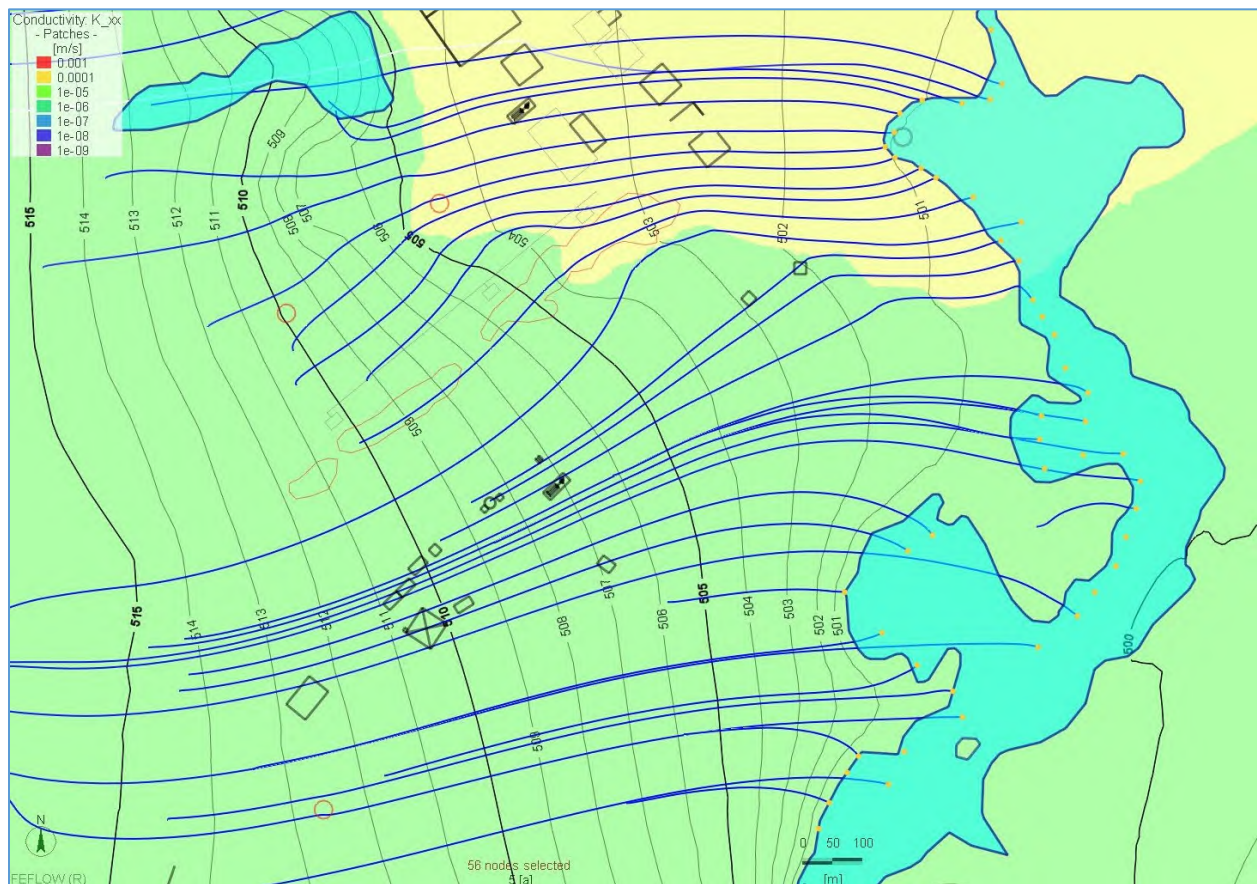


Figure 1: Groundwater Flow Paths Pre-Mining

Figure 2 illustrates the same groundwater flow paths toward Whitefish Lake during mining operations, while pumping was occurring (at red circles) and the freeze walls for phases 1 through 5 are in place. From this figure, the effect of the freeze walls can be seen to be limited to the immediate area around the freeze walls. The addition of the freeze walls creates a cluster of water level contours consistent with the freeze wall locations, representing the change in water levels between the area inside and outside of the freeze wall. Note that the water levels outside the freeze wall are simulated to be relatively unchanged during freeze wall operations.



Also evident on this figure are the water level drawdown contours, which deflect around the pumping wells (3 red circles). Note the additional level of drawdown experienced at wells simulated to pump from the lower hydraulic conductivity zone (i.e., green area, as opposed to the yellow area).

The flowlines in Figure 2 indicate how the groundwater flow patterns will change due to the addition of the freeze wall and the onsite pumping. Flowlines are noted to travel around the freeze wall and in between the pumping wells to discharge at the lake. The pumping wells will capture water flowing from the west which would otherwise discharge to Whitefish Lake.

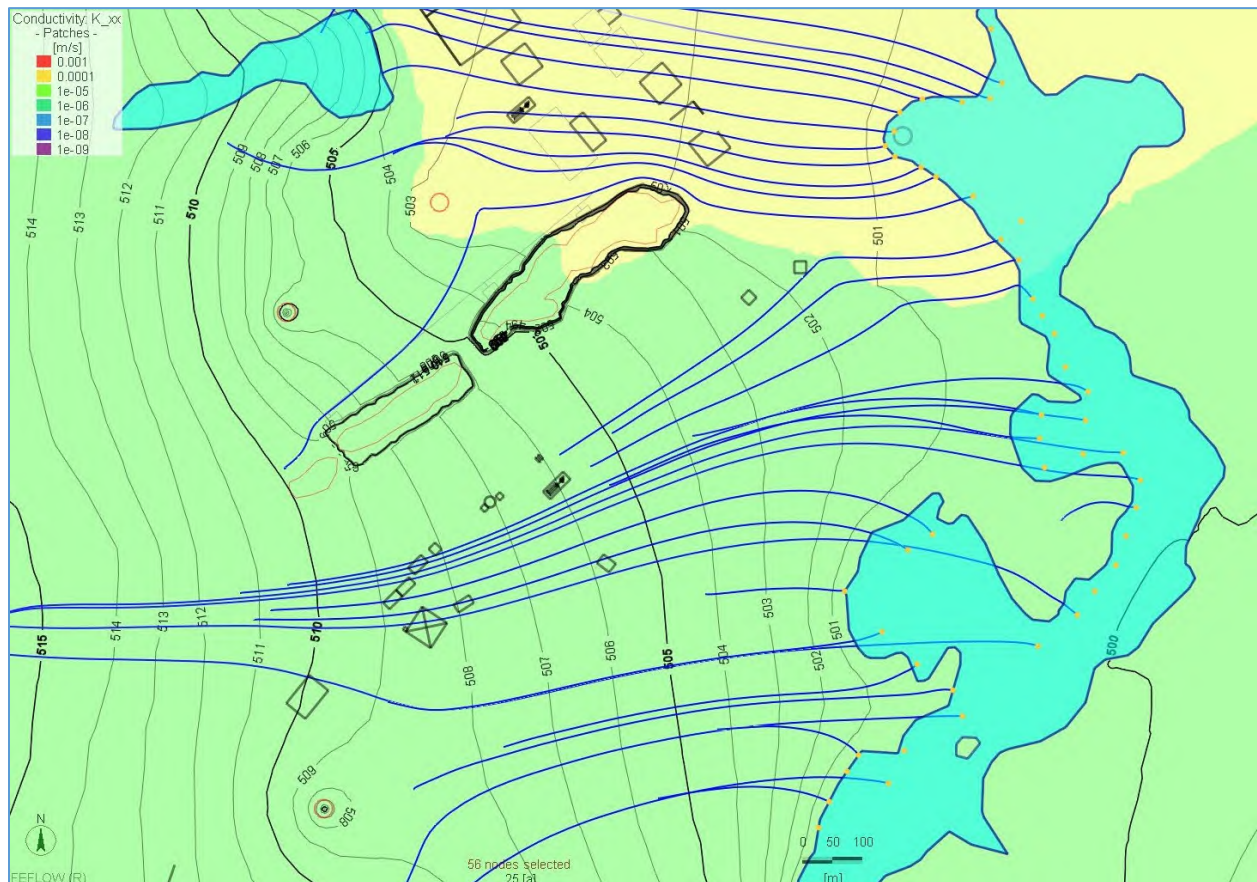


Figure 2: Groundwater Flow Paths During-Mining

Post mining, the groundwater flow path patterns would return to a condition similar to that simulated for pre-mining.

## **References**

Newmans Geotechnique Inc. (2020). Wheeler River In-Situ Leach Surface Freezing Option Pre-Feasibility. Report to Denison Mines Ltd. August 2020.

## Attachment: IR-68, IR-94, IR-97

Number	IR-68
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 7.6.2.2.3 Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7
Context and Rationale	Context: Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone. Rationale: In NRCan's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCan notes that scenario #2 in the proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCan's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.
Information Requirement	NRCan requests that the proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.

Number	IR-94
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated
Context and Rationale	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H<sup>+</sup> sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining</p>

	area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.
Information Requirement	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.

Number	IR-97
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b
Context and Rationale	<p>Context: Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations). In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.</p> <p>It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.</p> <p>Rationale: The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Explain and clarify if mining operations will mobilize contaminants beyond operations?</li> <li>2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?</li> <li>3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.</li> </ol>

#### **Response IR-68, IR-94 and Questions 1-3 for IR-97:**

In general, the ISR mining process will be sufficiently aggressive, chemically and through permeability enhancement, to access and remove most dissolvable mineral phases within the ore deposit during the mining operation. Metallurgical testing indicates that the mineralogy of the ore zone post-remediation (see IR-67 response) is made up of clay minerals, unreacted sulfide minerals (including pyrite, galena and chalcopyrite) and a small number of secondary mineral phases, discussed further below.

The decision made in the EIS to model geochemical reactive transport of the restored solution in the pore water of the mining zone post-remediation (i.e., initial conditions) and not a long-term contributions of COPCs from the ore zone for the following reasons:

- Uraninite that is not accessible to the mining process will represent residuals in very low permeability zones that will, likewise, have limited contact with groundwater in the future.

- As was discussed in the draft EIS (page 3.30 of Appendix 7-C), groundwater from the Athabasca sandstone that will flow through the ore zone following removal of the freeze wall will not be oxidizing (groundwater is anoxic and free of oxidants (e.g., O<sub>2</sub>, Fe<sup>3+</sup>), and thus, further oxidative dissolution of the reduced, low-solubility uraninite and sulphide minerals is not expected.
- Diffusion of UBS (containing U, Se and other COPCs), and lixiviant into the rock matrix may occur. However, the process of diffusion into the matrix will be limited over the relatively short timespan of mining in each zone (<10 years). Back-diffusion from the matrix of COPCs will be a slow process and will have a low mass flux rate.

The use of initial conditions in the model continues to be considered as sufficiently bounding for evaluation of potential effects in the EIS.

#### Secondary Minerals – Response to IR-68

The metallurgical testing to date suggests that secondary minerals may form in the ore zone during the operation, including jarosite (KFe<sub>3</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>6</sub>), gypsum (CaCO<sub>3</sub>•2H<sub>2</sub>O), barite (BaSO<sub>4</sub>; which could be Ra-bearing) and anglesite (PbSO<sub>4</sub>), with XRD evidence for these mineral phases in metallurgical testing at the end of the leaching period, and being flushed out of the mining areas as particulates in the UBS (see details in response to IR-67). Jarosite, gypsum and barite, however, were not identified in a QEMSCAN quantitative analysis on similar materials in the 2022 column leach tests that were designed to inform the understanding of mineralogy and solution composition in the mining area with remediation. Anglesite was present in quantifiable concentrations as mineral phase in the solid-phase residuals of those column tests.

Dissolution of anglesite has the potential to be a longer-term source of Pb from the ore zone, post-decommissioning. Testwork is ongoing to refine understanding of expected concentrations and distribution of Pb phases – meaning anglesite and galena – post-mining and post-remediation. Information from that test work will then be used to direct testing and monitoring during the operational phases.

Beyond the bounding scenario presented in the EIS, additional modelling of a Pb source over the long-term is not considered warranted at this time, for the following reasons:

1. Pb has a high affinity to sorb to clay minerals and iron oxide phases along the transport path. The assimilative capacity of the system, as modelled, will mitigate against maximum Pb concentrations at Whitefish Lake above those modelled in the EIS scenario.
2. Without further understanding of the reactivity of the anglesite – meaning, kinetic factors that may affect dissolution to solubility limits, modelling anglesite dissolution to thermodynamic equilibrium is expected to be overly conservative.
3. Mineral phases in the ore zone, including clay minerals and Fe oxides have the potential to sorb Pb mobilized from anglesite dissolution. Ongoing analysis of the results of the metallurgical testing and further test work will support refinement of that sorptive capacity and understanding of the potential for a long-term source of Pb from the remediated ore zone.

## Attachment: IR-80

Number	IR-80
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	Context: This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model. Rationale: The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO <sub>4</sub> groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO <sub>3</sub> or Ca-SO <sub>4</sub> /Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.
Information Requirement	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millennium/Cigar Lake.

### Response to #1

Figure 26 of the draft EIS was presented as two panels (panel “a” and panel “b”) in Appendix 7-A to the EIS. To support visual clarity and additional interpretation, Figure 26 has been split into two figures:

Figure 26: Hydrochemical Type: Groundwaters for the Wheeler River Project

Figure 27: Hydrochemical Type: Groundwaters for the Wheeler River, Cigar Lake and Millennium Projects

The figure numbering in Appendix 7-A of the draft EIS will be updated accordingly.

The revised Figures 26 and 27 are provided below. The figures have been updated to include visual support on the Piper plots to the interpretations of groundwater chemistry that are detailed in Section 4.3.3 of Appendix 7-A of the EIS. In addition, the text in Section 4.3.3. of Appendix 7-A of the ESI will be updated to provide additional clarity on the interpretations shown in the Piper plots. The new text is provided herebelow with additions shown in blue. .

On page 4-21... The Lower Sandstone Aquifer is characterized by two distinct hydrochemical types. The first is groundwater with low mineralization. The second groundwater type is much more highly

mineralized water that has Cl<sup>-</sup> as a dominant anion. The distinct nature of the two groundwater types is shown in Figure 25 through comparison of Stiff diagrams for GWR-029 and GWR-012. The mineralization at GWR-012 is much higher than that at GWR-029, and Cl<sup>-</sup>, versus HCO<sub>3</sub><sup>-</sup>, is the dominant anion. The mineralization and groundwater major ion composition of GWR-029 is much more similar to overburden well GWR-006 (shown in Figure 24) than to GWR-012. In the Piper plot shown in Figure 26, the distinct geochemical types are evidenced by:

- clustering of groundwater for 3 wells in the Lower Sandstone aquifer with samples from the Intermediate Sandstone Aquitard and local groundwater flow system. This hydrochemical type (dominantly in the Ca/Mg-HCO<sub>3</sub> quadrant of the central diamond of the Piper Plot) is shown within the purple circle; versus
- the other three wells from Lower Sandstone Aquifer, that show a higher relative dominance of Cl<sup>-</sup> as an anion. This shifts the hydrochemical type of the groundwater to the upper portion of the central diamond in the Piper plot, as shown by the purple arrows in Figures 26. This represents the contribution of leaching of halide salts into the groundwater as it moves along the flow path.

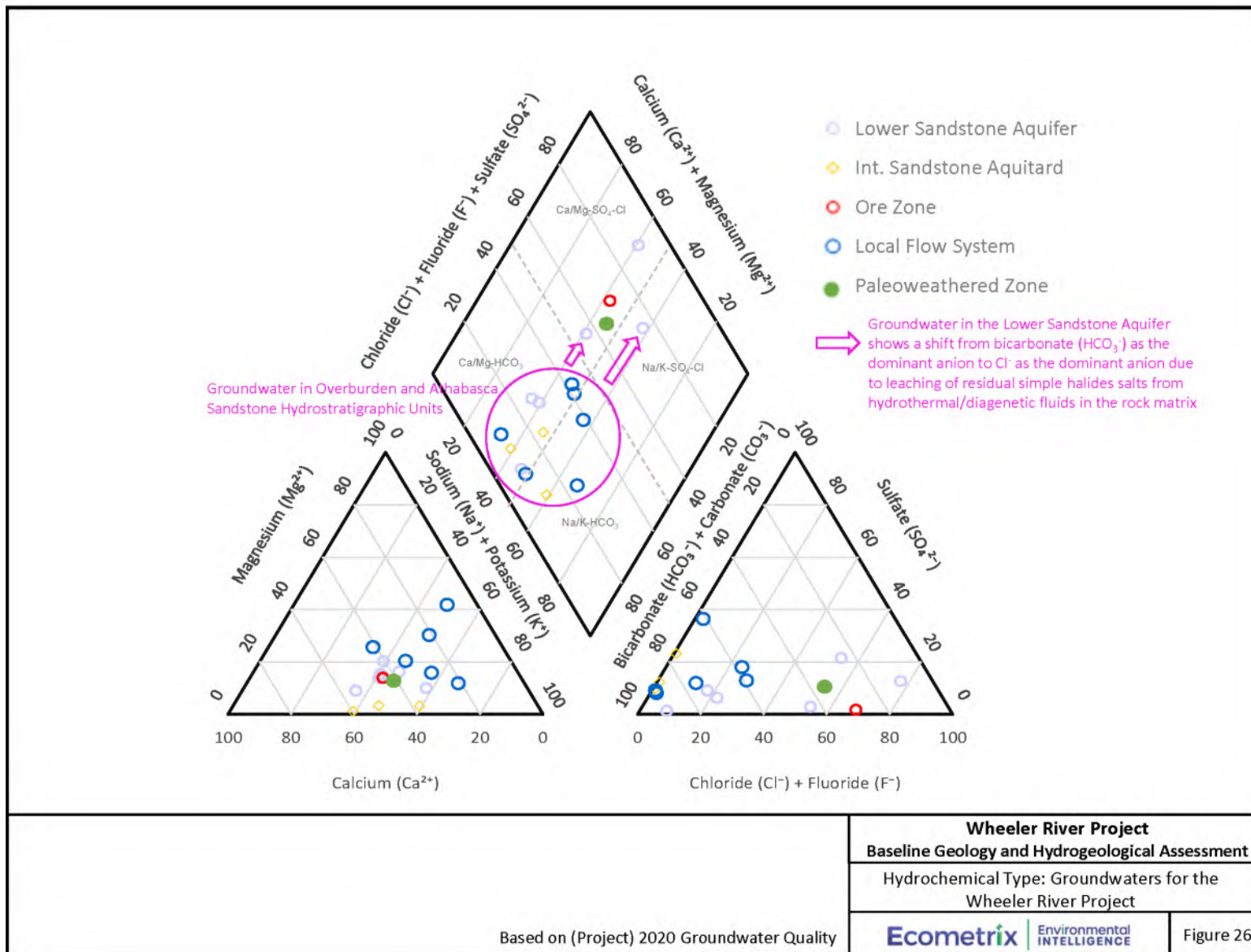
These same two distinct hydrochemical types were also observed in the MFa at Cigar Lake.

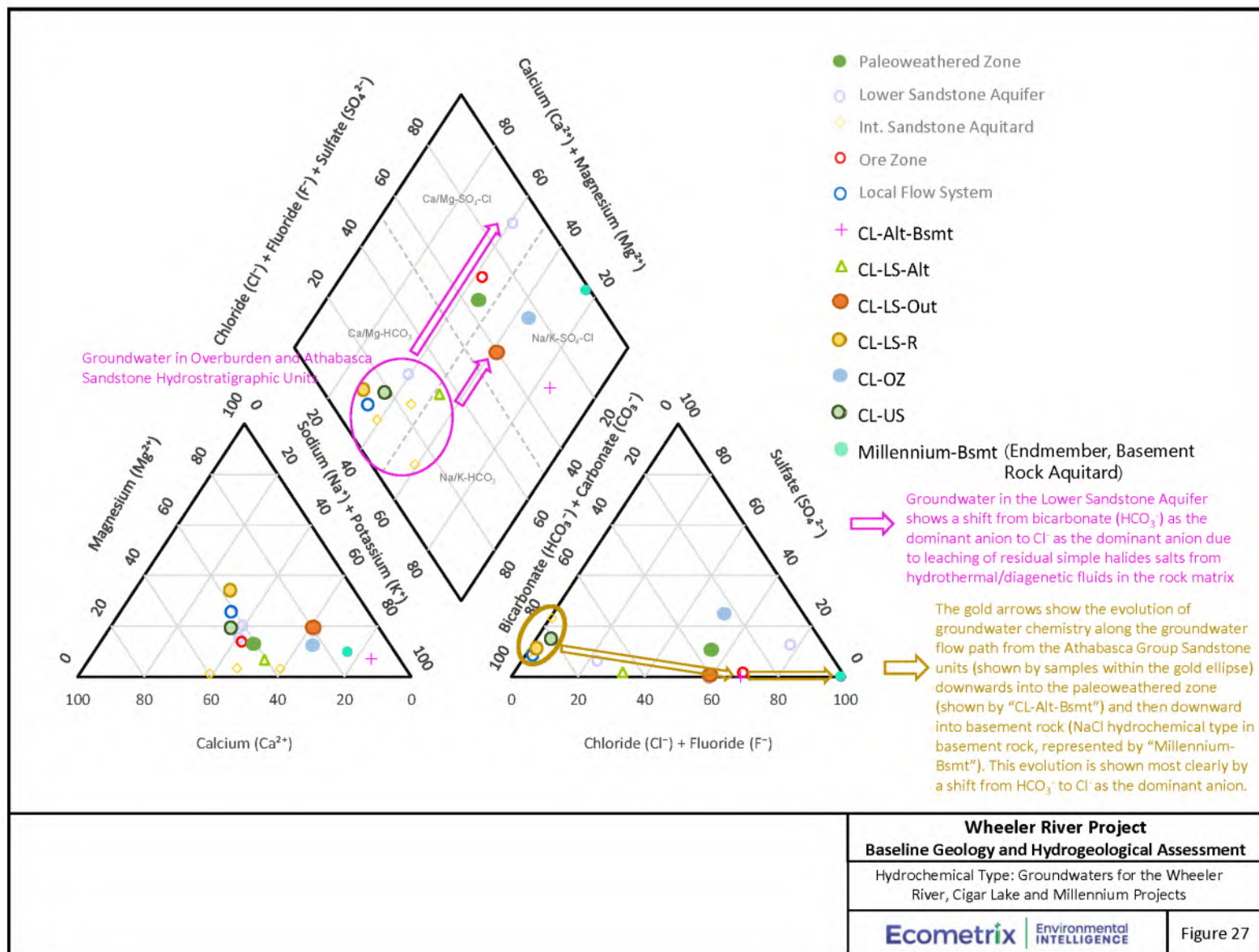
**On page 4.18 - 4.19....** The higher mineralization groundwater with Cl<sup>-</sup> as the dominant anion was observed at Cigar Lake in groundwater collected from a monitoring well located within the zone of thermal alteration and in the inferred downgradient direction of the ore zone. This sample is shown in Figure 27 as “CL-LS-Out” and is of Na-Cl-HCO<sub>3</sub> type. The reasons for the hydrochemical type observed in that monitoring well, and specifically for the source of chloride to the water, was evaluated in some detail in the Cigar Lake studies. One possible explanation explored was that the groundwater reflected mixing of groundwater in the MFa with groundwater from the basement rock. Groundwater in the basement rock is known to be of Na-Cl type, and this is shown in Figure 27 by samples collected from monitoring wells installed in the Basement at Millennium (“Millennium-Bsmt”). This sample represents one endmember hydrochemical type for the basement rock of Na-Cl type. However, the potential for the relatively elevated chloride proportion of anions in groundwater in the MFa to be a result of mixing with groundwater from the basement rocks was ruled out at Cigar Lake as groundwater flow conditions in the MFa were identified as dominantly horizontal, with a component of downward flow to the altered basement.

**On page 4.21...** The paleoweathered zone was sampled at Cigar Lake; analytical results are provided in Appendix J, as samples 199B and 199D. Sample 199D has been referred to in Figure 27 as “CL-Alt-Bsmt”. The hydrochemical type of the Cigar Lake paleoweathered zone is Na-Cl-HCO<sub>3</sub> and of GWR-031 for the Phoenix deposit is a more mixed hydrochemical type (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>). In the Cigar Lake study, the hydrochemistry of the sample in the paleoweathered zone was explained by recharge of the basement waters from the overlying flow regime in the Lower Athabasca Sandstones. Evolution of the groundwater chemistry in the paleoweathered zone is aligned with this flow path. The groundwater quality in the paleoweathered zone represents an intermediate along the hydrochemical evolution of groundwater from the hydrochemical type of the Athabasca Group Sandstone hydrogeological units (Ca-Na-HCO<sub>3</sub> to Na-Ca-HCO<sub>3</sub> type) to one endmember in basement rock (NaCl type). This evolution is a result of water-rock interactions within basement aquitard (including the paleoweathered zone) and is



most clearly visualized in the Piper plot by shifts in relative abundance of anions, shown with gold arrows in Figure 27. The difference in hydrochemical types between groundwater from the paleoweathered zone at Cigar Lake (Na-Cl-HCO<sub>3</sub> type) and associated with the Phoenix deposit (Na-Ca-Mg-Cl-HCO<sub>3</sub>-SO<sub>4</sub>) is likely due to the screened interval of the well, which spans the ore zone, and the paleoweathered zone (Appendix A). Groundwater chemistry in GWR-031 is likely influenced by the hydrochemistry of the ore zone.





## Attachment: IR-81

Number	IR-81
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit
Context and Rationale	The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”. Rationale: Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations <15 Bq/L for the 2020 sample, and 0.1 or <0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.
Information Requirement	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., $\delta^2\text{H}$ , $\delta^{18}\text{O}$ ) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.

### Response:

#### **$\delta^2\text{H}$ , $\delta^{18}\text{O}$ Isotopes in Groundwater**

Analysis of  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  Isotopes in groundwater was not performed for the Wheeler River Project baseline work at Ecometrix’s recommendation. Based on our review of the sampling and analysis of isotope data from neighbouring sites, our interpretation was that similar additional sampling at the Wheeler River Project would not add sufficient value. Other projects in the region including Cigar Lake (AECL, 1994) and Millenium (Devine, 2016) analyzed  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  isotopes in groundwater. At Cigar Lake, stable isotopes of water were measured in all Athabasca Group Sandstone units (“upper”, “lower”, “altered sandstone”), the ore zone, and the altered basement. The results were (quoted from AECL, 1994):

- “The waters from the glacial overburden all plot on or near the Cigar Lake meteoric water line...indicating their meteoric origin”;

- “deep groundwaters also plot entirely within the envelope, suggesting that the variations in the isotopic signatures observed for the groundwaters result entirely from variation in meteoric water compositions. The simplest explanation for these isotopic trends is that they reflect (moving) averaged meteoric water compositions of the Cigar Lake area”; and
- “[W]aters from the three [groundwater flow] regimes [in the Athabasca Sandstone group units], basement and mineralization have similar low temperature meteoric  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  values”

Devine, 2016 analyzed stable isotopes in groundwater for shallow groundwater (of depth < 50 m; groundwater in overburden and upper MFD) at the Millenium and McArthur River Projects. It was concluded that “Oxygen and H isotope compositions reveal that the groundwater sampled was meteoric water and has the same  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  as Saskatoon precipitation”.

The potential for analysis of stable isotopes in groundwater to add value to the development of the CSM for the Pheonix project was, as such, considered low.

### **Tritium in Groundwater**

The potential for tritium to support development of the CSM for the Wheeler River program was evaluated using the available information. The conclusion was that, beyond alignment between some samples in the overburden and the upper sandstone aquifer, tritium concentrations in groundwater do not provide a robust means of ageing groundwater in the subsurface at the Site. The reasons for this, and information supporting that conclusion are presented below.

Two tables have been presented in this IR to support the discussion below.

- a) Table IR-81-1: Provides tritium concentrations in precipitation over time since the 1950s. The source of the tritium data for Canadian locations, including Churchill, Fort Smith and Ottawa, was from the International Atomic Energy Agency Global Network of Isotopes in Precipitation database (GNIP; <https://nucleus.iaea.org/wiser>). Tritium concentrations over time due to radioactive decay were calculated for examination against tritium concentrations in groundwater concentrations for the Wheeler River Project.
- b) Table IR-87-2: Provides tritium concentrations measured in groundwater under baseline conditions for the Wheeler River Project. The tritium concentrations highlighted in yellow/orange were analyzed at the André E. Lalonde AMS Laboratory, University of Ottawa. The detection limit of < 15 Bq/L at the Saskatchewan Research council does not support interpretation of tritium concentrations with respect to groundwater flow conditions, considering the discussion below. The detection limit at the University of Ottawa is 0.8 TU (0.095 Bq/L). Tritium values measured in groundwater samples in 2021 at the University of Ottawa were examined further in the context of ageing groundwater for the Project.

Tritium concentrations in groundwater measured for the Wheeler River Project must consider several factors. These include:

- a) Tritium concentrations in groundwater can be used to identify recharge to mostly granular aquifers in the last approximately 68-70 years, since the early 1950s (Cherry et al., 2004); water recharged prior to that time will have tritium values below analytical detection limits. This is

shown in Table IR-81-1, where groundwater recharged prior to 1952, extrapolated out more than 60 years, has tritium values that are below the analytical detection limit of 0.1 Bq/L.

- b) Maximum tritium concentrations in the precipitation, associated with “bomb tritium” were observed in the early 1960s. At the present time, tritium concentrations in groundwater recharged at that time would be in the range of 14 Bq/L to 53 Bq/L. Values this high were not observed in groundwater at the Wheeler River Project in 2021, and only in one instance in 2020, which is discussed further below.
- c) Tritium concentrations in precipitation have stabilized from historically high “bomb tritium” values to values of approximately 9-25 Tritium Units (TU), equivalent to 1.1 – 3.0 Bq/L, in the last approximately 20 years (as noted by the CNSC review).
- d) Tritium concentrations may reflect the influence of drilling fluids, which is generally other groundwater from the site.
- e) Tritium is produced within the uranium ore deposits of the Athabasca region; this is evidenced by tritium concentrations at GWR-032 (Table IR-87-1) that were measured to be 950 Bq/L (2020) and 1800 Bq/L (2021) and are higher than can be explained by “bomb tritium” (Table IR-87-3). Tritium production in the ore zone is primarily by neutron capture by <sup>6</sup>Li (AECL, 1994). The groundwater sample from the paleoweathered zone (GWR-031; 910 Bq/L) are also considered to be reflecting tritium generation associated with the deposit.

It is our opinion, based on the above considerations and the discussion that follows, that measurement and analysis of tritium data at the Wheeler River Project is limited in value to conceptual model development, and the current data suggests it raises more questions than can be answered. Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.



Table IR-81-2: Calculated Tritium Concentrations in Groundwater based on time period of recharge

Time Periods of Interest for recharge	Tritium concentrations in precipitation		Half-Lives of Tritium				
			1	2	3	4	5
			Years Elapsed				
			12.3	24.6	36.9	49.2	61.5
	TU	Bq/L <sup>a</sup>	Tritium concentration measured in Groundwater (Bq/L) <sup>b,c</sup>				
Recharged Prior to 1952 (Clark and Fritz, 1997)	8.2E+00	9.8E-01	4.9E-01	2.4E-01	1.2E-01	6.1E-02	3.1E-02
1953, annual average, Ottawa	2.7E+01	3.3E+00	1.6E+00	8.1E-01	4.1E-01	2.0E-01	1.0E-01
1956, annual average, Ottawa	1.5E+02	1.7E+01	8.7E+00	4.3E+00	2.2E+00	1.1E+00	5.4E-01
1959, annual average, Ottawa	5.4E+02	6.4E+01	3.2E+01	1.6E+01	8.0E+00	4.0E+00	2.0E+00
1963, monthly maximum, Fort Smith (NWT)	7.1E+03	8.5E+02	4.3E+02	2.1E+02	1.1E+02	5.3E+01	2.7E+01
1963, annual average, Fort Smith (NWT)	3.8E+03	4.6E+02	2.3E+02	1.1E+02	5.7E+01	2.9E+01	1.4E+01
1969, annual average, Fort Smith (NWT)	4.0E+02	4.8E+01	2.4E+01	1.2E+01	6.0E+00	3.0E+00	1.5E+00
1979, annual average, Ottawa	4.8E+01	5.8E+00	2.9E+00	1.4E+00	7.2E-01	3.6E-01	1.8E-01
1992 Average (Churchill, MB)	1.8E+01	2.1E+00	1.1E+00	5.3E-01	2.6E-01	1.3E-01	6.6E-02
2000-2019, Maximum annual average, Ottawa	2.3E+01	2.7E+00	1.3E+00	6.7E-01	3.4E-01	1.7E-01	8.4E-02
2000-2019, Minimum annual average, Ottawa	9.7E+00	1.2E+00	5.8E-01	2.9E-01	1.4E-01	7.2E-02	3.6E-02
Snow (AECL, 1994) (6 TU)	6.0E+00	7.1E-01	3.6E-01	1.8E-01	8.9E-02	4.5E-02	2.2E-02

Notes

- a Tritium concentrations in TU were converted to Bq/L using the conversion factor of 0.1191 used by the André E. Lalonde AMS Laboratory at the University of Ottawa
- b Yellow Highlighting indicates calculated concentration at approximate present-day (2019-2021)
- c The detection limit for tritium at the André E. Lalonde AMS Laboratory, University of Ottawa in the water samples is 0.8 TU (0.095 Bq/L); Values shown in italics are below the detection limit

Table IR-81-1: Summary of Tritium Concentrations Measured in Groundwater for the Wheeler River EIS

Groundwater Well	Hydrostratigraphic Unit	Sampling Date	Tritium Concentration (Bq/L)
GWR-006	OB	2020-08-22	<15
GWR-006		2021-04-14	0.1
GWR-029	LSA	2020-08-30	<15
GWR-029		2021-04-12	0.1
GWR-003	OB	2020-08-16	<15
GWR-003		2021-04-18	1.1
GWR-025	LSA	2020-08-22	<15
GWR-025		2021-04-17	0.4
GWR-008	LSA/DSZ	2020-09-06	<15
GWR-008		2021-04-09	0.5
GWR-009	ISA/DSZ	2020-09-14	16
GWR-009		2021-04-10	1.2
GWR-033	LSA	2020-11-03	<15
GWR-033		2021-05-25	0.5
GWR-034	ISA	2020-10-30	<15
GWR-034		2021-05-24	1.2
GWR-035	USA	2020-11-03	<15
GWR-035		2021-05-24	0.80
GWR-005	OB	2020-08-29	<15
GWR-005		2021-05-22	<0.1
GWR-014	ISA/DSZ	2020-08-29	19
GWR-014		2021-05-21	0.13
GWR-012	LSA/DSZ	2020-08-29	<15
GWR-012		2021-05-23	<0.1
GWR-036	OB	2020-11-05	<15
GWR-036		2021-04-08	0.8
GWR-037	USA/DSZ	2020-10-24	<15
GWR-037		2021-04-09	0.1
GWR-031	PWZ	2020-08-09	<15
GWR-031		2021-06-04	910
GWR-011	LSA/DSZ	2020-08-08	<15
GWR-011		2021-06-01	0.13
GWR-013	ISA/DSZ	2020-08-09	<15
GWR-013		2021-06-02	0.78
GWR-032	OZ	2020-11-01	-
GWR-032		2020-08-08	950
GWR-032		2021-06-04	1800
GWR-046	ISA	9/14/2021	<40
GWR-047	ISA/DSZ	9/10/2021	<40
GWR-048	LSA	9/10/2021	<40

### **Overburden and Groundwater Wells in the uppermost Upper Sandstone Aquifer**

There are three wells monitored as part of the baseline program that are installed in overburden materials: GWR-006, GWR-003 and GWR-005. Two other wells are installed in the uppermost Athabasca Sandstone Group unit (MFd) immediately beneath the overburden. These wells are GWR-036, GWR-035. Tritium values in groundwater wells installed in the overburden and upper sandstone ranged from <0.1 Bq/L to 1.1 Bq/L. Tritium concentrations were 1.1 Bq/L in GWR-003, 0.8 Bq/L in GWR-036 and 0.8 Bq/L in GWR-035. These tritium concentrations in groundwater sampled in these wells is considered to have been recharged in the last 12-25 years. To check alignment between these results and the 3D hydrogeological model, particle tracking was done to estimate minimum groundwater residence times (in years) at each well cluster location. For the overburden unit, the particle tracking results indicated minimum residence times of between 0.5 and 20 years.

Tritium concentrations were at or below the detection limit of 0.1 Bq/L at GWR-006 and GWR-005. Monitoring well GWR-006 is very shallow (screened from 9-15 mbgs), whereas GWR-005 is the deepest of the overburden wells, with a screened interval from 117-123 mbgs. It is considered plausible that the low tritium values reflects the potential for longer residence groundwater times due to heterogeneity in hydraulic conductivities of till material in the overburden. However, tritium concentrations in snow are also lower than in precipitation (AECL, 1994). Thus, it is possible that in the localized areas to those groundwater monitoring wells, materials are lower hydraulic conductivity, and the tritium concentrations are relatively more influenced by snowmelt. Longer residence times in the overburden materials in wells GWR-006 and GWR-005 is supported by higher specific conductance in those wells GWR-003 and GWR-036. Field-measured specific conductance values in GWR-006 and GWR-005 were approximately 150 µS/cm in 2021, whereas values at GWR-003 and GWR-036 were < 75 µS/cm in 2021 (Table 3-2 of Appendix 7-A to the EIS).

### **Deeper Groundwater**

Interpretation of tritium values for “ageing” of groundwater was considered inappropriate beyond the shallowest units at the Site. This is because of the relatively low values of tritium in the groundwater in all but the ore zone, and the numerous confounding factors/complexities. Several tritium concentrations are within 1-3 times the analytical detection limits and are thus considered at the limits of interpretability.

One possible confounding factor at low tritium concentrations is contamination of the sample with drilling fluids. Influence of drilling fluids is possibly a factor in the tritium concentrations observed in groundwater well GWR-014. In that well, tritium values in 2020 were measured as 16 Bq/L at SRC. This is the highest value of tritium detected in groundwater in the Athabasca Sandstone hydrogeologic units and was not reproduced when the well was sampled in 2021; the tritium concentration fell significantly to 0.13 Bq/L. The higher relative concentration of tritium in that well is not considered to reflect “bomb tritium” because of the significant change upon resampling, and it is considered possible that the groundwater quality in that well was influenced by drilling fluids/well construction materials, which was also noted for this well in terms of groundwater quality in the Baseline Report (Appendix 7-A of the EIS). Influence of drilling fluids is also considered the likely explanation for the tritium concentration of 1.2

Bq/L in monitoring well GWR-034. As was noted in the Baseline Report, the water quality in GRW-034 is considered to reflect influence from drilling fluids and additives and is not considered reliable.

Tritium concentrations in groundwater will continue to be measured as part of the routine groundwater sampling, to further evaluate the usefulness of this approach for refining the conceptual site model developed for the Wheeler River Project.

### References

AECL (Atomic Energy of Canada Ltd.), 1994. Final Report for the AECL/ SKB Cigar Lake Analog Study. Report No. AECL-10851. July.

Cherry, J.A., Parker, B.L., Bradbury, K.R., Eaton, T.T., Gotkowitz, M.G., Hart, D.J., and Borchardt, M.A., 2004, Role of aquitards in the protection of aquifers from contamination: a “state of the science” report: Awwa Research Foundation, Denver, Colorado.

Clark, I.D., and Fritz P. 1997. Environmental isotopes in hydrogeology. Lewis Publishers: New York. 328pp.

Devine, 2016. Sources and Pathways of Radiogenic Elements in Surface Media Above the Millennium and McArthur River Uranium Deposits in the Athabasca Basin, Saskatchewan, Canada. Ph.D. Thesis, Department of Earth Sciences, Faculty of Science, University of Ottawa.

## Attachment: IR-82

Number	IR-82
Dept.	CNSC
Project effects link	Geology and groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit Appendix 7-C, Section 3.5
Context and Rationale	<p>Context: A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen, resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p>Rationale: A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p>Reference:  [1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.</p>
Information Requirement	1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2]

	<p>below provide an example of simplified framework for characterizing redox conditions in aquifers.</p> <p>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</p> <p>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</p> <p>Reference:  [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>
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### Response to #1

Redox conditions within the different hydrostratigraphic units at the site, which addresses spatial heterogeneity, was provided as part of Section 4.3.3 of Appendix 7-A of the draft EIS. As was noted by the CNSC reviewer in this IR (IR-82), the measurement of ORP in the system is qualitative at best, and this is also true of field-measured dissolved oxygen, which, upon exposure of groundwater to the atmosphere will quickly equilibrate with atmospheric oxygen. For the project, where concentrations of nitrate are low in all hydrostratigraphic units, the primary indicators of redox conditions are dissolved iron and sulphate concentrations. At the circumneutral pH range observed in groundwater in all hydrostratigraphic units at the site, concentrations of dissolved iron in groundwater above approximately 0.1 mg/L indicate definitively that the system is anoxic. Ferric oxyhydroxide solid control dissolved ferric iron ( $\text{Fe}^{3+}$ ) concentrations to values less than 0.1 mg/L in near neutral pH water, whereas ferrous iron ( $\text{Fe}^{2+}$ ) is very soluble and mobile in groundwater that is anoxic. The presence of sulphate and qualitative absence of detectable sulphide (based on absence of odour;  $\text{H}_2\text{S}_{(\text{g})}$ ) can typically be detected by odour down to 10  $\mu\text{g/L}$  in the groundwater is also an indicator that the system is not currently highly reducing. Sulphate reduction is typically tied to organic matter oxidation and the system does not appear to have organic carbon sources at this time.

As discussed in Section 4.3.3. of Appendix 7A of the draft EIS, the exception to the above is within the ore zone, where more reducing conditions are evidenced by the mineralogy and the persistence of sulphide minerals and uraninite for more than 1 billion years. In this zone, any oxidant will be scavenged by pyrite, maintaining a reducing environment. This is reflected qualitatively by the ORP measurements in the ore zone which was measured to be -265 mV (page 4.20 of Appendix 7A of the draft EIS).

The technical team acknowledges that there are other redox pairs or species, and specifically As(V)/As(III) and the measurement of dissolved reduced sulphur species sulphide species, that may support the interpretation of redox in groundwater. Holm (1989) concluded on the basis of his work calculating redox potentials from As(V)/As(III), Fe(III)/Fe(II) that the arsenic redox pairs provides supplementary information to that provided by dissolved iron, but is considered qualitative in nature. For the As(V)/As(III) pair, the solution phase speciation of the arsenic ions also has to be considered and may affect the accuracy of calculation of redox potentials from their analytical quantification in groundwater.



It is generally understood that groundwaters are typically not at redox equilibrium (e.g., Lindberg and Runnells, 1984). Thus, in this work, our primary reliance on the concentrations of dissolved iron and sulphate in the groundwater, as well as the mineralogy of the system was considered adequately robust for interpretation of baseline redox conditions in the hydrostratigraphic units for the Wheeler River project. Use of tools like the Jurgen et al., (2009) excel spreadsheet referenced by the CNSC reviewer requires careful consideration and qualification of the results provided, as it based on measured redox indicator ion concentrations and empirical relationships between them. The tool was applied to the available data on groundwater and returns interpretation that is aligned with what was discussed in the draft EIS and herein.

#### Response to #2

The redox conditions assumed for the 3D modelling, using PiChem, were the same for all scenarios as in the 1D modelling in PHREEQC. This includes the equilibration of the groundwater with atmospheric concentrations of oxygen for most of the modelling scenarios. The one exception was the “Redox Scenario” (page 3.48 of Appendix 7-C of the EIS), in which the solution was equilibrated with pyrite, resulting in reducing conditions controlled by the iron sulphide mineral.

It is noted that this equilibration of the groundwater solutions with atmospheric concentrations of oxygen affects only the speciation of elements that are redox sensitive and is a modelling approach that is used to force redox sensitive species to be in their most oxidized form. As noted above, groundwaters are seldom at equilibrium with respect to the speciation of redox sensitive species and thus, using thermodynamic considerations alone can results in elements being present in the model as species that are not observed in the environment. This was mitigated by forcing the conditions in the model to oxidized conditions. As was discussed in Appendix 7-C of the draft EIS (page 3.29), this is a conservative approach because the important redox-active constituents of concern are more mobile in their oxidized forms, including uranium as U(VI).

#### Response to #3

The “Redox” scenario model (page 3.48 of Appendix 7-C of the draft EIS) was run iteratively to evaluate the minimum amount of pyrite that would be required to reduce dissolved-phase U(VI) associated with remediation of the mining zone (i.e., the restored solutions). As was outlined on page 3.49 of Appendix 7-C of the draft EIS, the information available included quantification of total iron through wet chemical extraction in core samples, and observations recorded by Denison personnel during core logging. Specifically, pyrite was observed associated with hydrothermally altered materials between an approximate depth interval of 240-390 mbgs (page 3.49 of Appendix 7-C of the draft EIS).

Total (wet chemical) extraction of iron content of the core materials does not provide speciation of iron. The maximum, minimum, and median total iron concentration, expressed as Fe<sub>2</sub>O<sub>3</sub> weight %, in the MFa are provided in Table 3-2 of Appendix 7-C of the draft EIS. Not indicated in that table is that these statistics are based on 10,436 elemental analyses of core samples. *(Noted is that as part of the response to IR-92, Table 3-2 is being updated to indicate the total number of samples from which the statistics were derived).*

A sample from the MFa downgradient of the mining zone was recently submitted to the Saskatchewan Research Council (SRC) for analysis of total iron and mineralogy by XRD. The sample was taken from location GWR-062 (located within Phase 1 of mining) at a depth of 398.7 mbgs in sandstone and was

named “Altered Pyrite”. The total iron content of the sample was determined in the whole rock assay (by lithium metaborate fusion) to be 13% by weight; the analytical results are provided in Appendix A. The certification of analysis for the whole rock assay is attached to this IR. Pyrite and marcasite were identified as the iron phases in the sample by XRD; the XRD results are attached to this IR in Appendix A.

*Pyrite Content Assumed in the “Redox Scenario”*

In the numeric model for the sensitivity “Redox Scenario”, the total iron content was considered was the median value in the MFA. The Median total iron value in the MFA is 1.4 wt % (1.4 g) of  $\text{Fe}_2\text{O}_3$  per kg of sediment/rock, which is equivalent to 0.0175 moles of Fe per kg of soil. Because of the stoichiometry of pyrite ( $\text{FeS}_2$ ), this is equivalent to 0.0175 moles of pyrite per kg of soil. This value was then converted to moles of Fe per litre of water, as is the convention for PHREEQC. To do this conversion, it was assumed that the groundwater flow was predominantly through the desilicified/hydrothermally altered portion of the MFA, with a porosity of 0.2 and a bulk density of  $2.12 \text{ g/cm}^3$ . The total moles of pyrite per litre of soil was calculated as 0.186 moles/L.

Determined through the reactive transport modelling in PHREEQC was that only 0.0001 moles of pyrite per litre of water was required to oxidize the mass of U(VI) transported from the mining zone. This amount of pyrite represents 0.054% of the median total moles of iron present in the MFA.

The pyrite content measured in the “Altered pyrite” sample by XRD, presented herein, exceeds that assumed in the reactive transport modelling.

References

Holm, T.R. and Curtiss, C.D., 1989. A comparison of oxidation-reduction potentials calculated from the As(V)/As(III) and Fe(III)/Fe(II) couples with measured platinum-electrode potentials in groundwater. J. Contam. Hydrol., 5: 67-81.

Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.

Lindberg, R.D. and Runnells, D.D., 1984. Ground water redox reactions: an analysis of equilibrium state applied to Eh measurements and geochemical modeling. Science, 225:925 927.

Attachment IR-82 Appendix A

**SRC Mineral Processing**  
Attention: Jack Zhang  
PO #/Project: 15475  
Samples: 3

**SRC Geoanalytical Laboratories**  
2901 Cleveland Avenue, Saskatoon, Saskatchewan, S7K 8A9  
Tel: (306) 933-8118 Fax: (306) 933-5656 Email: geolab@src.sk.ca

Report No: G-2023-1281

Date of Report: Jun 28, 2023

**ICP Whole Rock Assay**  
**Lithium Metaborate Fusion**

Column Header Details

Aluminum in wt % (Al<sub>2</sub>O<sub>3</sub>)  
Calcium in wt % (CaO)  
Iron in wt % (Fe<sub>2</sub>O<sub>3</sub>)  
Potassium in wt % (K<sub>2</sub>O)  
Magnesium in wt % (MgO)

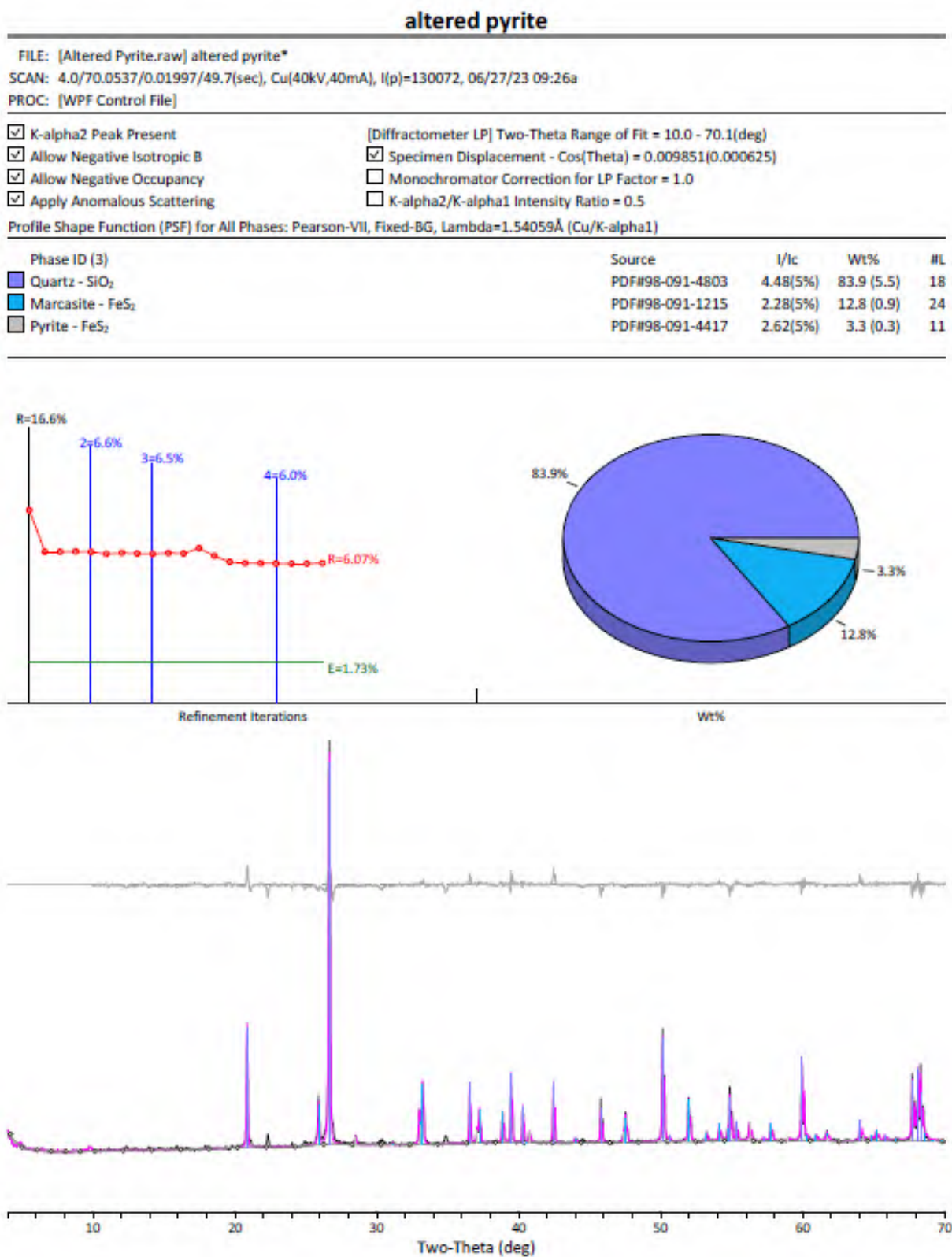
Manganese in wt % (MnO)  
Sodium in wt % (Na<sub>2</sub>O)  
Phosphorus in wt % (P<sub>2</sub>O<sub>5</sub>)  
Titanium in wt % (TiO<sub>2</sub>)  
SiO<sub>2</sub> by ICP in wt % (SiO<sub>2</sub>)

Barium in ppm (Ba)  
Chromium in ppm (Cr)  
Scandium in ppm (Sc)  
Strontium in ppm (Sr)  
Yttrium in ppm (Y)

Zirconium in ppm (Zr)  
Loss on Ignition in wt % (LOI)  
SUM in (SUM)

Sample Number	Al <sub>2</sub> O <sub>3</sub> wt %	CaO wt %	Fe <sub>2</sub> O <sub>3</sub> wt %	K <sub>2</sub> O wt %	MgO wt %	MnO wt %	Na <sub>2</sub> O wt %	P <sub>2</sub> O <sub>5</sub> wt %	TiO <sub>2</sub> wt %	SiO <sub>2</sub> wt %	Ba ppm	Cr ppm	Sc ppm	Sr ppm	Y ppm	Zr ppm	LOI wt %	SUM
SY5	14.5	7.16	10.6	4.23	3.27	0.13	4.18	2.05	1.82	49.9	6410	147	13	3130	57	743	N/R	97.84
ALTERED PYRITE	2.23	0.02	13.0	0.05	0.41	<0.01	0.04	0.05	0.08	67.5	9	49	<2	151	37	176	16.9	100.58
ALTERED PYRITE R	2.16	0.02	13.0	0.05	0.40	<0.01	0.04	0.04	0.10	67.2	9	48	<2	148	36	178	17.5	100.50

Whole Rock Analysis: A 0.1 gram pulp is fused at 1000 C with lithium metaborate then dissolved in dilute HNO<sub>3</sub>.  
The standard is SY5.



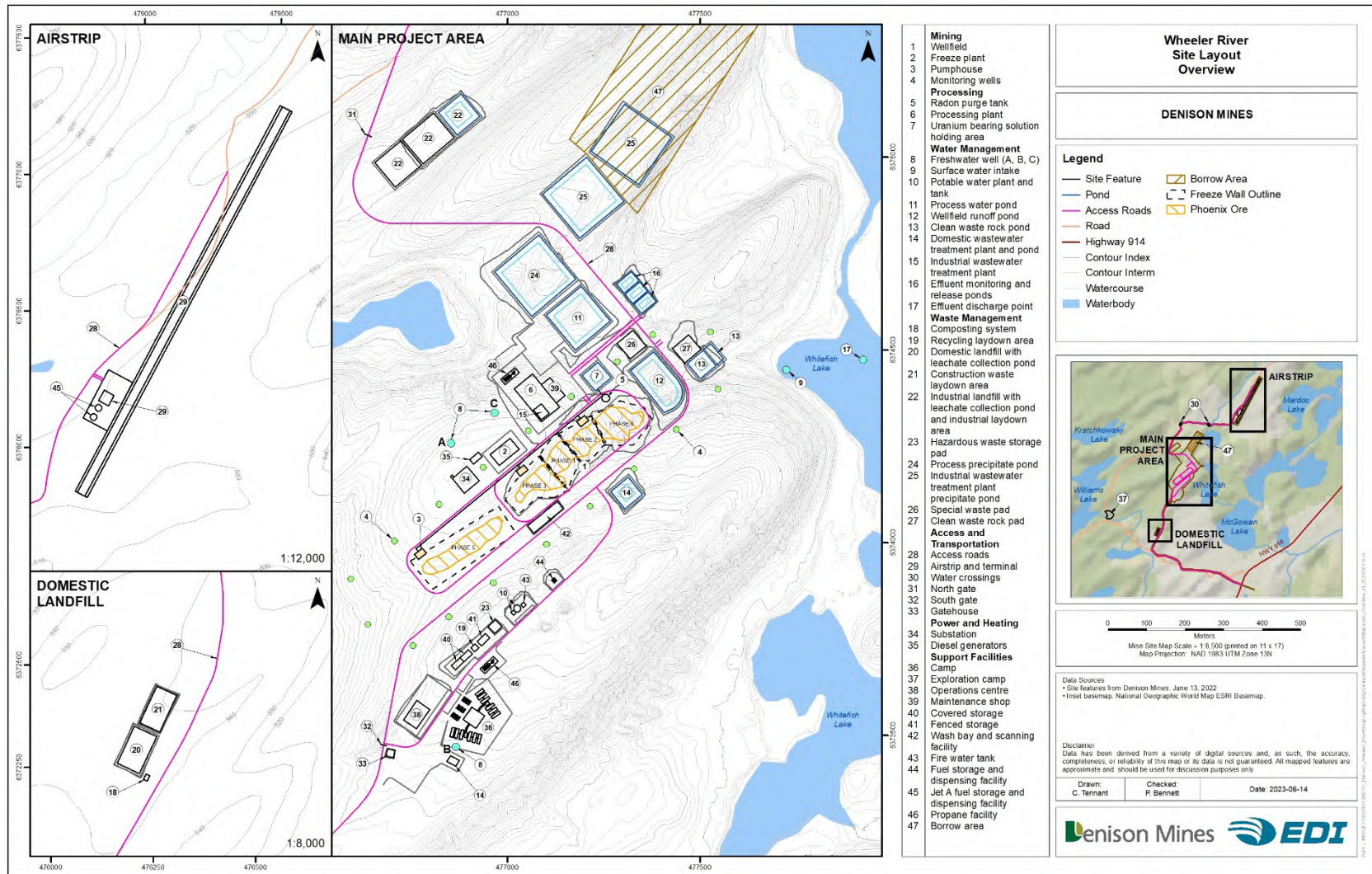
## Attachment: IR-85

Number	IR-85
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C
Context and Rationale	Context: Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C. Rationale: It is not clear where Well A, Well B and Well C are located.
Information Requirement	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.



Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Supporting figure to the response provided in table:

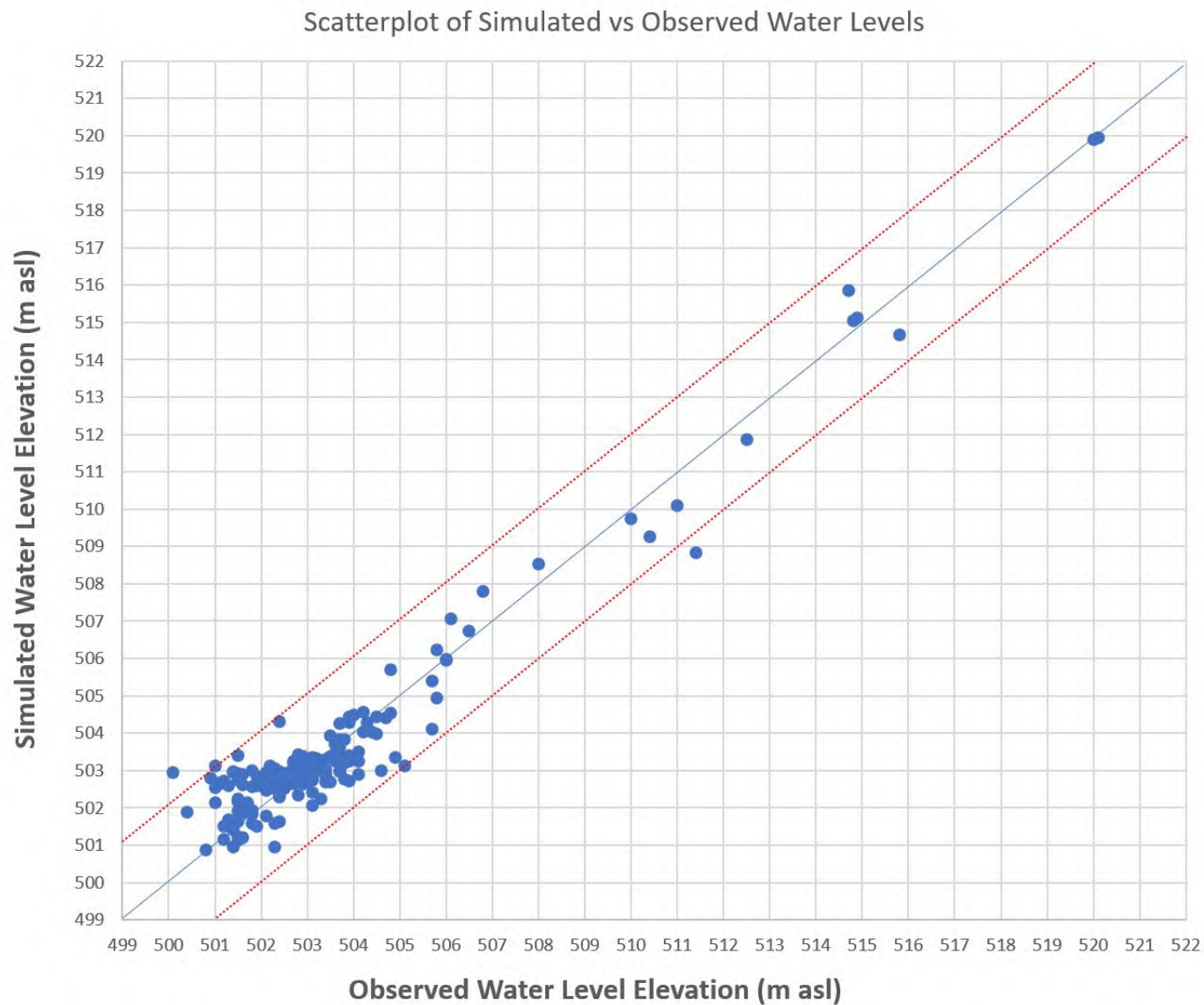




## Attachment: IR-91

Number	IR-91
Dept.	NRCan
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, section 2.5.2
Context and Rationale	<p>Context: The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p>Rationale: As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>
Information Requirement	The proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.

Supporting figure to the response provided in table:



## Attachment: IR-92

Number	IR-92
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 3.2.1, Mineralogical Composition
Context and Rationale	<p>Context: Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca</p> <p>Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p>Rationale: Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported. The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</li> <li>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is</li> </ol>

	conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. ditrichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).
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#### Response to #1

Table 3-2 in Appendix 7C of the draft EIS has been updated to indicate the number of samples analyzed and arithmetic average and (one) standard deviation values as a measure of sample variability, in addition to the maximum, median and minimum values that had already been provided. Results from Portable Infrared Mineral Analyzer (PIMA) have also been included for the paleoweathered zone. The updated Table 3-2 is included on the next page.

Note that in Table 3-2 in Appendix 7C of the draft EIS, the normative clay content for kaolinite, illite and ditrichlorite in the paleoweathered zone had been entered erroneously as the % of total clay and had not been converted to wt% in the sediment/rock. This was corrected and the updated values represent wt% of kaolinite, illite and ditrichlorite in the sediment/rock.

#### Response to #2

Unlike the iron oxide minerals goethite and ferrihydrite and gibbsite, for which there is an existing compilation of thermodynamic surface complexation constants for sorption of metals, metalloids, and anions to a single, laboratory-produced mineral phase (Dzombak and Morel, 1991; Mathur and Dzombak, 2006; Karamalidis and Dzombak, 2006), such a compilation does not exist for clay minerals. Rather, to develop the database of surface complexation constants for metals and metalloids to illite clay for the modelling work presented in Appendix 7-C of the draft EIS took an extensive review of the literature to make decisions on the most defensible constants to include in the work. For kaolinite, a similarly comprehensive databased could have been developed, but not for chlorite, where the number of studies identified in the literature for sorption characteristics is much more limited.

The decision was made to use illite to represent the clays present in the Athabasca Sandstone group units because:

- for the reasons give above and the discussion provided below, it was not practicable to develop a database of surface complexation constants for more than one clay mineral phase;
- using the updated Table 3-2 provided as part of this IR response, the median illite content (weight %, based on normative clay calculations) of the Athabasca Sandstone Group units is, with only one exception, always more than twice (2x) the median kaolinite content, and three times (3x) the median chlorite content. The exception is the “MFa in downgradient DSZ”, where the median illite content is lower, than the median kaolinite and chlorite contents.

In the model, the choice was made to represent the clays assemblage as a whole as 3.9% illite/kg of sediments/rock (wt %, based on normative clay calculations). Median normative clay contents in the Athabasca Sandstone Units (MFa, MFb, MFC, and MFD) and overburden materials ranged from 1.74-5.85 wt %, and for the locations downgradient of the mining zone (“Downgradient Desilicified Zone, All Units”) was 4.14 %. The robustness of selection of illite to represent the clay assemblage is discussed here below using CEC as an important characteristic of the sorption behaviour of the clays present in the system (illite, kaolinite and chlorite).

Updated Table 3-2 in Appendix 7-C of the draft EIS: CaO, Fe Oxide and Clay Contents of the Athabasca Group Sandstones and Paleoweathered Zone

Lithologic Unit	Number of Samples (CaO and Fe2O3, %)	Number of Samples (Clay %)	Statistic	Elemental Analysis (wt % in sediment/rock)		Normative Clay (wt % in sediments/rock) <sup>b</sup>					PIMA (% of total clay content) <sup>c</sup>			
				CaO (% Total)	Fe2O3 (% Total) <sup>a</sup>	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite (%)	Illite (%)	Chlorite (%)	Kaolinite (%)	Dravite <sup>1</sup> (%)
Overburden	8	84	Max	0.21	0.38	6.7	3.63	5.23	2.17	0.62	Data Not Collected			
			Min	0.005	0.03	0.20	0.00	0.06	0.00	0.01				
			Median	0.165	0.28	1.74	0.29	1.06	0.04	0.03				
			Average	0.14	0.26	1.94	0.47	1.22	0.25	0.08				
			Standard Deviation	0.063	0.10	1.23	0.52	0.94	0.47	0.11				
MFd	3077	3556	Max	0.71	1.7	39.6	17.2	24.4	15.2	8.03				
			Min	0.005	0.02	0.02	0.00	0.00	0.00	0.00				
			Median	0.005	0.05	2.05	0.32	1.45	0.00	0.28				
			Average	0.009	0.085	2.27	0.47	1.49	0.30	0.45				
			Standard Deviation	0.014	0.120	1.45	0.76	1.20	0.66	0.53				
MFc	8532	9065	Max	1.44	9.1	60.5	18.9	46.1	27.8	16.3				
			Min	0.005	0.02	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.29	3.76	0.44	2.60	0.08	0.30				
			Average	0.02	0.52	4.08	0.84	2.73	0.49	0.66				
			Standard Deviation	0.02	0.60	2.50	1.23	1.96	1.17	0.99				
MFb	6086	7115	Max	2.48	7.23	64.3	32.61	31.95	52.59	21.60				
			Min	0.005	0.04	0.03	0.00	0.00	0.00	0.00				
			Median	0.02	0.89	5.85	0.95	4.17	0.00	0.17				
			Average	0.02	1.10	6.23	1.56	4.24	0.41	0.51				
			Standard Deviation	0.06	0.87	3.28	1.99	2.20	2.12	1.07				
MFa	10436	10817	Max	3.74	25.8	68.0	34.2	38.2	63.7	45.0				
			Min	0.005	0.01	0.03	0.00	0.00	0.00	0.00				
			Median	0.01	0.14	3.53	0.67	1.74	0.20	0.33				
			Average	0.021	0.52	4.76	1.16	2.67	0.93	1.00				
			Standard Deviation	0.056	1.08	4.73	1.94	2.95	2.79	2.03				
MFa in Downgradient DSZ	510	542	Max	0.28	5.77	41.3	28.8	17.0	20.9	9.22				
			Min	0.005	0.03	0.40	0.00	0.00	0.00	0.01				
			Median	0.02	0.09	2.62	0.51	0.42	1.18	0.15				
			Average	0.021	0.30	3.96	0.78	1.66	1.52	0.52				
			Standard Deviation	0.022	0.64	3.95	1.70	2.55	1.89	1.23				
Downgradient Desilicified Zone, All Units	1376	1459	Max	0.28	6.73	41.3	28.8	17.0	20.9	9.2				
			Min	0.005	0.03	0.30	0.00	0.00	0.00	0.01				
			Median	0.02	0.23	4.14	0.47	2.42	0.64	0.17				
			Average	0.019	0.58	4.63	0.79	2.94	0.90	0.47				
			Standard Deviation	0.017	0.78	3.05	1.28	2.60	1.36	0.89				
Paleoweathered Zone	109	109	Max	10.1	23.598	67.1	17.9	36.0	65.3	43.3	98.5	95.4	21.1	11.1
			Min	0.1	0	2.81	0.00	0.00	0.00	0.06	0	1.5	0	0
			Median	0.29	2.05	47.1	0.00	9.20	35.5	0.97	13.1	69.5	NC <sup>d</sup>	NC <sup>e</sup>
			Average	0.61	3.4	48.5	1.70	10.10	36.7	1.67	28.1	64.5	NC <sup>d</sup>	NC <sup>e</sup>
			Standard Deviation	1.51	4.2	10.4	3.60	7.60	12.60	4.10	33.2	30	NC <sup>d</sup>	NC <sup>e</sup>

Notes

- <sup>a</sup> Iron oxide content for the paleoweathered zone is % Hematite (vs. total iron as Fe<sub>2</sub>O<sub>3</sub>)
- <sup>b</sup> Normative clay values for predominantly basement-hosted paleoweathered zone may be erroneous due to variable host lithology chemistry
- <sup>c</sup> The number of samples analyzed by PIMA for the paleoweathered zone was 9 (i.e., n= 9)
- <sup>d</sup> Kaolinite was only detected in 3 samples in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.
- <sup>e</sup> Dravite was only detected in 1 sample in the paleoweathered zone using PIMA, and was "0" in all other samples. A. Median, average and standard deviation values were not calculated.

### Cation Exchange Capacity (CEC) in the Overburden and Athabasca Sandstone Group Units

Literature ranges for cation exchange capacity for kaolinite, illite and chlorite are shown below in Table IR-92-1. Because there is a range of CEC values for each clay mineral in the literature, the maximum and minimum CEC value in the range provided in the literature was used to evaluate the CEC of the overburden and Athabasca Sandstone Group units for the Wheeler River Project. The range of calculated CECs based on the clay mineral assemblage in each sample is given in Table IR-92-2. Note that the number of samples used for each of the lithologic units is the same as that provided in the updated Table 3-2.

In Table IR-92-2, the “Kaolinite+Illite+Dichlorite CEC – Minimum” and “Kaolinite+Illite+Dichlorite CEC- Maximum” were calculated in the following way, to estimate the range of CEC that may be expected by lithologic unit.

*Kaolinite + Illite + Dichlorite CEC – Minimum*

$$= \frac{\text{wt\% kaolinite } (\frac{kg}{kg})}{100} * 10 \frac{meq}{kg} + \frac{\text{wt\% illite } (\frac{kg}{kg})}{100} * 100 \frac{meq}{kg} + \frac{\text{wt\% dichlorite } (\frac{kg}{kg})}{100} * 14 \frac{meq}{kg}$$

*Kaolinite + Illite + Dichlorite CEC – Maximum*

$$= \frac{\text{wt\% kaolinite } (\frac{kg}{kg})}{100} * 150 \frac{meq}{kg} + \frac{\text{wt\% illite } (\frac{kg}{kg})}{100} * 400 \frac{meq}{kg} + \frac{\text{wt\% dichlorite } (\frac{kg}{kg})}{100} * 100 \frac{meq}{kg}$$

This was then compared to the CEC used in the reactive transport modelling presented in Appendix 7-C of the draft EIS. The CEC of illite assumed was 225 meq/kg (Baeyans and Bradbury, 2009), which is a value intermediate to range in the literature sources (Table IR-92-1). At 3.9% illite, which was the illite content assumed in the base case of the modelling scenarios, the CEC assumed for the overburden and Athabasca Sandstones was  $(3.9 \text{ wt \% (kg/kg)}) / 100 * 225 \text{ meq/kg} = 8.87 \text{ meq/kg}$  of sediments/bedrock). In the modelling sensitivity analysis, 1/10 of the reactive phases, including illite, were assumed to be accessible to solution, so that the CEC of the bedrock/sediments was assumed to be 0.887 meq/kg.

The CEC values evaluated in the modelling (0.887 and 8.87 meq/kg) are within the range of median CECs that are represented for the lithologic units for the project. Because groundwater movement from the mining zone is understood to be preferentially through the desilicified zone (DSZ), as presented in Appendix 7-C of the draft EIS, it is important that the CEC assumed in the model is reflective of conditions in that unit. The calculated CEC for the “Downgradient Desilicified Zone, All Units” ranged from 2.7-11.8 meq/kg (Table IR-92-2). The CEC value assumed in the base case of the model (8.87 meq/kg) is intermediate to this range, and the sensitivity analysis value of 0.887 meq/kg is reflective of not all cation exchange sites being accessible for reaction with constituents in groundwater.

Further, three core samples from the desilicified zone at depth were submitted for CEC analysis. Details of the samples, the normative clay content, and the measured CEC using the ammonium-saturation method are provided in Table IR-92-3.



Table IR-92-1: CEC values from the Literature

Clay Mineral	Cation Exchange Capacity (meq/kg)		
	Kaolinite	Illite	(DiTri)Chlorite
Minimum CEC Applied	10	100	14
Maximum CEC Applied	150	400	100
Ranges in Literature (meq/kg)			
Drever (1982)	10-100	100-400	<100
Bain et al., (1994)	30-150	100-400	100-400
Zazzi, 2009	-	-	14-40
Bradbury and Baeyens (2009)		225	

Applied for geochemical reactive transport modelling in Appendix 7-C of the draft EIS

Table IR-92-2: Calculated CEC ranges for the Lithologic Units for the Wheeler River Project

Lithologic Unit	Statistic	Clays (%)	Kaolinite (%)	Illite (%)	Dichlorite (%)	Dravite1 (%)	Kaolinite+Illite +Dichlorite CEC - Minimum	Kaolinite+Illite +Dichlorite CEC - Maximum
Overburden	Max	6.7	3.63	5.23	2.17	0.62	5.4	22.2
	Min	0.20	0.00	0.06	0.00	0.01	0.076	0.39
	Median	1.74	0.29	1.06	0.04	0.03	1.1	4.9
MFd	Max	39.6	17.2	24.4	15.2	8.03	26.6	112.9
	Min	0.02	0.00	0.00	0.00	0.00	0	0
	Median	2.05	0.32	1.45	0.00	0.28	1.5	6.3
MFc	Max	60.5	18.9	46.1	27.8	16.3	48.1	198.7
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.76	0.44	2.60	0.08	0.30	2.8	11.7
MFb	Max	64.3	32.61	31.95	52.59	21.60	34.9	149.2
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	5.85	0.95	4.17	0.00	0.17	4.4	18.6
MFa	Max	68.0	34.2	38.2	63.7	45.0	38.8	157.1
	Min	0.03	0.00	0.00	0.00	0.00	0	0
	Median	3.53	0.67	1.74	0.20	0.33	2.0	9.0
MFa in Downgradient DSZ	Max	41.3	28.8	17.0	20.9	9.22	19.6	92.3
	Min	0.40	0.00	0.00	0.00	0.01	0.11	0.64
	Median	2.62	0.51	0.42	1.18	0.15	0.7	3.9
Downgradient Desilicified Zone, All Units	Max	41.3	28.8	17.0	20.9	9.2	19.6	92.3
	Min	0.30	0.00	0.00	0.00	0.01	0.11	0.64
	Median	4.14	0.47	2.42	0.64	0.17	2.7	11.8

Table IR-92-3: Normative Clay and Measured CEC for Desilicified Zone Samples

Sample Name	Corehole Location	Normative Clay Content					CEC (meq/kg)
		Clays (wt %)	Kaolinite (wt %)	Illite (wt %)	DiTriChlorite (wt %)	Dravite (%)	
DS-1	GWR-054	10.16	0.14	9.5	0.49	0.24	21
DS-2	GWR-059	5.74	0.40	6.2	3.6	0.743	26
DS-3	GWR-060	12.12	0.89	6.7	2.6	0.312	25
DS-Feed	Composite of DS-1, DS-2, DS-3	7.91	0.61	7.4	2.2	0.404	21

### The Paleoweathered Zone

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz, as was described on page 3-29 of Appendix 7-C of the draft EIS. For the paleoweathered zone, there is a smaller dataset and the normative clay content in this unit can be inaccurate due to the host (basement) mineralogy. This is because the normative clay percentages for kaolinite, illite, dravite and chlorites are calculated from the bulk total geochemical composition of the sandstones using an in-house set of linear equations that govern the distribution of oxides into minerals of interest. Key oxide inputs are Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, and MgO in percent and B in ppm. Unlike the sandstones, that contain little parent basement rock material, calculation of clay content in samples from the paleoweathered zone – because this unit is basement-hosted – can be influenced by the presence of parent rock material that has the same/similar chemical composition. In the paleoweathered zone, portable infrared mineral analysis (PIMA) was used to support the information from the normative clay content in terms of the relative abundance of the clay mineral phases. PIMA does not quantify the total clay in the rock sample (i.e., clay as a wt% of rock), but it does provide the relative abundances of the clay minerals present.

The conceptualization of the paleoweathered zone with respect to reactive mineral phases in the numeric modelling presented in Appendix 7-C of the draft EIS is considered conservative and robust based on the alignment of the following:

- The normative clay content, which as shown in the updated Table 3-2 presented above in this IR has a median value of 47.1 wt % clay content, with median illite and chlorite contents of 9.20 wt %, and 35.3 wt %, respectively.

- The PIMA results, presented in the updated Table 3-2. The PIMA results support the normative clay content results in that the dominant clay is chlorite (median of 69.5% relative abundance) followed by illite (median 13.1% relative abundance).
- Characteristics of the paleoweathered zone have been discussed for the Cigar Lake program (AECL, 1994) and for other study areas in the Athabasca Basin by Macdonald (1980) and by Wilson (1986). Macdonald (1980) studied the Precambrian regolith in areas of the Athabasca Basin that were not mineralized – meaning away from areas of hydrothermal alteration. The mineralogy of the regolith depended on the depth in the regolith and on the specific parent basement rock (Meta-arkose, meta-semipelite, and meta-pelite). The quartz content of the regolith ranged from 5-40 volume % with values generally close to 25 volume %.
- In Wilson (1996), the author identifies zones of hydrothermal alteration overprinting the regolith that are dominated by quartz, illite, and kaolinite.
- In the Cigar Lake study (AELC, 1994) the paleoweathered zone beneath the ore body is described in the following way: *“A noticeable feature is the funnel-shaped zone of hydrothermally altered basement rock which also overprints the older regolithic alteration immediately underneath the unconformity. This hydrothermal alteration is characterized by a weakening of the rock strength through shearing and foliation dominated by clay-mineral development”*.

#### *Support from CEC and XRD Analyses*

Using the same calculation method as above, the CEC of the paleoweathered materials would be 20.25 meq/kg assuming 9% wt% illite.

Recently, a composite sample of 4 core samples taken from the paleoweathered zone (“PW-Feed”) was analyzed by XRD for mineralogy and the CEC was measured. Details of the samples included in the “PW-Feed” sample are provided below in Table IR-92-4. The CEC for PW-Feed is also included in that table, and was 72 meq/kg, and is aligned with a higher content of illite in the PW-Feed sample than is assumed for the numerical modelling and suggests a contribution to the CEC from the chlorite. The XRD results are provided as Appendix A of this IR response. The results indicate that the mineralogical makeup of PW-feed is: 24.4 wt% quartz (which aligns very well with the assumptions of 25 wt% in the conceptualization), 31.4 wt% illite, and 40.5 wt% chlorite. There is also a small amount of basement rock/parent material present in the sample (3.7wt% biotite).

The measured CEC was substantively (~3x) higher than assumed in the numeric model. It was understood in representing the clay mineral phases in the paleoweathered zone by 9% illite that the sorptive capacity may be underestimated. The decision was made to take a conservative approach because the dataset of surface complexation constants developed for the project was for illite, and it was considered inappropriate to apply the same sorptive reactivity to the much larger relative content of chlorite in this zone. The results of the XRD and the measured CEC provide support to the approach in the reactive transport modelling of assuming illite as the sorptive clay mineral as a conservative one.

Table IR-92-4: Measured CEC for PW-Feed Sample

Sample Name	Corehole Location	CEC (meq/kg)
PW-1	GWR-054	-
PW-2	GWR-061	-
PW-3	GWR-057	-
PW-4	GWR-060	-
PW-Feed	Composite of PW-1 through PW-4	72

#### Changes to the draft EIS text

To reflect the discussion above and updates to Table 3-2 of Appendix 7-C of the draft EIS, the following changes will be made to the text on page 3.29-3.20 of Appendix 7-C of the EIS.

Conceptually, the paleoweathered zone mineral assemblage was made up of 9% clay by mass, as illite, and 25% quartz. The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 9.20%; Table 3-2). Portable infra-red mineral analysis supported the normative clay content in that chlorite is the dominant clay mineral (69.5% relative abundance) followed by illite (median 13.1% relative abundance). The quartz content was based on a regional study by Macdonald (1980) evaluating the mineralogical composition of the weathered bedrock/saprolite regionally. The mineral composition of the paleoweathered zone was conceptualized in this manner because the data set for the project with respect to clay minerals was for the sorptive properties of illite. Using the relatively smaller illite content of the paleoweathered zone compared to the more dominant chlorite content is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone.

#### References

AECL (Atomic Energy of Canada Ltd.), 1994. Final Report for the AECL/ SKB Cigar Lake Analog Study. Report No. AECL-10851. July.

Bain, D. C. Smith, B.F. L., Wilson, M. J., Ed. 1994. Clay Mineralogy: Spectroscopy and Chemical Determinative Methods, Chapman and Hall New York, USA. p. 300.

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Karamalidis A.K. and Dzombak D.A., 2010. Surface Complexation Modeling: Gibbsite, John Wiley & Sons, New York, New York, pp. 312, ISBN: 0470587687

Macdonald, C.C., 1980. Mineralogy and geochemistry of a precambrian regolith in the Athabasca Basin. Master's Thesis Submitted to the University of Saskatchewan.

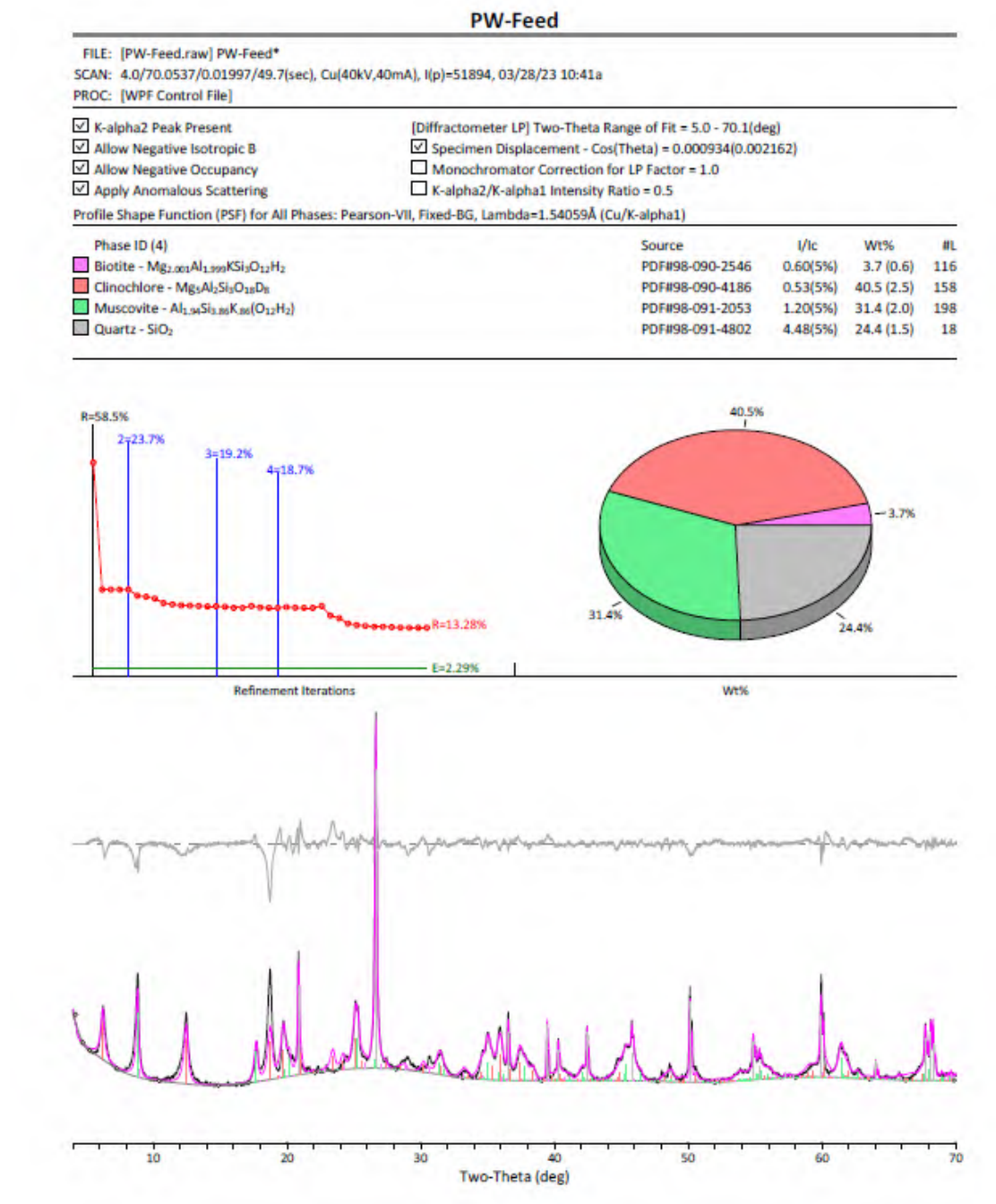
Mathur, S.S., Dzombak, D.A., 2006. Surface Complexation: Goethite, in: Surface Complexation Modelling. Elsevier, p. 443.

Wilson, J.A., 1986, Geology of the basement beneath the Athabasca Basin in Alberta. Bulletin 55. Geological Survey Department, Alberta Research Council, Edmonton, Alberta, Canada.

## Attachment IR-92 Appendix A

Note the following on the XRD results for the PW-Feed sample:

- Chlinochlore is part of the chlorite group of minerals.
- The diffraction patterns for illite and muscovite are nearly identical, and thus, muscovite is interpreted as illite in this sample.





## Attachment: IR-93

Number	IR-93
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-10: Properties of Adsorbing Mineral Phases
Context and Rationale	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Goethite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m<sup>2</sup>/g, this equals to 1600/6E4 mol/m<sup>2</sup>, or 0.0266 mol/m<sup>2</sup>, 1.6e4 sites/nm<sup>2</sup>.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm<sup>2</sup>. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters. The overestimation of sorption site density will directly result in underestimation of the affected COPCs' concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>
Information Requirement	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport modelling should be re-run to update the contents presented in the EIS report.

### Response:

The value provided in Table 3-10 for site density on goethite was a typographical error. The correct value for the density of reactive sites for goethite is 0.203 moles/kg. This value is derived below.

Equation for site density on goethite per kg of goethite:

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = \text{Site Density} \left( \frac{\text{mole sites}}{\text{mole Fe}} \right) \times \text{MW Goethite} \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{kg}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.018 \left( \frac{\text{mole sites}}{\text{moles Fe}} \right) \times 88.8517 \left( \frac{\text{g}}{\text{mol}} \right) \times 1000 \left( \frac{\text{g}}{\text{mol}} \right)$$

$$\text{Site Density} \left( \frac{\text{mole sites}}{\text{kg Goethite}} \right) = 0.203 \left( \frac{\text{mol}}{\text{kg}} \right)$$

The values for site density of 0.018 mole sites/mole Fe and the was given by Mathur and Dzombak (2006). The formula of goethite is FeOOH (also given by Mathur and Dzombak, 2006) and has a molecular weight ("MW") of 88.8517 g/mol.

The corrected table 3-10 is provided here below. Noted is that the value for site density for quartz has also been corrected. Please see the discussion below.

Table 3-10: Properties of Adsorbing Mineral Phases

Sorbent Phase	Site Density (mol/kg)	Specific Area (m <sup>2</sup> /g)	Reference
Goethite (FeOOH)	0.203	60	Mathur and Dzombak, 2006
Quartz (SiO <sub>2</sub> )	0.00118	0.31	Prikryl et al., 2001
Illite	Strong Sites: 0.002 (metals and protons sorb); Weak Sites: 0.04 (protons only sorb)	97	Bradbury and Baeyans, 2009

### Properties of Sorbent Phases used in PHREEQC/piChem modelling

The erroneous values reported in Table 3-10 were not used in the modelling. Below, example calculations are given for goethite to derive the total number of binding sites, in moles, for the mineral phase. The total number of sites for the clay, quartz and goethite were provided in the example PHREEQC file given in Appendix E of Appendix 7C of the EIS.

In PHREEQC, the default assumption is that a reaction occurs within 1L of the aqueous phase. This aqueous phase is pore water in the calculations of geochemical reactive transport through rocks and soils. Thus, the total moles of reactive sites associated with goethite (and other reactive phases) is expressed as that which is present in contact with 1L of pore water.

For total density of reactive sites on the goethite surface in the model, the following information was used:

- Site density: 0.018 mole of sites/mole Fe
- Fe<sub>2</sub>O<sub>3</sub> content of sediment/rock: 0.29 wt % in whole rock (from rock core)  
(equivalent to 2.9 g/kg in whole rock)
- MW of Fe<sub>2</sub>O<sub>3</sub> 159.6882
- MW of FeOOH (goethite) 88.8517
- Specific Area of goethite 60 m<sup>2</sup>/g
- (Rock) Effective Porosity 0.2 (Desilicified Zone; Appendix 7C, Table 2-4)
- Bulk Density of sediment/rock 2.12 g/cm<sup>3</sup> (calculated) (equivalent to 2.12 kg/L)
- Density of quartz 2.65 g/cm<sup>3</sup>

### Step 1: Total moles of reactive sites on goethite per kg of soil

*Total moles reactive sites on goethite per kg of soil*

$$= \text{mass Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{kg soil}} \right) \div \text{MW Fe}_2\text{O}_3 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right) \times 0.018 \left( \frac{\text{mole reactive sites}}{\text{mole Fe}} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 2.9 \left( \frac{\text{g}}{\text{kg soil}} \right) \div 159.6882 \left( \frac{\text{g}}{\text{mol}} \right) \times 2 \left( \frac{\text{mole Fe}}{\text{mole Fe}_2\text{O}_3} \right)$$

$$\text{Total moles reactive sites on goethite per kg of soil} = 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right)$$

## Step 2: Bulk Density of the sediment/soil

Quartz is the predominant mineral present in the Athabasca Sandstones. Thus, the bulk density of the sediment/rock was first calculated for the modelling purposes using the density of quartz, for a given effective porosity.

Density of Quartz ( $\rho_{\text{quartz}}$ ) = 2.65 kg/L (Appelo and Postma)

Effective porosity ( $\epsilon$ ) = 0.2 (Desilificied zone, as above)

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{(1 - \epsilon)}{\left( \frac{1}{\rho_{\text{quartz}} \left( \frac{\text{kg}}{\text{L}} \right)} \right)}$$

$$\text{Bulk Density of Soil} \left( \frac{\text{kg}}{\text{L}} \right) = \frac{1 - 0.2 \text{ (unitless)}}{\frac{1}{2.65 \left( \frac{\text{kg}}{\text{L}} \right)}}$$

$$\text{Bulk Density of soil} = 2.12 \text{ kg/L}$$

## Step 3: Reactive sites per 1L of aqueous solution (groundwater)

Total moles reactive sites on goethite per 1L porewater

$$\begin{aligned} &= \text{Total moles of reactive sites on goethite per kg of soil} \left( \frac{\text{moles}}{\text{kg}} \right) \times \text{soil bulk density} \left( \frac{\text{kg}}{\text{L}} \right) \\ &\div \text{soil effective porosity (unitless)} \end{aligned}$$

Total moles of reactive sites on goethite per 1L porewater

$$= 0.000654 \left( \frac{\text{moles reactive sites}}{\text{kg soil}} \right) * 2.12 \div 0.2$$

$$\text{Total moles of reactive sites on goethite per 1L pore water} = 0.00693 \text{ moles/L}$$

This is the value for reactive sites on goethite provided in the example PHREEQC File “**#PHREEQC Input File\_Transport\_PWZ\_DSZ and Sediments2\_Chlorite2.phr**” provided in Appendix E of Appendix 7-C of the EIS. Goethite in the model was indicated by “Hfo\_”. The values “60” and “32.4” are the specific surface area of goethite (60 m<sup>2</sup>/g) and mass of goethite in contact with 1 L of porewater, respectively. The specific area and mass of goethite are not used in the model calculations, as the reactive sites are provided as the absolute number of moles (0.00693 moles reactive sites per 1 L of porewater).

(Excerpted from the PHREEQC input file provided)

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Surface 56-145 #Mineral Assemblage, reactive sites, Desilicified zone			
-equilibrate with solution 96-145			
Hfo	0.00693	60	34.2
-no_edl			
Hao_s	0.0008268	97	413.4
Hao_w	0.0165		
Hao_ww	0.0165		
-no_edl			
QOH	0.0119	0.31	10017
-no_edl			

## References

Appelo, C.A.J, and Postma, D. Geochemistry, groundwater and pollution, 2<sup>nd</sup> edition. CRC Press, Boca Raton, Florida. 649 pages.

## Attachment: IR-95

Number	IR-95
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Table 3-11
Context and Rationale	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated. Rationale: It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these K<sub>d</sub> analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients. In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of K<sub>d</sub> value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>
Information Requirement	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.

### Response:

Solid-liquid partition coefficients (K<sub>d</sub> values) were not used in the geochemical reactive transport modelling for groundwater except for the lake bottom sediments of Whitefish Lake, as described in Appendix 7-C, Sections 4.5.1 and 4.5.6.2.3 of the draft EIS. The lake bottom sediments are encountered only at the very end of the (much longer; approximately 1000 m) transport pathway from the mining area to Whitefish Lake and were conceptualized as a 1 m zone between the overburden soils and the lake (page 4.6 of Appendix 7-C of the draft EIS).

For reactive transport of groundwater through all subsurface hydrogeologic units (paleoweathered zone, Athabasca Group Sandstone units, and overburden materials), the geochemical code PHREEQC was incorporated for geochemical reactive transport modelling, and sorption reactions included cation exchange and adsorption of constituents from solution to reactive sites at the surface of mineral phases as surface complexes (i.e. using the Surface Complexation Model). The Surface Complexation Model accounts for:

- non-linear sorption of metals and other constituents

- competition amongst these constituents for reactive sites at mineral surfaces
- pH-dependent sorption.

K<sub>d</sub> values were presented in Appendix 7-C, Section 3.5.6.2.3 of the draft EIS as a check on the reasonableness of the modelled. COPC adsorption that was conceptualized in the model as occurring at quartz, illite and goethite mineral surfaces. It was important, *as a check*, to demonstrate that modelled sorption to these surfaces was not overpredicting COPC concentrations in the solid phase under initial/baseline conditions. To do this, measured concentrations of COPCs in core material were compared to predicted solids concentrations in the model. Further, using concentrations of COPCs in representative groundwater, K<sub>d</sub> values were calculated from both the measured COPC concentrations and those modelled.

### **Supplemental Information – calculation of K<sub>d</sub>s**

Information supplemental to the response above is presented herein to detail how the K<sub>d</sub> values provided in Appendix 7-C, Section 3.5.6.2.3 and Table 3-11 of the draft EIS were calculated.

The K<sub>d</sub> (L/kg) is calculated as the solid phase concentration of an element, divided by the dissolved-phase concentration of that element.

#### *Measured Solid-Phase COPC Concentrations:*

- “Desilicified Zone” refers to solid phase elemental concentrations in core from wells indicated in Figure 3-1 of Appendix 7-C of the draft EIS. Elemental concentrations were measured on total and partial digestions. The total number of samples used in the calculation of the maximum, minimum and median values of the solid phase concentrations was 1,459 for samples for which total digestion results were presented. This includes all elements presented other than arsenic (As) and selenium (Se). For these elements, only partial digestion results were available. The total number of samples used to calculate maximum, minimum and median solid phase concentrations for As and Se was 843.
- Elemental Analysis for the Paleoweathered Zone represents a total of 108 samples, as provided in Appendix E of Appendix 7C, Table E-1.

*Measured Solution-Phase Concentrations:* Representative groundwater concentrations of COPCs were those used in the model, and are presented in Appendix 7-C, Table 3-5.

An example K<sub>d</sub> calculation is provided here below for chromium in the Desilicified Zone, using the measured median solid-phase concentration and the Cr concentration in groundwater:

$$K_d \text{ (L/kg)} = \frac{\text{Median Solid phase Cr concentration (total digestion; mg/kg)}}{\text{Concentration of Cr in Representative Solution for Desilicified Zone (mg/L)}}$$

$$K_d \text{ (L/kg)} = 8 \text{ mg/kg} \div 0.0005 \text{ mg/L}$$

$$K_d \text{ (L/kg)} = 1.6 \times 10^4 \text{ L/kg}$$

Calculating K<sub>d</sub> values in this way is appropriate because it is calculated using measured data. Thus, no assumptions were made with respect to pH. The pH of groundwater in the system is circumneutral (i.e., pH = 6-7) and the measured solid-phase concentrations are from rock material that was in equilibrium with the groundwater when collected and analyzed.



In the PHREEQC and, likewise, piChem models, solid phase concentrations are yielded by assuming equilibrium occurs between the solution phase concentrations of COPCs, which are the inputs to the model, and the sorbing phases. As is described in Appendix 7C, Section 3.5.6.2.3, within the model the solid sorbent phases (quartz, illite and goethite) are “pre-loaded” (pre-equilibrated) with COPCs to bring the solid phase concentrations into equilibrium with the dissolved phase, groundwater, concentrations before the transport simulation is started. Outside of the model, an “Apparent  $K_d$ ” was then calculated by dividing the modelled solid phase concentration for each COPC by its solution phase concentration. These  $K_d$  values are referred to as “apparent” because they are modelled and because they are derived from the modelled concentrations metals sorbed to mineral surfaces and the modelled solution phase concentrations of those metals; they do not account, for example, for metals that are present within the crystal structure of the minerals in the bedrock.

The  $K_d$ s derived from the core and groundwater data were compared to the Apparent  $K_d$ s. For the majority of the COPCs and for both the Desilicified and paleoweathered zones, the modelled solid phase concentrations and apparent  $K_d$  values were below those measured, and calculated from measured values, respectively. This indicates that the model is not overpredicting solid-phase concentrations based on sorption, nor are the apparent  $K_d$  values exceeding those reported in the literature.”

It was noted that there a few were minor transcription errors in the results presented for the Desilicified Zone in Table 3-11 of Appendix 7-C. None of the corrections affect the interpretation above. The corrected table is given here (below), and will be updated in the final EIS.

Table 3-11: Solid-Phase Concentrations and Partitioning Constants for COPCs, measured and simulated (Updated)

Desilicified Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	8.46E+00	7.00E-01	2.25E+01	1.09E+02	1.09E+02	4.51E+00	1.58E+02	7.33E+01	4.00E-01	2.13E+02	3.71E+02	9.30E+01
Solid Phase Concentration - Minimum	mg/kg	9.00E-02	5.00E-02	1.20E-01	2.00E+00	2.00E-01	4.00E-02	1.00E+00	7.80E-01	1.00E-01	5.00E-01	1.40E+00	5.00E-01
Solid Phase Concentration - Median	mg/kg	5.60E-01	1.00E-01	4.90E-01	8.00E+00	2.00E+00	1.70E-01	6.00E+00	2.95E+00	1.00E-01	1.77E+00	7.70E+00	3.00E+00
Concentration in Representative Groundwater	mg/L	1.30E-03	1.00E-05	1.00E-04	5.00E-04	1.80E-03	4.20E-03	1.00E-04	1.00E-04	1.00E-04	7.00E-04	1.00E-04	1.20E-02
K <sub>d</sub> - maximum value	L/kg	6.51E+03	7.00E+04	2.25E+05	2.18E+05	6.06E+04	1.07E+03	1.58E+06	7.33E+05	4.00E+03	3.04E+05	3.71E+06	7.75E+03
K <sub>d</sub> - minimum value	L/kg	6.92E+01	5.00E+03	1.20E+03	4.00E+03	1.11E+02	9.52E+00	1.00E+04	7.80E+03	1.00E+03	7.14E+02	1.40E+04	4.17E+01
K <sub>d</sub> - median value	L/kg	4.30E+02	1.00E+04	4.90E+03	1.60E+04	1.11E+03	4.05E+01	6.00E+03	2.95E+04	1.00E+03	2.53E+03	7.70E+04	2.50E+02
Modelled Solids Concentration <b>Base Case</b>	mg/kg	7.70E-03	1.11E-04	5.62E-03	1.90E+00	3.57E+00	5.51E-07	1.30E-02	8.68E-02	6.60E-06	7.25E-02	3.90E-07	1.37E+00
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	5.92E+00	1.11E+01	5.62E+01	3.81E+03	1.98E+03	1.31E-04	1.30E+02	8.68E+02	6.60E-02	1.04E+02	3.90E-03	1.14E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	5.92E-01	1.11E+00	5.62E+00	3.81E+02	1.98E+02	1.31E-05	1.30E+01	8.68E+01	6.60E-03	1.04E+01	3.90E-04	1.14E+01
Paleoweathered Zone													
	Units	As (Partial)	Cd	Co	Cr	Cu	Mo	Ni	Pb	Se (Partial)	U	V	Zn
Solid Phase Concentration - Maximum	mg/kg	5.66E+02	8.00E+00	4.23E+02	4.41E+02	5.24E+04	3.93E+03	5.88E+02	5.15E+03	2.00E+02	5.56E+04	6.05E+03	1.58E+03
Solid Phase Concentration - Minimum	mg/kg	5.00E-01	1.00E-01	6.00E+00	6.00E+00	5.00E+00	5.00E-01	4.40E+01	1.00E+00	5.00E-01	9.00E+00	2.20E+01	7.00E+00
Solid Phase Concentration - Median	mg/kg	2.40E+01	1.00E+00	2.80E+01	1.55E+02	2.28E+02	5.00E+00	1.67E+02	4.60E+01	1.00E+00	4.03E+02	3.10E+02	3.10E+01
Concentration in Representative Groundwater	mg/L	5.00E-02	1.00E-05	1.00E-02	4.50E-03	5.00E-03	1.28E-02	1.50E-02	1.00E-04	1.00E-04	1.24E-02	1.00E-04	4.25E-03
K <sub>d</sub> - maximum value	L/kg	1.13E+04	8.00E+05	4.23E+04	9.80E+04	1.05E+07	3.07E+05	3.92E+04	5.92E+07	2.00E+06	4.49E+06	6.05E+07	3.72E+05
K <sub>d</sub> - minimum value	L/kg	1.00E+01	1.00E+04	6.00E+02	1.33E+03	1.00E+03	3.91E+01	2.93E+03	7.00E+04	5.00E+03	7.26E+02	2.20E+05	1.65E+03
K <sub>d</sub> - median value	L/kg	4.80E+02	1.00E+05	2.80E+03	3.44E+04	4.56E+04	3.91E+02	1.11E+04	8.30E+05	1.00E+04	3.25E+04	3.10E+06	7.29E+03
Modelled Solids Concentration <b>Base Case</b>	mg/kg	1.87E-01	9.80E-05	4.69E-01	0.00E+00	5.30E+00	0.00E+00	2.34E+00	6.34E-02	2.87E-06	3.63E-01	0.00E+00	4.41E-01
Apparent K <sub>d</sub> value in the <b>Base Case</b> model	(L/kg)	3.74E+00	9.80E+00	4.69E+01	0.00E+00	1.06E+03	0.00E+00	1.56E+02	6.34E+02	2.87E-02	2.93E+01	0.00E+00	1.04E+02
Apparent K <sub>d</sub> value in the model; <b>1/10 reactive sites</b>	(L/kg)	3.74E-01	9.80E-01	4.69E+00	0.00E+00	1.06E+02	0.00E+00	1.56E+01	6.34E+01	2.87E-03	2.93E+00	0.00E+00	1.04E+01
Literature K <sub>d</sub> values (mean value and range) <sup>a,b</sup>	L/kg	550 (25-3000)	15 (2.0-250)	1.9x10 <sup>3</sup> (29-99,000)	18 (1.0-1600)	530 (760-2700)	40 (7-130)	58 (7.0-1100)	2000 (25- 130,000)	56 (4-1600)	740 (2.6 - 6.2x10 <sup>4</sup> )	1.1-2.7	1.6x10 <sup>3</sup> (6.2- 30,000)

**Notes**

<sup>a</sup> Literature K<sub>d</sub> values are for pH values ranging from 5-8 from IAEA, 2010. These values show mean values (and range). Value for Cd is for soils with pH < 6.5. Where pH dependent K<sub>d</sub> values were not available, the mineral soil texture values were obtained. Where a K<sub>d</sub> was not available for mineral soil, the value for "All soil" texture or "Sand" was used.

<sup>b</sup> Literature range of K<sub>d</sub> values for Vanadium taken from US EPA, 2005

<sup>c</sup> Literature value of maximum K<sub>d</sub> for pH values ranging from 5-7 from IAEA, 2010.

## Attachment: IR-96

Number	IR-96
Dept.	CNSC
Project effects link	Geology and Groundwater
Reference to EIS, appendices, or supporting documentation	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions
Context and Rationale	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (<math>1 \times 10^{-9} \text{ m}^2/\text{s}</math>), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)”. The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport. Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p>Reference: [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>
Information Requirement	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89</p>

### **Response Part 1:**

The transport parameters applied in the model were not calibrated and that is why they were: a) selected to be conservative, and b) why more conservative parameters were selected for prediction uncertainty analyses.

Diffusion rates are unknown, as is commonly the case at most sites, and so a representative literature value was selected. Matrix diffusion of mass into lower permeability zones is considered the most relevant area for diffusion; migration to Whitefish Lake is advection-dominated such that diffusion along

the flow path would not appreciably enhance transport timing. Matrix diffusion was accounted for in the set-up of transport simulation parameters using PHREEQC.

Longitudinal and transverse dispersivity rates can vary greatly and are generally scale dependent. Literature references for dispersivity are noted below and used to estimate longitudinal and transverse dispersivity rates for the plume, which is estimated to have a length of 0.9 to 1.7 km. Graphic representation of the values suggested by the literature are appended.

- Gelhar et al. (1992), as quoted in the B.C. guidance (BC MOE, 2012), suggests a representative longitudinal dispersivity of approximately 40 m (with a range from 10 to 150 m), and a transverse dispersivity of 5 m.
- Neuman (1995) suggests a “best fit” longitudinal dispersivity of 350 m to be consistent with field observed values (note the range of model-calibrated values was 10 to 350 m).
- Schulze-Makuch (2005), suggests a best fit value for sandstone units of 10 to 20 m.
- Chapman et al (2014) found a longitudinal dispersivity for a site in a similar fractured sandstone environment to be 10 m for a plume 1.2 km in length. Martin et al. (2019) found the equivalent longitudinal dispersivity appropriate under dual porosity and EPM simulations was 10.7 m for the same site.

Recognizing all of this, the longitudinal dispersivity applied (i.e., 10 m) is considered reasonable, and the more conservative value of 5 m represents a reasonable lower bounding limit. Similarly, the literature supports the transverse dispersivity value of 5 m applied. It was noted that minor exceedances were noted under the lower dispersivity simulations; however, these simulations more importantly also contain conservative geochemical assumptions, such that we feel such breakthrough is unlikely.

## **Response Part 2:**

As noted in the literature (e.g., Neuman et al., 2003; Neuman, 2006) dispersivity is expected to increase as a plume encounters heterogeneities of increasing length-scales. This is the foundation of scale-dependent dispersivity. As such, large-scale heterogeneity will enhance dispersion of the plume, and reduction of solute concentrations, as the plume gets larger and encounters heterogeneities of increasing length-scales. At the Phoenix site, an example of such large-scale features is the desilicified zone, wherein dispersion is simulated to play a role in reducing transported solute concentrations. The dispersion of solute concentrations is coupled with geochemical reactions along the plume trajectory. The plume dispersion exposes concentrations to a greater surface area of the geologic materials, which enhances the ability of geochemical processes to curtail plume migration.

## **References**

- British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.
- Chapman, S.W., B. Parker, J. Cherry, P. Martin, D. Abbey, S.D. McDonald. 2014. Combined EPM-DFN Modelling Approach for Plume in Sedimentary Bedrock Aquifers. DFNE 2014-236.
- Gelhar, L.W., Welty, C., & Rehfeldt, K.R. (1992). A critical review of data on field-scale dispersion in aquifers. *Water Resources Research* 28, no. 7, 1955-1974.
- Martin, P.J., B. Parker, S. Chapman, and K. Walton. 2019. Utilizing the DFN-M Framework to Inform Transport Modelling. Presentation to the American Geophysical Union (AGU).

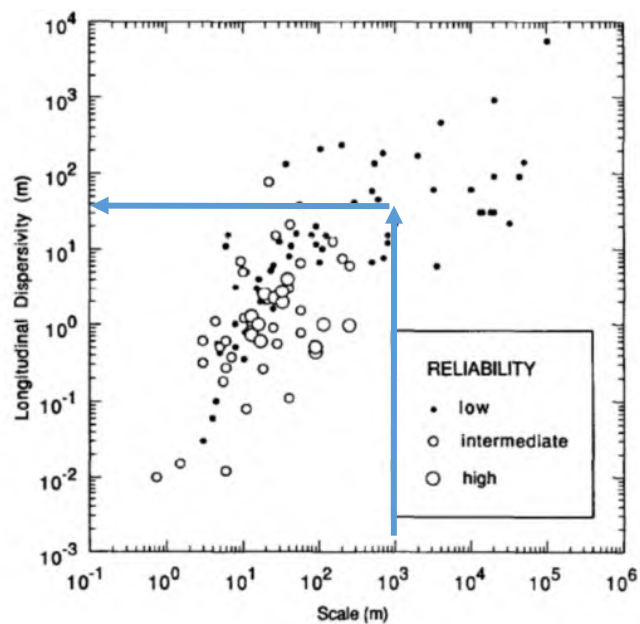
Neuman, S.P. 1990. Universal scaling of hydraulic conductivities and dispersivities in geologic media. *Water Resources Research* 26, no. 8: 1749–1758.

Neuman, S.P. 1995. On advective dispersion in fractal velocity and permeability fields. *Water Resources Research* 31, no. 6: 1455–1460.

Neuman, S.P., and V. Di Federico. 2003. Multifaceted nature of hydrogeologic scaling and its interpretation. *Reviews of Geophysics* 41, no. 3: 1014.

Neuman, S.P. 2006. Response to paper: Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 44, no. 2: 139–141.

Schulze-Makuch, D. 2005. Longitudinal Dispersivity Data and Implications for Scaling Behavior. *GROUND WATER* 43, no. 3: 443–456.



(b)

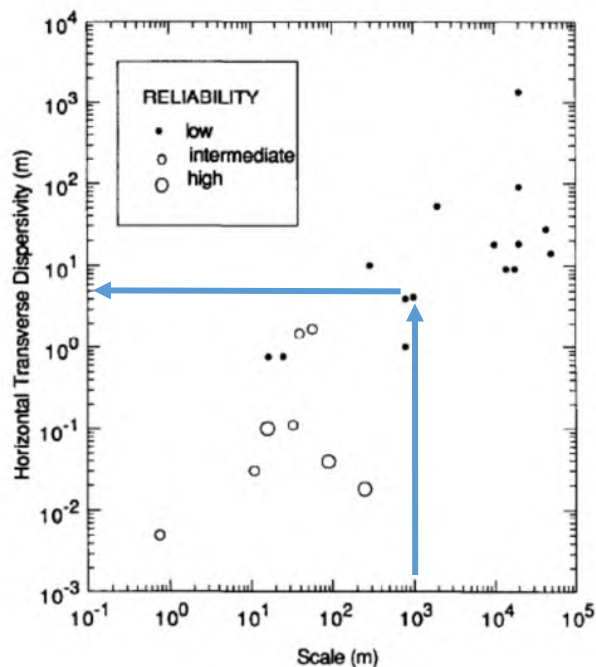
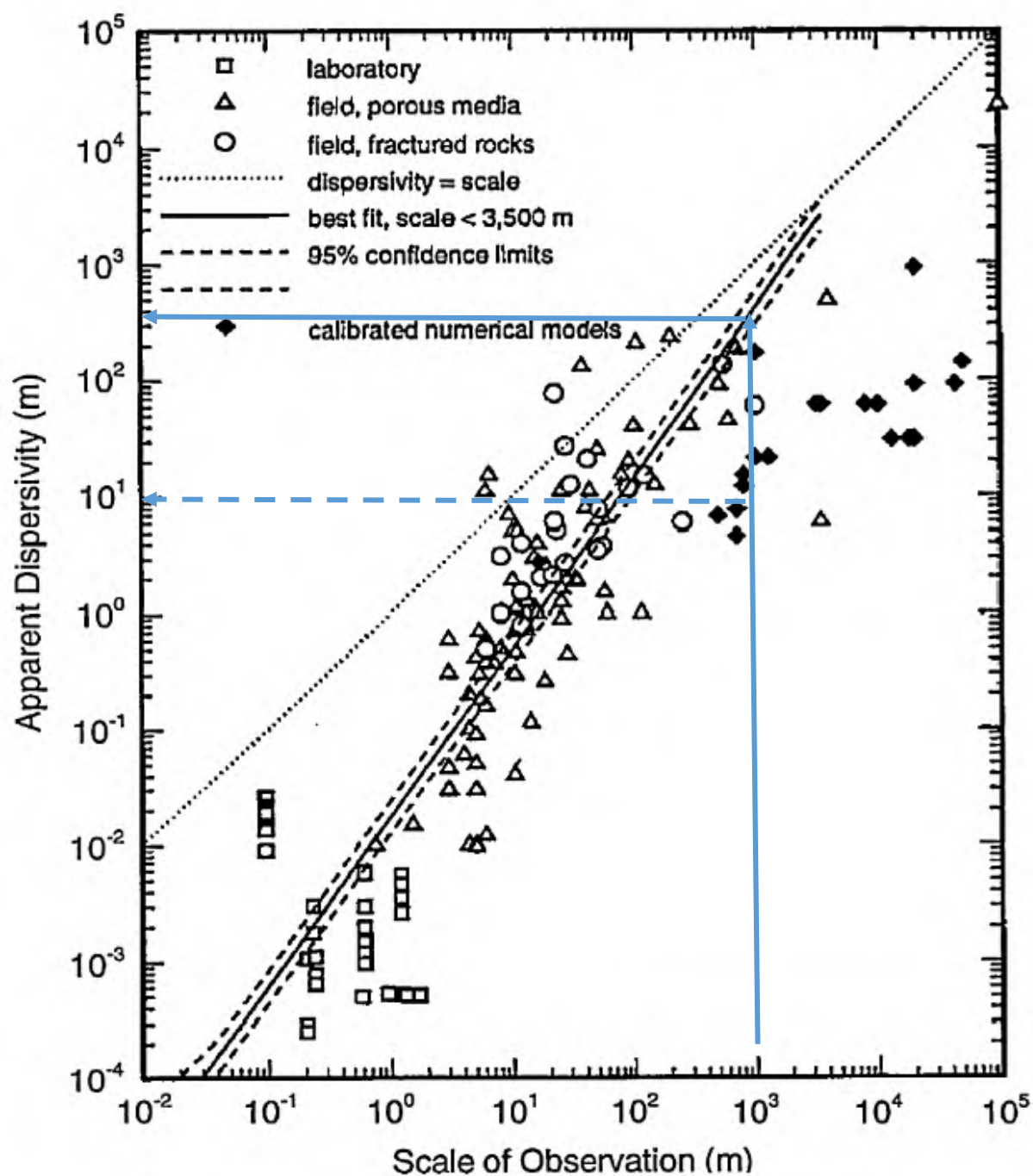
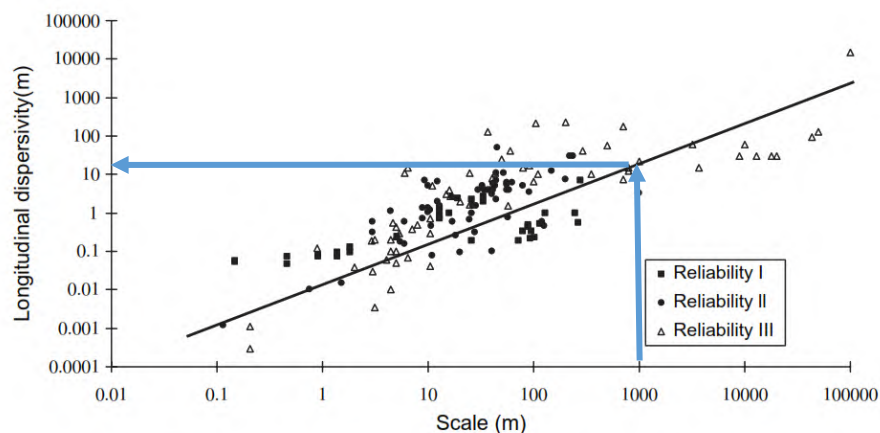


Figure 9-5: (a) Longitudinal dispersivity versus scale with data classified by reliability and (b) horizontal transverse dispersivity as a function of observation scale (from Gelhar et al., 1992).

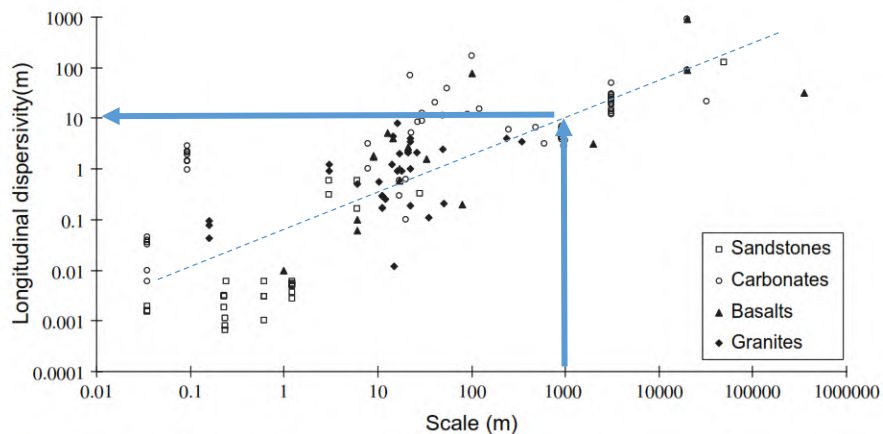




**Figure 1. Apparent longitudinal dispersivities vs. scale of observation based on worldwide tracer studies (after Neuman 1995).**



**Figure 1. Relationship of longitudinal dispersivity to scale of measurement for unconsolidated sediments. The line represents the regression line for all data points (regardless of assigned reliability class) with a scaling exponent of 0.81 and a  $c$  value of 0.085 m.**



**Figure 2. Relationship of longitudinal dispersivity to scale of measurement for various rock types. The scaling behavior for each rock type is quantified in Table 3.**

## Attachment: IR-99

Number	IR-99
Dept.	CNSC
Project effects link	Aquatic environment
Reference to EIS, appendices, or supporting documentation	Section 8, Water Quality, Table 8.2-13
Context and Rationale	<p>Context: Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC's in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.</p> <p>Rationale: It is unusual for radiological COPC's to be displayed in mg/L, radiological constituents are typically displayed in Bq/L.</p>
Information Requirement	Please use Bq/L when displaying concentration of radiological COPC's. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.

Revised Table 8.2-13 to support response in IR table:

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated)

Location	Maximum Concentration (mg/L) of Non-radionuclides in Surface Waters During Project Phases										
	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	8.40E-04
Location	Maximum Concentration (Bq/L) of Radionuclides in Surface Waters During Project Phases										
	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-210	Polonium-210					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03					
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03					
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03					
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03					
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03					
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03					
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03					

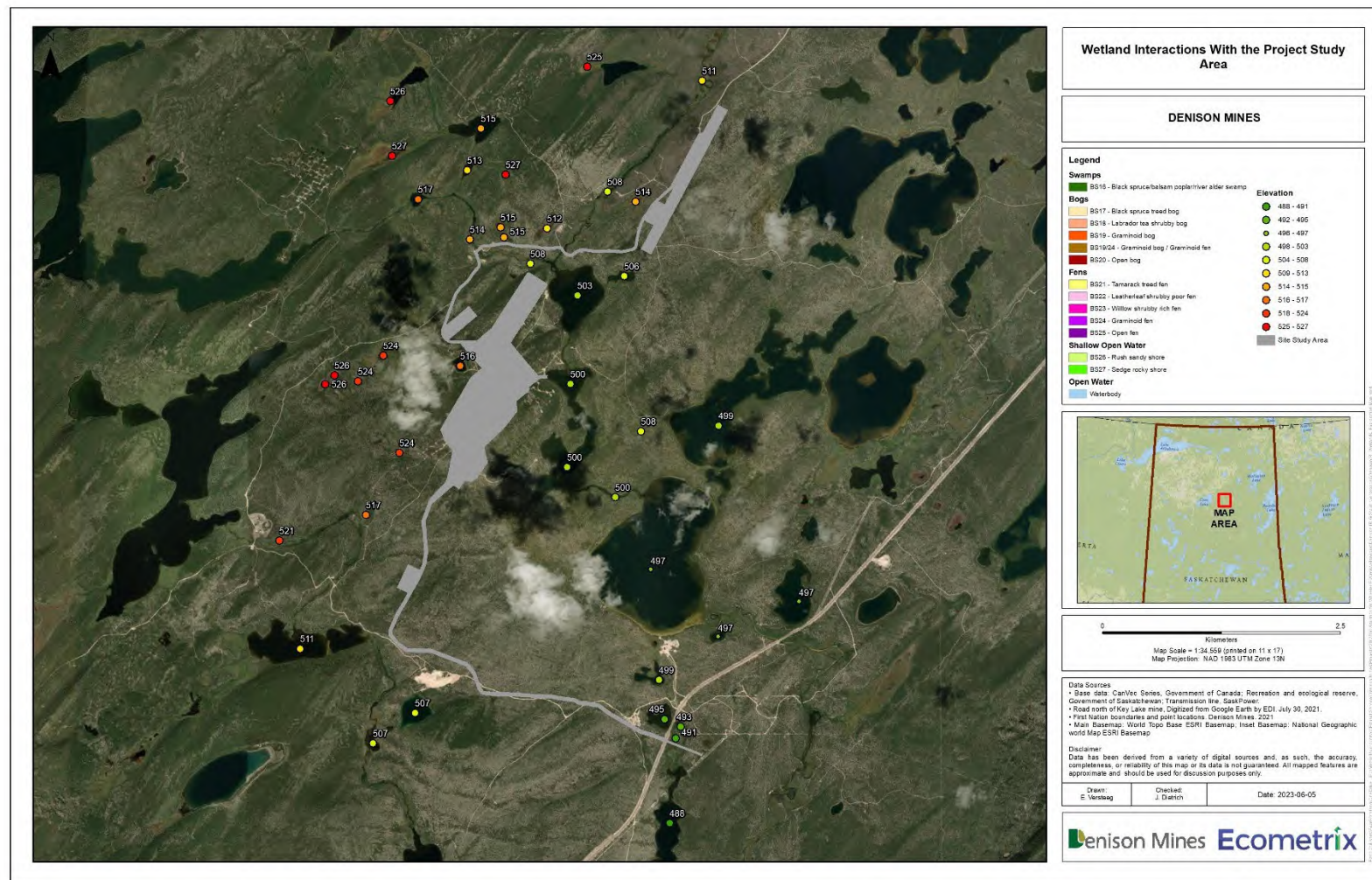
## Attachment: IR-101

Number	IR-101
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment
Context and Rationale	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>
Information Requirement	1) Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of

	<p>wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <ol style="list-style-type: none"><li>2) Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</li><li>3) Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</li><li>4) Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</li></ol>
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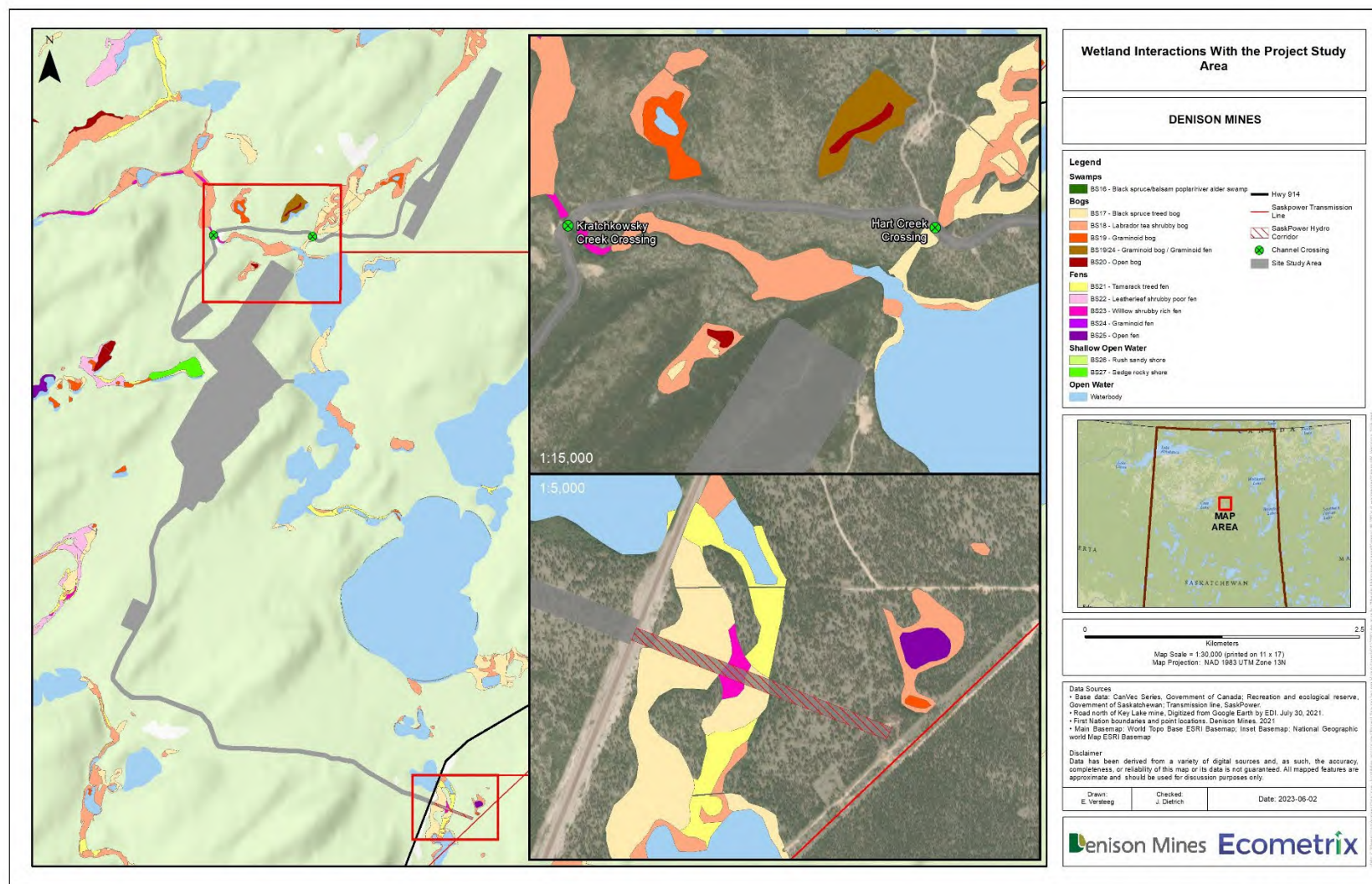
Supporting figures to the response provided in table:





Attachment IR-101 Figure 1 – Elevations of Wetland Features in the LSA.





Attachment IR-101 Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution

## Attachment: IR-102

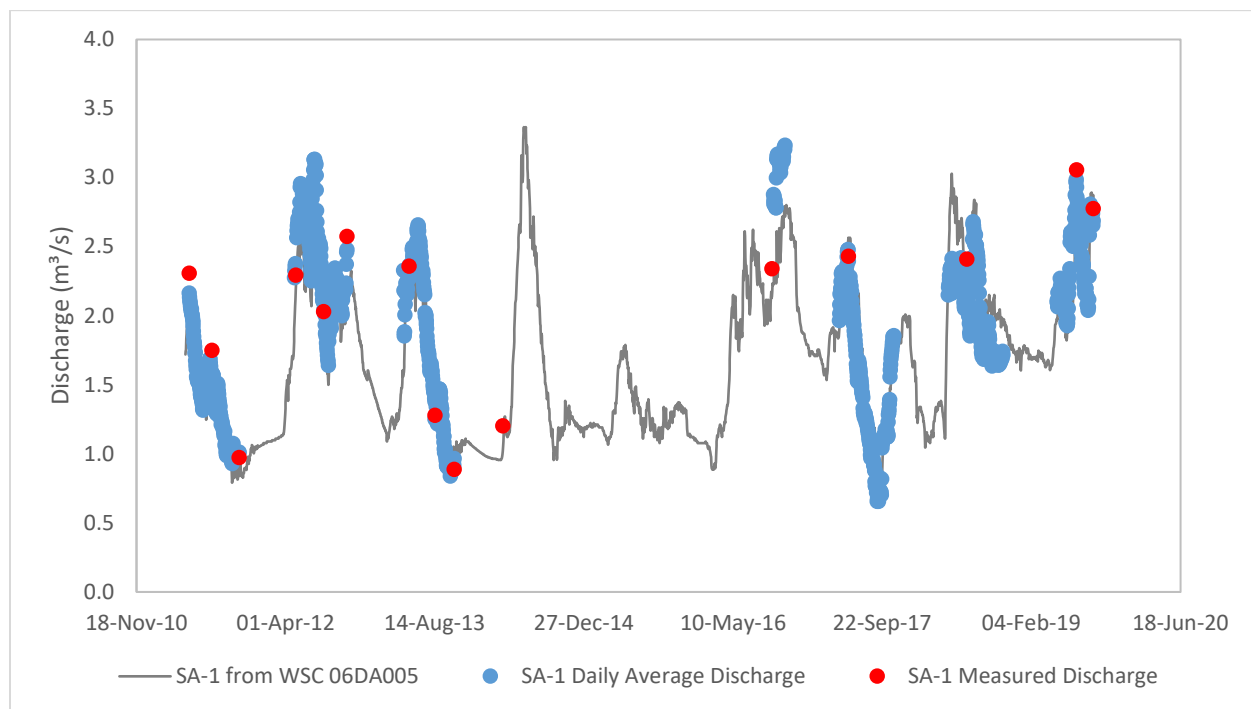
Number	IR-102
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	8.1.3.1 Appendix 8-C, including Appendix II, Table 1 (p. 2)
Context and Rationale	<p><b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water licenses) would be affected by this uncertainty.</p> <p><b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent's estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.</li> <li>2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.</li> <li>3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.</li> </ol>

Supporting information to the response provided in table:

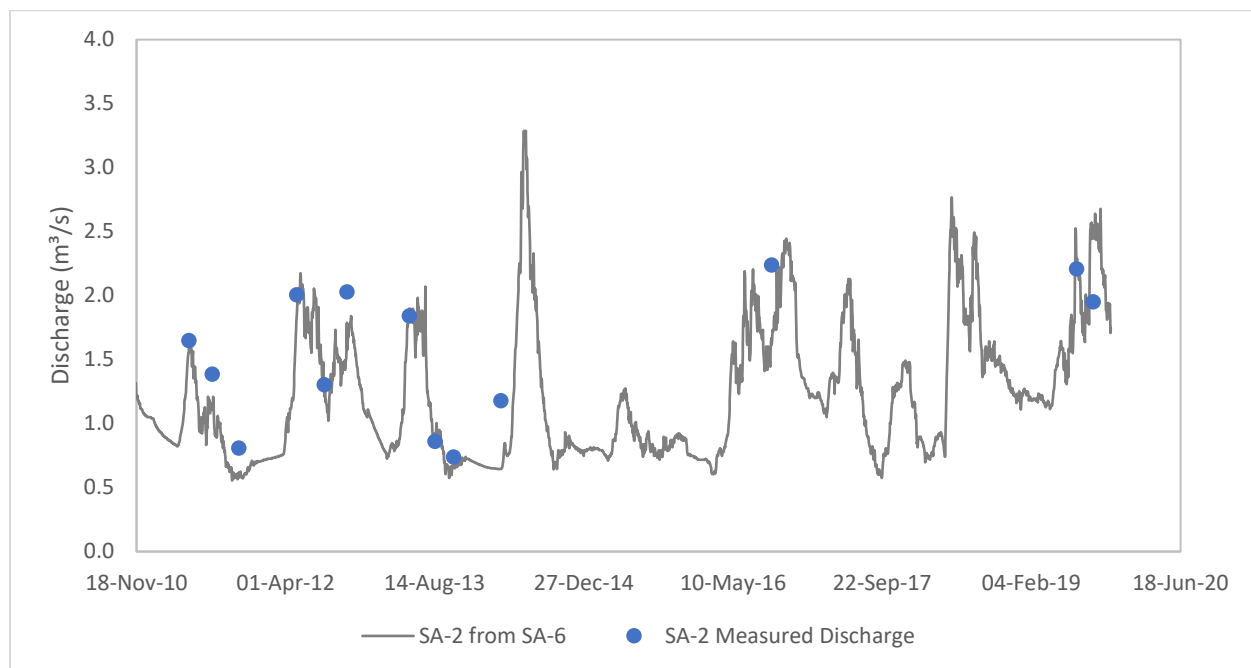
Attachment IR-102 Table 1: Record Extension Variables

Assessment Node (AN)	Assessment Node Drainage Area (km <sup>2</sup> )	Source Station (SS)	Source Station Drainage Area (km <sup>2</sup> )	Extension Method	Equation Parameters: QAN = A(B+C(QSS+D)E)				
					A	B	C	D	E
SA-1	280.55	06DA005	3030	Correlation	7.1250E-01	0.0000E+00	1.3029E-01	0.0000E+00	1.0599E+00
SA-2	257.36	SA-6	251.69	Unit Area Runoff with Scaling and Offset	1.0000E+00	-6.2600E-02	1.0708E+00	0.0000E+00	1.0000E+00
SA-3	15.537	SA-1	280.55	Unit Area Runoff with Scaling	1.0000E+00	0.0000E+00	2.3453E-01	0.0000E+00	1.0000E+00
SA-4	80.498	SA-6	251.69	Correlation	7.6738E-01	0.0000E+00	3.4997E-01	0.0000E+00	9.0494E-01
SA-5	167.32	SA-6	251.69	Unit Area Runoff	6.6479E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
SA-6/LA-6	251.69	SA-1	280.55	Correlation	8.0221E-01	3.3463E-01	2.1528E-01	5.3078E-01	2.0643E+00
SB-3	24.869	SA-1	280.55	Unit Area Runoff	8.8644E-02	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-1	277.52	SA-1	280.55	Unit Area Runoff	9.8920E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00
LA-5	257.18	SA-2	257.36	Unit Area Runoff	9.9930E-01	0.0000E+00	1.0000E+00	0.0000E+00	1.0000E+00

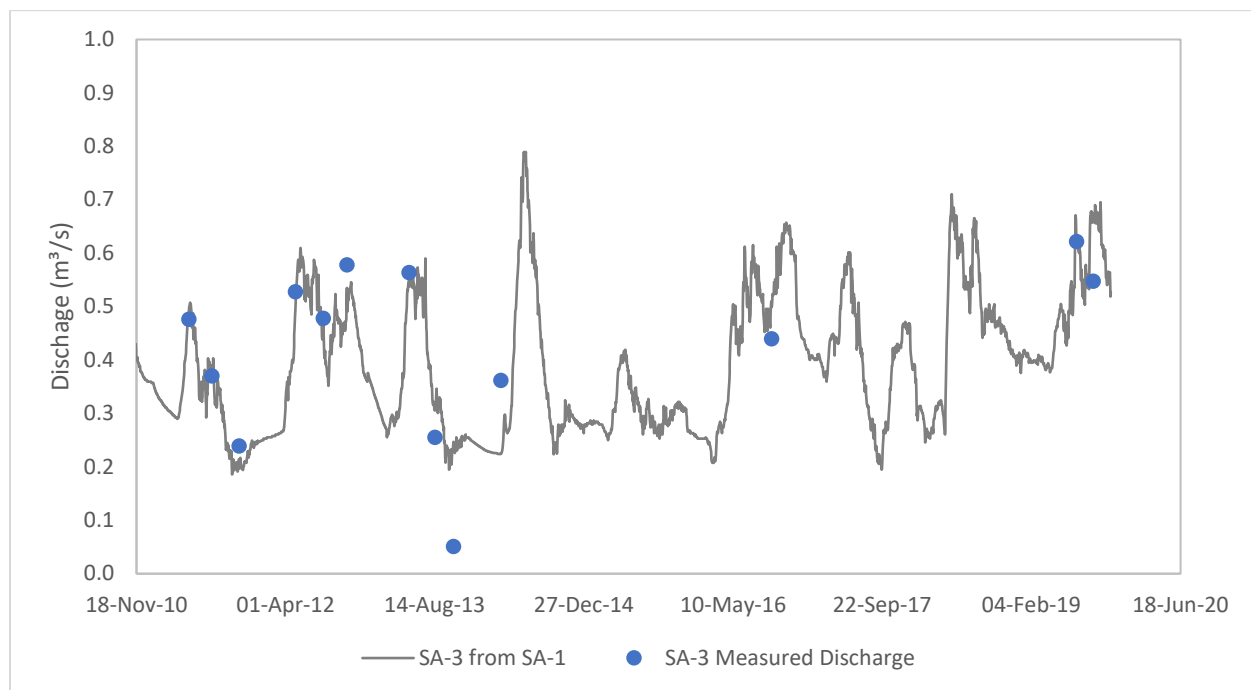
Attachment IR-102 Figure 1: SA-1 from WSC 06DA005



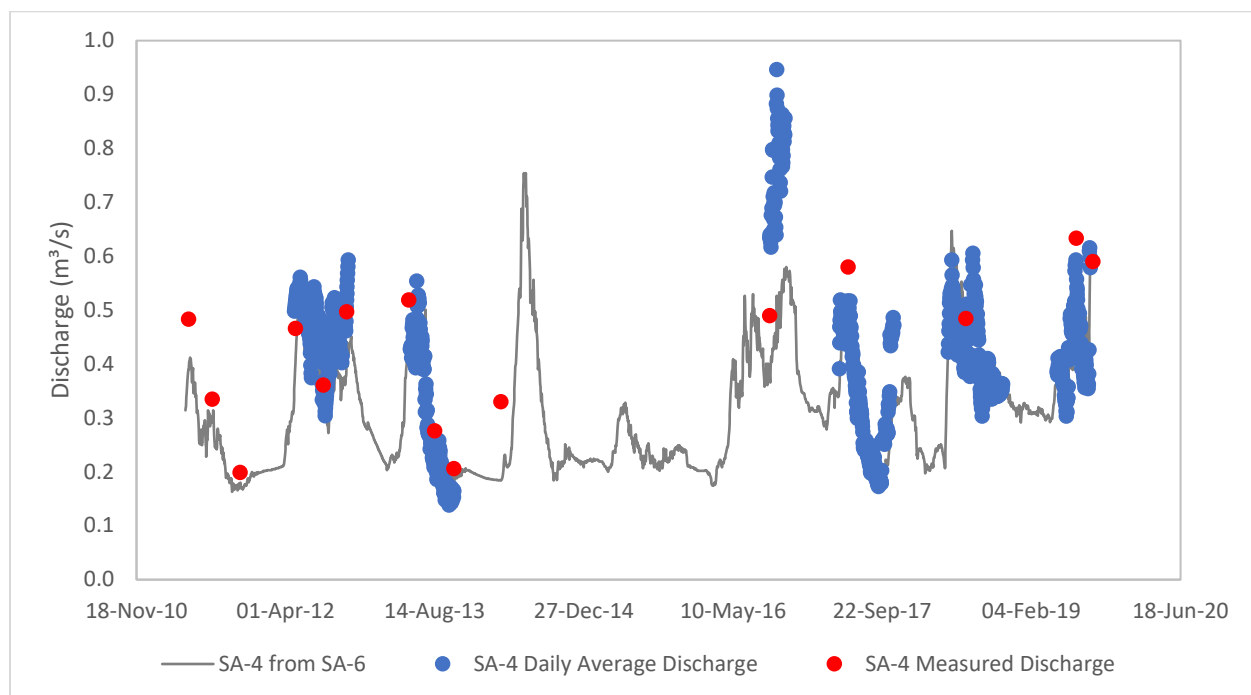
Attachment IR-102 Figure 2: SA-2 from SA-6



Attachment IR-102 Figure 3: SA-3 from SA-1

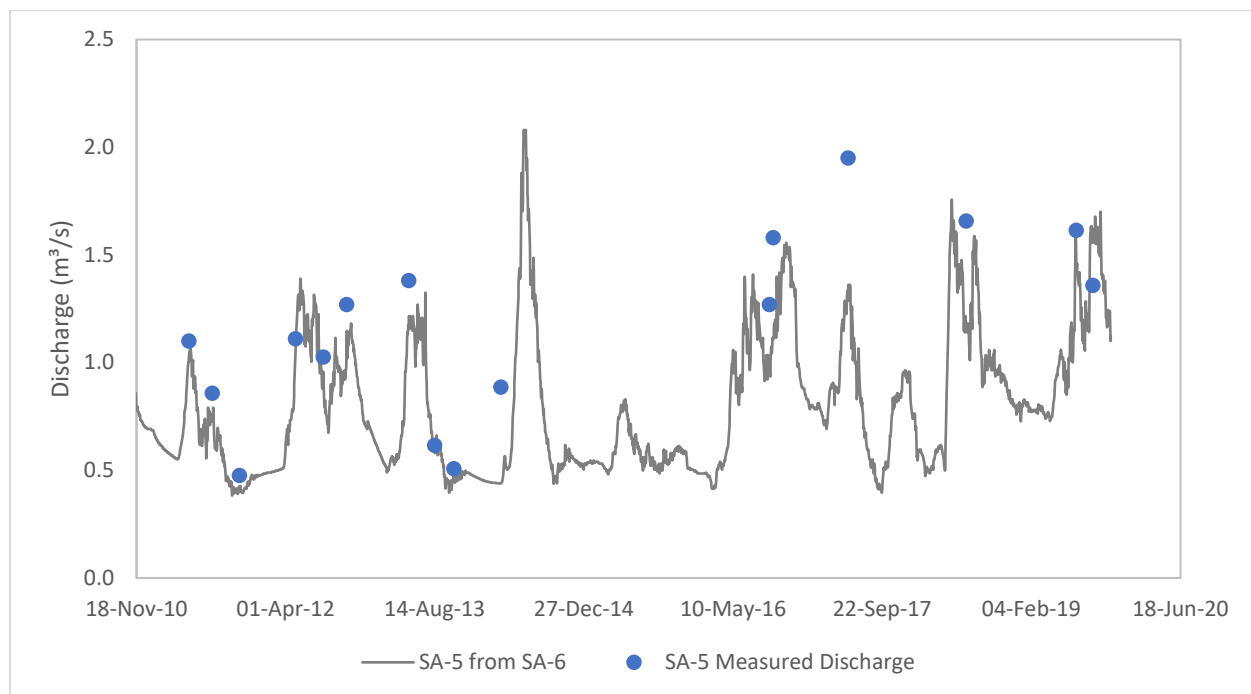


Attachment IR-102 Figure 4: SA-4 from SA-6

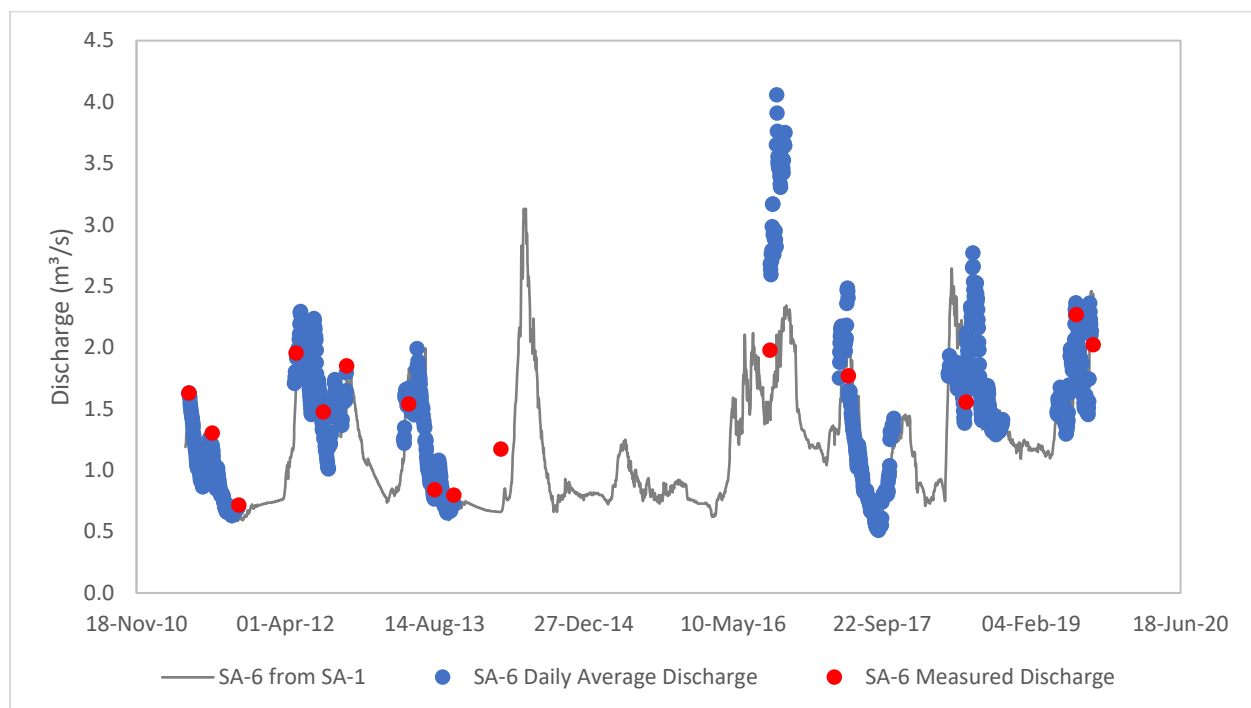




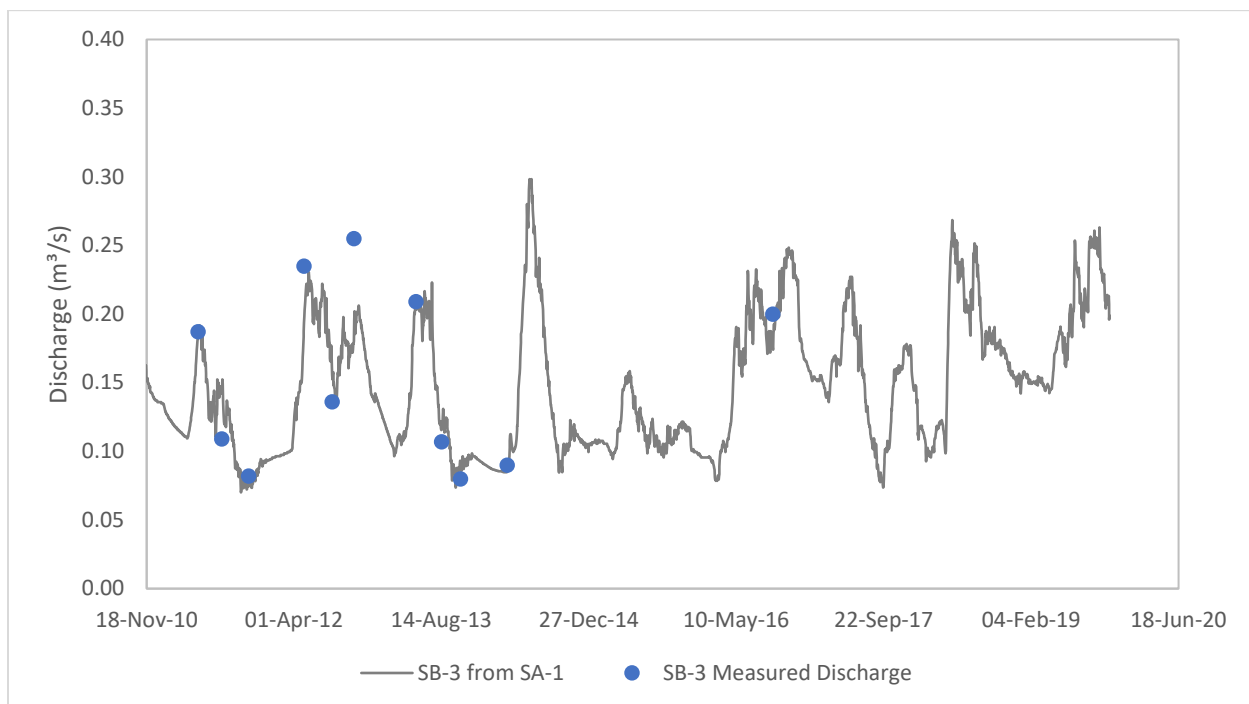
Attachment IR-102 Figure 5: SA-5 from SA-6



Attachment IR-102 Figure 6: SA-6 from SA-1



Attachment IR-102 Figure 7: SB-3 from SA-1



## Attachment: IR-108

Number	IR-108
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.3.3 Aquatic Environment
Context and Rationale	<p>Context: Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><u>Rationale:</u> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>
Information Requirement	<p>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</p> <p>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</p>

### Response:

Tables 8.2-2 and 8.2-3 will be updated in the final EIS to include 1) all COPCs that require effluent characterization and receiving environment monitoring under the MDMER and 2) missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters. The updated EIS tables are provided below for completeness.

**Table 8.2-2: Baseline Surface Water Quality in Local Study Area Lakes and Russell Lake (Updated)**

Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Alkalinity	mg/L			2	10	6	3	13	7.7	3	38	15
Aluminum	mg/L	0.005	SEQG	0.001	<b>0.0051</b>	0.0034	0.0048	<b>0.0078</b>	<b>0.0061</b>	0.005	<b>0.073</b>	<b>0.0201</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.09	0.0266	<0.01	0.07	0.043	<0.01	0.05	0.026
Ammonia, *unionized	ug/L	19	CWQG	0.008	0.072	0.0229	0.013	0.105	0.0543	0.005	0.036	0.0164
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.000233	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0023	0.0038	0.003	0.0021	0.0032	0.0027	0.0024	0.0051	0.00328
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	12	7.8	4	16	9.3	4	46	13.4
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	0.00003	0.000015	<0.00001	0.00002	0.000013	<0.00001	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.35	1.2	1.6	1.4	1.1	1.5	1.24
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.5	0.43	0.3	0.4	0.33	0.3	0.4	0.32
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	0.00024
DOC	mg/L			2	2.6	2.23	2	2.5	2.2	2	2.5	2.22
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	<0.01	0.08	0.03166	0.02	0.07	0.037	0.02	0.08	0.042
Hardness	mg/L			5	6	5.5	5	6	5.3	5	5	5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.037	0.27	0.12	0.04	0.19	0.11	0.031	0.21	0.1064
Lead	mg/L	0.001	CWQG	<0.0001	0.0004	0.00015	<0.0001	<0.0001	<0.0001	<0.0001	<b>0.0012</b>	0.00032
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.42	0.4	0.4	0.4	0.2	0.4	0.36

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Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Manganese	mg/L			0.0039	0.029	0.016	0.0046	0.02	0.0142	0.0024	0.019	0.01232
Mercury	mg/L	2.60E-05	CWQG	1.00E-07	1.00E-05	6.00E-06	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-05	6.00E-06
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	0.00016
Nitrate	mg/L	13.29	SEQG	<0.04	0.49	0.18	<0.04	0.26	0.15	<0.04	0.31	0.1725
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.52	6.94	6.77	6.6	7	6.8	<b>5.71</b>	6.79	6.502
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	0.008	0.006	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.37	0.2	0.4	0.33	0.2	0.4	0.32
Radium-226	Bq/L	0.11	SSWQO	<0.005	<0.005	<0.005	<0.005	0.01	0.0076667	<0.005	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	0.00005	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.8	1.5	1.4	1.7	1.5	1.4	1.8	1.52
Conductivity	µS/cm			9	24	16.8	16	22	19	9	21	15.2
Strontium	mg/L			0.012	0.016	0.014	0.012	0.015	0.013	0.011	0.014	0.0126
Sulphate	mg/L	128	SEQG	0.7	0.8	0.75	0.6	0.7	0.63	0.5	0.7	0.64
Sum of Ions				6	18	12.5	8	22	14	8	51	18
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.0133	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	0.0013	0.0004	<0.0001	0.0008	0.00033	<0.0001	0.0011	0.0003
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			18	26	22.167	22	29	24	14	29	22.2
TKN	mg/L			0.17	0.38	0.27333	0.14	0.34	0.22	0.24	0.43	0.306
TOC	mg/L			2.2	2.6	2.3667	1.9	4.3	2.8	2.2	2.9	2.36
TSS	mg/L			<1	4	2.5	<1	4	2.66	<1	4	2

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Parameter	Units	Benchmark		McGowan Lake (LA-1)			Whitefish Lake South (LA-5)			Whitefish Lake North (LA-6)		
		Value	Reference	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.001	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	0.02	0.00474

**Table 8.2-2 (Continued)**

Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			2	14	7.7	8	8	8	7	12	9.5
Aluminum	mg/L	0.005	SEQG	0.0023	0.0025	0.0024	0.0029	0.0029	0.0029	<b>0.0067</b>	<b>0.0096</b>	<b>0.0082</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.0233	<0.01	<0.01	<0.01	<0.01	0.04	0.025
Ammonia, *unionized	ug/L			0.016	0.055	0.0303	0.033	0.033	0.033	0.011	0.028	0.0195
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Barium	mg/L			0.0033	0.0039	0.0036	0.0034	0.0034	0.0034	0.0033	0.0046	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	17	9	10	10	10	8	15	12
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium	mg/L			2.7	3.9	3.5	3.5	3.5	3.5	1.3	1.8	1.6
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	<0.1	0.5	0.3333333	0.4	0.4	0.4	0.2	0.2	0.2
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.1	2.5	2.3	2.2	2.2	2.2	2.6	3.5	3.1
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02
Fluoride	mg/L	0.12	CWQG	0.02	0.07	0.04	0.03	0.03	0.03	<0.01	0.07	0.04



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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Hardness	mg/L			9	13	11	12	12	12	5	6	5.5
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.056	0.08	0.070667	0.039	0.039	0.039	0.15	0.15	0.15
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.5	0.7	0.6	0.7	0.7	0.7	0.4	0.4	0.4
Manganese	mg/L			0.029	0.064	0.045	0.019	0.019	0.019	0.0094	0.037	0.0232
Mercury	mg/L	2.60E-05	CWQG	1.00E-06	1.00E-05	7.00E-06	1.00E-07	1.00E-07	1.00E-07	1.00E-06	1.00E-05	5.50E-06
Molybdenum	mg/L	26	SEQG	0.0003	0.0013	0.00077	0.0011	0.0011	0.0011	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0001	<0.0001	0.0003	0.0003	0.0003	0.0001	0.0002	0.00015
Nitrate	mg/L	13.29	SEQG	0.05	0.44	0.25	0.05	0.05	0.05	<0.04	0.66	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.7	7	6.9	7.2	7.2	7.2	6.7	6.8	6.8
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	mg/L			0.3	0.6	0.5	0.8	0.8	0.8	0.2	0.4	0.3
Radium-226	Bq/L	0.11	SSWQO	<0.005	0.006	0.0053333	0.007	0.007	0.007	<0.005	0.008	0.0065
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.7	2	1.8	1.7	1.7	1.7	1.4	1.6	1.5
Conductivity	µS/cm			30	47	38	42	42	42	20	22	21
Strontium	mg/L			0.017	0.018	0.017	0.016	0.016	0.016	0.013	0.016	0.0145
Sulphate	mg/L	128	SEQG	3.7	8.1	6.5	8.3	8.3	8.3	0.5	0.8	0.65
Sum of Ions				18	28	23	25	25	25	12	21	16.5
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Parameter	Units	Benchmark		Russell Lake (LAB-1)			Russell Lake (LAB-2)			LB-2		
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Tin	mg/L			<0.0001	0.001	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.00045
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			30	35	32	35	35	35	19	30	24.5
TKN	mg/L			0.14	0.22	0.17	0.29	0.29	0.29	0.13	0.35	0.24
TOC	mg/L			2.2	2.6	2.4	2.2	2.2	2.2	2.7	3.6	3.2
TSS	mg/L			1	1	<1.0	4	4	4	<1	<1	<1
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.00115

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

**Table 8.2-3: Baseline Surface Water Quality in Local Study Area Watercourses (Updated)**

Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	13	5.5	2	11	6.75	1	23
Aluminum	mg/L	0.005	SEQG	0.0022	<b>0.0056</b>	0.0037	0.0039	<b>0.081</b>	<b>0.015</b>	0.0013	<b>0.006</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.014	<0.01	0.04	0.01375	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.005	0.036	0.0143	0.006	0.024	0.013	0.004	0.036
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0022	0.0035	0.00267	0.0019	0.0041	0.0026625	0.0025	0.004
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	16	6.7	2	13	8.125	1	28
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	0.000012	<1.0E-05	0.00002	0.0000125	1.00E-05	0.00002
Calcium	mg/L			1.3	1.7	1.4	1.2	1.7	1.3375	1.5	1.9
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.4	0.3125	0.5	0.7
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.000275	<0.0002	<0.0002
DOC	mg/L			1.7	2.4	2.13	1.9	2.5	2.225	1.7	2.6
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.026	0.01	0.03	0.01625	<0.01	0.07
Hardness	mg/L			5	6	5.3	4	6	4.75	5	7
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.031	<b>0.31</b>	0.1215	0.041	0.11	0.073875	0.036	0.13
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.000125	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	0.05	0.02375	<0.02	0.03
Magnesium	mg/L			0.3	0.7	0.43	0.3	0.6	0.375	0.4	0.5

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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Manganese	mg/L			0.0041	0.025	0.01467	0.0044	0.017	0.010325	0.0066	0.023
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.26	0.0714286	<0.04	0.31	0.094	<0.04	0.26
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.34</b>	6.99	6.75	6.58	7.01	6.7775	<b>6.42</b>	7.02
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.01	0.0054999	<0.005	<0.005	<0.005	<0.005	0.01
Potassium	mg/L			0.2	0.5	0.36	0.1	0.4	0.3375	0.3	0.5
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.0061	<0.005	0.01	0.006125	<0.005	0.01
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	1.7	1.53	1.2	1.8	1.45	1.4	1.8
Conductivity	µS/cm			16	22	18.2	14	22	17	18	24
Strontium	mg/L			0.011	0.015	0.0127	0.011	0.015	0.012125	0.013	0.018
Sulphate	mg/L	128	SSWQO	0.4	0.9	0.71	<0.2	0.7	0.5875	0.4	0.8
Sum of Ions				6	22	11.5	6	19	12.5	6	33
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	0.02	0.01125	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	0.0015	0.000375	<0.0002	<0.0002
TDS	mg/L			18	25	21.7	13	30	21.25	17	26
TKN	mg/L			0.11	0.3	0.241	<0.05	0.31	<0.195	0.13	0.3
TOC	mg/L			1.8	2.6	2.25	2.1	2.4	2.2875	1.8	2.6
TSS	mg/L			<1	3	2.2	1	3	1.5	<1	2

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Parameter	Units	Benchmark		Icelander River (SA-1)			SA-2			SA-3	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0028	0.00074	<0.0005	0.0096	0.001675	<0.0005	0.0011

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Alkalinity	mg/L			2	15	7.5	2	8	5.2222	3	13
Aluminum	mg/L	0.005	SEQG	0.0025	<b>0.0099</b>	<b>0.0053</b>	0.004	<b>0.014</b>	<b>0.0065</b>	0.0032	<b>0.02</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.05	0.015	<0.01	0.05	0.01444	<0.01	0.04
Ammonia, *unionized	ug/L	19	CWQG	0.007	0.065	0.0194	0.002	0.04	0.0137	0.006	0.04
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Barium	mg/L			0.0021	0.0032	0.0025625	0.0021	0.0031	0.0025556	0.0023	0.0032
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			2	18	9.125	2	10	6.2222	4	16
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	1.00E-05	<b>0.00007</b>	0.0000175	1.00E-05	0.00004	1.44E-05	1.00E-05	<b>0.00005</b>
Calcium	mg/L			1.3	2	1.5625	1.2	1.4	1.2444	1.2	1.8
Carbonate	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.4	0.6	0.45	0.2	0.3	0.23333	0.3	0.5
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2	2.4	2.275	1.8	2.5	2.2667	1.9	2.5
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.02625	0.01	0.08	0.0233	<0.01	0.07

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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Hardness	mg/L			5	7	5.625	4	5	4.56	4	6
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.034	0.13	0.077375	0.03	0.11	0.071222	0.036	0.16
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	0.03	0.02125	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.4	0.6	0.4375	0.2	0.4	0.33333	0.3	0.5
Manganese	mg/L			0.0029	0.019	0.010625	0.0025	0.018	0.0083333	0.0037	0.029
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.35	0.112	<0.04	0.31	0.093	<0.04	0.35
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	6.58	7.16	6.8488	<b>6.17</b>	6.97	6.7233	<b>6.48</b>	7.07
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.007	0.0052	<0.005	<0.005	<0.005	<0.005	0.006
Potassium	mg/L			0.2	0.6	0.375	0.2	0.4	0.32222	0.2	0.4
Radium-226	Bq/L	0.11	SEQG	<0.005	0.009	0.00625	<0.005	0.007	0.00544	<0.005	<0.005
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.4	2.1	1.63	1.3	1.6	1.41	1.3	1.9
Conductivity	µS/cm			17	25	19.375	14	20	16.111	14	23
Strontium	mg/L			0.012	0.018	0.0141	0.011	0.013	0.0113	0.011	0.016
Sulphate	mg/L	128	SSWQO	0.4	0.7	0.525	0.4	0.8	0.63333	0.3	0.8
Sum of Ions				7	25	14.125	6	14	10.667	8	22
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



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Parameter	Units	Benchmark		SA-4			SA-5			SA-6	
		Value	Reference	Min	Max	Mean	Min	Max	Mean	Min	Max
Tin	mg/L			<0.0001	0.0002	0.0001125	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
TDS	mg/L			21	32	25	13	28	20	15	28
TKN	mg/L			0.13	0.3	0.215	0.11	0.29	0.213	0.15	0.41
TOC	mg/L			2	2.6	2.325	1.9	2.7	2.3111	1.9	2.6
TSS	mg/L			1	3	2	<1	3	1.89	1	6
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.0006	<0.0005	0.0017	0.0007445	<0.0005	0.0006

**Table 8.2-3 (Continued)**

Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Alkalinity	mg/L			<1	24	<6.7778	3	13	7.375
Aluminum	mg/L	0.005	SEQG	<b>0.0052</b>	<b>0.012</b>	<b>0.0089</b>	0.0016	<b>0.0086</b>	<b>0.0054</b>
Ammonia as N	mg/L	5.7	SEQG	<0.01	0.04	0.01333	<0.01	0.04	0.0138
Ammonia, *unionized	ug/L			0.003	0.024	0.012	0.005	0.032	0.0134
Antimony	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	mg/L	0.005	SEQG	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001
Barium	mg/L			0.0025	0.0041	0.0031111	0.0026	0.004	0.0030625
Beryllium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bicarbonate	mg/L			<1	29	<8.3333	4	16	9
Boron	mg/L	1.5	CWQG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	CWQG	<1.0E-05	0.00002	1.11E-05	<1.0E-05	0.00004	0.000016
Calcium	mg/L			1.1	1.7	1.3778	1.2	1.7	1.3625
Carbonate	mg/L			<1	<1	<1	<1	<1	<1
Chloride	mg/L	120	CWQG	0.1	0.2	0.17778	<0.1	0.2	<0.175

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Chromium	mg/L	0.001	CWQG	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper	mg/L	0.002	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
DOC	mg/L			2.2	3.4	3.0222	2.6	3.2	2.975
Diss. Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride	mg/L	0.12	CWQG	0.01	0.07	0.023333	0.01	0.07	0.02375
Hardness	mg/L			4	6	5.11	4	6	4.88
Hydroxide	mg/L			<1	<1	<1	<1	<1	<1
Iron	mg/L	0.3	SEQG	0.042	0.22	0.095111	0.036	0.16	0.098375
Lead	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead-210	Bq/L			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L			0.3	0.5	0.38889	0.2	0.5	0.375
Manganese	mg/L			0.0053	0.02	0.010633	0.0071	0.016	0.010325
Mercury	mg/L	2.60E-05	CWQG	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05	<1.0E-05
Molybdenum	mg/L	26	SEQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.025	CWQG	0.0001	0.0002	0.00011	<0.0001	<0.0001	<0.0001
Nitrate	mg/L	13.29	SEQG	<0.04	0.4	0.115	<0.04	0.4	0.13
P. Alkalinity	mg/L			<1	<1	<1	<1	<1	<1
pH	units	6.5–9	CWQG	<b>6.18</b>	6.99	6.7044	<b>6.47</b>	6.99	6.7288
Phosphorus	mg/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polonium-210	Bq/L			<0.005	0.008	0.0058	<0.005	<0.005	<0.005
Potassium	mg/L			0.2	0.5	0.33333	0.2	0.5	0.3625
Radium-226	Bq/L	0.11	SEQG	<0.005	0.01	0.0059	<0.005	0.006	0.0051
Selenium	mg/L	0.001	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	mg/L	0.0001	CWQG	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodium	mg/L			1.2	1.7	1.4	1.3	1.7	1.44
Conductivity	µS/cm			15	22	16.778	15	23	17.25
Strontium	mg/L			0.011	0.015	0.0124	0.011	0.015	0.0119

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Parameter	Units	Benchmark		SB-3			SB-5		
		Value	Reference	Min	Max	Mean	Min	Max	Mean
Sulphate	mg/L	128	SSWQO	0.3	0.9	0.68889	0.5	1	0.725
Sum of Ions				4	34	12.667	8	22	13.375
Thallium	mg/L	0.0008	CWQG	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium-228	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-232	Bq/L			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L			<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
TDS	mg/L			14	26	20.556	16	26	20.125
TKN	mg/L			0.16	0.34	0.256	0.18	0.33	0.27
TOC	mg/L			2.4	3.6	3.1111	2.7	3.2	3
TSS	mg/L			<1	4	2.56	<1	3	1.875
Uranium	mg/L	0.015	CWQG	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	mg/L	0.03	CWQG	<0.0005	0.0012	0.00059	<0.0005	0.0016	0.00065

**Notes:**

Green-highlighted cells indicate values that fall below the analysis detection limit.

Bold values indicate metrics that exceed benchmark values.

Italicized values include a temperature point estimated from an adjacent water body taken in the same season

Blank cells in the "benchmark" column indicate parameters without a prescribed benchmark at this time

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

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TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

## Attachment: IR-114

Number	IR-114
Dept.	ECCC, CNSC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 and Section 8.2.4.2.4
Context and Rationale	<p>Context: Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field.</p> <p>General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p>Rationale: A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>

	<p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water.</p> <p>Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li> <li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li> <li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li> </ol>

Response:

1) Please see updated Tables 8.2-9 and 8.2-10 from the draft EIS below. Water quality predictions for the well mixed portion of LA-5 for each of the three flow scenarios (described in Section 8.2.4.2.3 and Table 8.2-7 of the draft EIS) are provided in the updated Table 8.2-10 below. Predicted site discharge concentrations that exceed respective receiver WQOs are bolded. Chloride, sulphate, TDS, arsenic, cadmium, chromium, cobalt, copper, selenium, and uranium, thorium-230, radium-226, lead-210, and polonium-210 predicted discharge concentrations are above receiver WQOs. However, under all three flow scenarios, the predicted water quality for all constituents is below respective WQOs within the well mixed portion of LA-5, indicating that sufficient dilution is present within LA-5 to meet objectives. Updated Table 8.2-13 is provided below. Water quality predictions have been added for MDMER constituents listed under Schedule 4 and Schedule 5. There are no predicted exceedances of water quality guidelines for any of the COPCs during Construction, Operation, or Decommissioning

2) The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The



effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.

3) The table below (IR-114 Table 1) shows a summary of baseline concentrations of total mercury in surface water within the LSA. Sediment was not analyzed for mercury during previous baseline surveys. Baseline water quality in the LSA and RSA showed no indication of total mercury present above detectable limits and as such, the potential for methyl-mercury to be detected was unlikely. Generally, 60 to 95% of total mercury concentrations in fish muscle tissues are present in the form of methyl-mercury. Table 8.5-2 of Section 8.5 of the EIS provides a full summary of tissue constituent concentrations for key species from the Icelander River and Russell Lake. A conservative approach of assuming 95% of mercury in the tissues is present in the methylated form could be used for comparative purposes. These data supplemented with more current baseline data for water, sediment and fish tissues specific to total and methyl-mercury prior to the onset of site development will provide a robust database for comparative purposes during the subsequent development and operation on site.

4) Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in the ERA in Appendix 10-A. The following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."

As baseline surface water did not identify measurable concentrations of total mercury in the LSA or RSA (See IR-114 Table 1 below) and deposition to large water bodies such as lakes is not likely to contribute to the methyl mercury concentration in the Wheeler River receiving waters, it is most reasonable to conclude that changes in total and methyl mercury can be adequately monitored in relation to sulphate inputs. Denison will undertake monitoring of total and methyl mercury as it relates to the discharge of sulphate to Whitefish Lake.

#### References:

Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I

Table 8.2-9: Predicted Effluent Water Quality (Updated to include MDMER Constituents)

Constituent	Unit	Discharge Concentration
		(max predicted)
Chloride	mg/L	<b>600</b>
Sulphate (Hardness)	mg/L	<b>3915</b>
Sulphate	mg/L	<b>3915</b>
TDS	mg/L	<b>6420</b>
TSS	mg/L	6
Arsenic	mg/L	<b>0.006</b>
Cadmium	mg/L	<b>0.0018</b>
Chromium	mg/L	<b>0.025</b>
Cobalt	mg/L	<b>0.0030</b>
Copper	mg/L	<b>0.022</b>
Lead	mg/L	0.0003
Molybdenum	mg/L	2.5
Nickel	mg/L	0.014
Selenium	mg/L	<b>0.042</b>
Uranium	mg/L	<b>0.057</b>
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Mercury	mg/L	0.000001
Ammonia (as N)	mg/L	3.9
Un-ionized Ammonia*	mg/L	0.0078
Phosphorus	mg/L	N/A
Thorium-230	Bq/L	<b>0.9</b>
Radium-226	Bq/L	<b>0.15</b>
Lead-210	Bq/L	<b>0.419</b>
Polonium-210	Bq/L	<b>0.15</b>

Note:

\* - Calculated value

Table 8.2-10: Near-field Receiving Water Quality Results (Updated to include MDMER Constituents)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
Chloride	mg/L	120	SEQG/CCME	<b>600</b>	10.06	6.18	4.69
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>	63.83	38.51	28.76
Sulphate	mg/L	128	BC MOE	<b>3915</b>	63.83	38.51	28.76
TDS	mg/L	500	SEQG	<b>6420</b>	131.41	90.06	74.13
TSS	mg/L	15	Schd 4 - MDMER	6	3.9	3.9	3.9
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>	0.00020	0.00016	0.00014
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>	0.00005	0.00004	0.00003
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>	0.00090	0.001	0.00068
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>	0.00015	0.00013	0.00012
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>	0.00055	0.00041	0.00036
Lead	mg/L	0.005	CCME	0.0003	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.07	WHO	2.5	0.040	0.024	0.018
Nickel	mg/L	0.07	WHO	0.014	0.0003	0.0002	0.0002
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>	0.0008	0.001	0.0004
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>	0.0010	0.0006	0.0005
Vanadium	mg/L	0.12	FEQG	0.059	0.0011	0.0007	0.0005
Zinc	mg/L	0.1	FEQG**	0.042	0.0018	0.0015	0.0014
Mercury	mg/L	0.000026	SEQG/CCME	0.000001	0.00001	0.00001	0.00001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9	0.13	0.11	0.10
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078	0.00008	0.00006	0.00006
Phosphorus	mg/L	0.015	BC MOE	N/A	0.01	0.01	0.01
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>	0.024	0.019	0.016
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>	0.008	0.007	0.007
Lead-210	Bq/L	0.2	HC	<b>0.419</b>	0.026	0.024	0.023
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>	0.007	0.006	0.006
Notes							

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
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Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
<p>(1) <b>Bolded values</b> are those that exceed the screening concentrations</p> <p>Un-ionized ammonia calculated value</p> <p>* Hardness induced guideline, assuming hardness &gt;250 mg/L</p> <p>** Hardness induced guideline, assuming hardness &gt;250 mg/L, pH=7.0, DOC = 5.26 mg/L</p>							

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated to include available MDMER Constituents)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Iceland River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	6.14	6.11	4.20	4.16	3.26	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.01	SEQG/CCME
Cadmium	mg/L	0.000024	0.000023	0.000040	0.000039	0.000033	0.000033	0.000030	0.0003	SEQG/CCME*
Chromium	mg/L	0.000530	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*
Lead	mg/L	0.000124	0.000114	0.000118	0.000130	0.000114	0.000114	0.000116	0.005	CCME
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.0240	0.0158	0.0156	0.0118	0.07	WHO
Nickel	mg/L	0.00039	0.00038	0.00051	0.00050	0.00046	0.00046	0.00044	0.07	WHO
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.00020	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG
Zinc	mg/L	0.00070	0.00069	0.00106	0.00103	0.00090	0.00090	0.00084	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.03950	0.03368	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.01430	0.6	HC
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Iceland River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L Un-ionized ammonia represented by calculated values										



IR-114 Table 1: Total and Dissolved Mercury Concentrations in the LSA and RSA

Parameter	Total Mercury, Dissolved	Total Mercury
Units	mg/L	mg/L
Total Count	40	59
Count (<RDL)	39	46
Minimum	<1.00E-05	<1.00E-07
5th Percentile	<1.00E-05	<8.20E-07
50th Percentile	<1.00E-05	<1.00E-05
95th Percentile	<1.00E-05	<1.00E-05
Maximum	<1.00E-05	<1.00E-05
Arithmetic Mean	<1.00E-05	<7.63E-06
StdDev	2.76E-12	3.70E-06
Std Error	0	4.81E-07
Geometric Mean	<1.00E-05	<5.38E-06
Geometric StdDev	1.	3.281

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.
2. The reporting locations are: "LA-1", "LA-1-Bottom", "LA-5", "LA-6", "LAB-1", "LAB-2", "SA-1", "SA-2", "SA-3", "SA-6".

## Attachment: IR-115

Number	IR-115
Dept.	ECCC
Project effects link	Fish and Fish Habitat
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.3 Aquatic Environment Appendix 10-A (ERA), Section 3.1.1.1
Context and Rationale	<p>Context: Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.</p> <p>Rationale: ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.</li> <li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.</li> <li>3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.</li> </ol>

### Table to support response:

Table 8.2-8 has been updated and provided below.

Constituent	Unit	LA-5 Background Concentration (95th percentile)	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.39	120	SEQG/CCME
Sulphate (Hardness)	mg/L	0.69	429	BC MOE*
Sulphate	mg/L	0.69	128	BC MOE
TDS	mg/L	28.3	500	SEQG
TSS	mg/L	3.9	15	Schd 4 - MDMER
Arsenic	mg/L	0.0001	0.01	SEQG/CCME
Cadmium	mg/L	0.000019	0.0003	SEQG/CCME*
Chromium	mg/L	<0.0005	0.001	SEQG/CCME
Cobalt	mg/L	<0.0001	0.0003	FEQG
Copper	mg/L	<0.0002	0.004	SEQG/CCME*
Lead	mg/L	<0.0001	0.005	CCME
Molybdenum	mg/L	<0.0001	0.07	WHO
Nickel	mg/L	<0.0001	0.07	WHO
Selenium	mg/L	<0.0001	0.001	SEQG/CCME
Uranium	mg/L	<0.0001	0.02	SEQG/CCME
Vanadium	mg/L	<0.0001	0.12	FEQG
Zinc	mg/L	0.0011	0.1	FEQG**
Mercury	mg/L	<0.00001	0.000026	SEQG/CCME
Ammonia (as N)	mg/L	0.068	5.74	SEQG/CCME
Phosphorus	mg/L	<0.01	0.015	BC MOE
Thorium-230	Bq/L	<0.01	0.6	HC
Radium-226	Bq/L	<0.0059	0.11	SEQG
Lead-210	Bq/L	<0.02	0.2	HC
Polonium-210	Bq/L	<0.005	0.1	HC

Notes

\* Hardness induced guideline, assuming hardness >250 mg/L

\*\* Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L

## Attachment: IR-116

Number	IR-116
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3
Context and Rationale	<p>Context: Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.</p> <p>Rationale: It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.</p>
Information Requirement	<p>Information Requirement:</p> <ol style="list-style-type: none"> <li>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</li> <li>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</li> </ol>

### Response:

- 1) The maximum concentrations of COPCs in surface water and sediment during the Future Centuries period are provided in IR-116 Table 1 and IR-116 Table 2, respectively.
- 2) The suite of COPCs that are provided in IR-116 Table 1 and IR-116 Table 2 are generally inclusive of those that have the potential for elevated concentrations in groundwater. However, estimates for pH, iron and manganese have not currently been modelled. These three parameters were identified in

Section 7.6.2.2.3 and Appendix 7-C as having the potential to be present in groundwater above the groundwater quality screening criteria (see Table 7.6-1 in the EIS and Table 3-4 in Appendix 7-C [existing conditions groundwater quality]).

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a pH ranging from 6.39 to 6.47, which is slightly below the screening criteria of 6.5 to 9. However, the range predicted is within the range of the local groundwater flow system of 5.9 to 7.5 (median of 6.5, as provided in Table 3-4 of Appendix 7-C). Therefore, no change from the current existing conditions is expected during future centuries.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have an iron concentration ranging from 0.0065 mg/L and 2.91 mg/L. The upper range of concentrations will exceed the Groundwater quality guideline of 0.3 mg/L. However, the range predicted is within the range of dissolved iron concentrations measured for groundwater in the local groundwater flow system, of 0.01 mg/L to 4.8 mg/L (median of 0.41). Therefore, no change from the current existing conditions is expected.

During future centuries, groundwater that may reach Whitefish Lake is estimated to have a manganese concentration ranging from 0.279 mg/L and 0.289 mg/L. The range of predicted concentrations will exceed the Groundwater quality guideline of 0.230 mg/L. However, the range predicted is only marginally above that of the local groundwater flow system of 0.04 mg/L and 0.2 mg/L (median of 0.1) and within a similar magnitude.

Arsenic concentrations in sediment have also been predicted based on mass-flux in a conservative manner and indicate potential exceedance of the CCME ISQG.

The modelled predictions of the future centuries groundwater are highly conservative. Continued monitoring of groundwater through the period of construction and initial operation will allow for refinement of the predictions for the future centuries scenario, thereby providing information for adaptive management.

IR-116 Table 1: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water During Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	0.41	0.41	0.39	0.39	0.38	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	0.72	0.72	0.71	0.71	0.71	128	BC MOE
Arsenic	mg/L	0.000103	0.000103	0.000107	0.000107	0.000105	0.000105	0.000104	0.01	SEQG/CCME
Cadmium	mg/L	0.0000232	0.0000232	0.0000233	0.0000233	0.0000233	0.0000233	0.0000232	0.0003	SEQG/CCME*
Chromium	mg/L	0.00052	0.00052	0.00053	0.00053	0.00052	0.00052	0.00052	0.001	SEQG/CCME
Cobalt	mg/L	0.00010	0.00010	0.00011	0.00011	0.00011	0.00010	0.00010	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00063	0.00063	0.00062	0.00062	0.00062	0.004	SEQG/CCME*
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.005	CCME
Molybdenum	mg/L	0.00011	0.00011	0.00012	0.00012	0.00011	0.00011	0.00011	0.07	WHO
Nickel	mg/L	0.00038	0.00038	0.00041	0.00041	0.00040	0.00040	0.00039	0.07	WHO
Selenium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00003	0.00003	0.00003	0.02	SEQG/CCME
Vanadium	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.12	FEQG
Zinc	mg/L	0.00068	0.00068	0.00074	0.00074	0.00072	0.00072	0.00071	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01010	0.01010	0.01036	0.01036	0.01030	0.01030	0.01025	0.6	HC
Radium-226	Bq/L	0.00557	0.00557	0.00639	0.00637	0.00615	0.00614	0.00600	0.11	SEQG
Lead-210	Bq/L	0.00527	0.00527	0.00605	0.00592	0.00557	0.00556	0.00545	0.2	HC
Polonium-210	Bq/L	0.00536	0.00536	0.00615	0.00602	0.00566	0.00564	0.00553	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5



Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
<b>Notes</b> (1) Bolded values are those that exceed the screening concentrations * Hardness induced guideline, assuming hardness >250 mg/L ** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L										

IR-116 Table 2: Predicted Maximum Sediment Quality during Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake Inlet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Chloride	mg/kg(dw)	2.81	2.81	3.62	3.61	3.43	3.29	--	--	--	--	--	--
Sulphate	mg/kg(dw)	6.00	6.00	6.29	6.29	6.22	6.17	--	--	--	--	--	--
Arsenic	mg/kg(dw)	<b>8.35</b>	<b>8.35</b>	<b>8.66</b>	<b>8.62</b>	<b>8.48</b>	<b>8.43</b>	21	522	9.8	346.4	5.9	17
Cadmium	mg/kg(dw)	0.34	0.34	0.34	0.34	0.34	0.34	--	--	--	--	0.6	3.5
Chromium	mg/kg(dw)	5.86	5.86	5.94	5.93	5.91	5.90	31.5	26.2	47.6	115.4	37.3	90
Cobalt	mg/kg(dw)	0.25	0.25	0.27	0.26	0.26	0.26	--	--	--	--	--	--
Copper	mg/kg(dw)	1.85	1.85	1.87	1.87	1.87	1.86	9.1	11.3	22.2	268.8	35.7	197
Lead	mg/kg(dw)	10.21	10.21	10.34	10.31	10.26	10.24	16.3	19.7	36.7	412.4	35	91.3
Molybdenum	mg/kg(dw)	0.34	0.34	0.37	0.37	0.36	0.35	23	245	13.8	1,239	--	--
Nickel	mg/kg(dw)	3.32	3.32	3.53	3.52	3.47	3.43	21	326	23.4	484	--	--

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
Denison Response – August 18<sup>th</sup>, 2023

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Russell Lake InLet	Sediment Quality Guidelines					
								Burnett-Seidel and Liber		Thompson et al.		CCME	
								REF	NE2	LEL	SEL	ISQG	PEL
Selenium	mg/kg(dw)	0.62	0.62	0.83	0.82	0.76	0.72	3.6	30	1.9	16.1	--	--
Uranium	mg/kg(dw)	0.58	0.58	0.71	0.70	0.66	0.64	97	2,296	104.4	5,874	--	--
Zinc	mg/kg(dw)	9.93	9.93	10.79	10.76	10.52	10.37	--	--	--	--	123	315
Total Ammonia (N)	mg/kg(dw)	0.13	0.13	0.13	0.13	0.13	0.13	--	--	--	--	--	--
Thorium-230	Bq/kg(dw)	23.19	23.19	23.80	23.79	23.64	23.54	--	--	--	--	--	--
Radium-226	Bq/kg(dw)	65.14	65.14	74.67	74.39	71.82	70.13	--	--	600	14,400	--	--
Lead-210	Bq/kg(dw)	373.84	373.84	428.83	419.39	394.66	386.43	--	--	900	20,800	--	--
Polonium-210	Bq/kg(dw)	380.31	380.31	436.25	426.65	401.49	393.07	--	--	800	12,100	--	--
Mercury	mg/kg(dw)	No background information or effluent concentration to model											
Aluminum	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Iron	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Thallium	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Manganese	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											
Phosphorus	mg/kg(dw)	Monitoring required in effluent under MDMER Schedule 5 - no criteria stipulated under this regulation											

**Note:**

bolded values indicate exceedance of the CCME ISQG

## Attachment: IR-123

Number	IR-123
Dept.	ECCC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Section 8.4.3.2.3, Aquatic Environment Appendix 8-D, Table 3-5
Context and Rationale	<p><b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.</p> <p><b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.</li> <li>2. Provide data on baseline concentrations of mercury in sediment.</li> <li>3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.</li> </ol>

Table 1 is provided below to support the text response to IR-123 in the IR table:

Table 1: Baseline Sediment Quality Summary

Category	Parameter	Units	Total Count	Count (<RDL)	Min	5th Percentile	50th Percentile	95th Percentile	Max	Arithmetic Mean	StdDev	Std Error	Geometric Mean	Geometric StdDev	Sediment Quality Guidelines					
															Burnett-Seidel and Liber		Thompson et al.		CCME	
															REF	NE2	LEL	SEL	ISQG	PEL
Physical Tests	Moisture	%	22	0	24.59	28.934	94.81	96.858	97.24	74.715	31.256	6.6637	66.042	1.7444						
Total Metals	Aluminum	ug/g	22	0	920	1144	4645	9110.	9300	4391.82	2321.67	494.98	3723.16	1.8908	n/d	n/d	n/d	n/d	n/d	n/d
	Antimony	ug/g	22	17	<0.2	0.2	0.2	0.295	0.3	<0.20909	0.029425	0.0062733	<0.20751	1.1267	n/d	n/d	n/d	n/d	n/d	n/d
	Arsenic	ug/g	22	0	0.4	0.505	3.35	5.695	7.2	3.1909	2.0128	0.42913	2.3379	2.5249	21	522	9.8	346.4	5.9	17
	Barium	ug/g	22	0	19	21.25	42.5	70.45	100	43.727	17.694	3.7723	40.761	1.4647	n/d	n/d	n/d	n/d	n/d	n/d
	Beryllium	ug/g	22	7	<0.1	<0.1	0.3	0.395	0.5	<0.24545	0.11434	0.024377	<0.21531	1.747	n/d	n/d	n/d	n/d	n/d	n/d
	Boron	ug/g	22	7	<1	<1	5.5	11	12	<5.0455	3.5787	0.76299	<3.5672	2.5755	n/d	n/d	n/d	n/d	n/d	n/d
	Cadmium	ug/g	22	2	<0.1	<0.1	0.4	0.595	0.7	<0.35909	0.16521	0.035223	<0.31108	1.8383	n/d	n/d	n/d	n/d	0.6	3.5
	Chromium	ug/g	22	3	<0.5	<0.5	8.15	14.9	16	<7.55	4.7699	1.017	<5.0365	3.1656	31.5	26.2	47.6	115.4	37.3	90
	Cobalt	ug/g	22	5	<0.2	0.2	1.65	2.68	3.8	<1.4591	1.0051	0.21428	<0.96852	2.9677	n/d	n/d	n/d	n/d	n/d	n/d
	Copper	ug/g	22	7	<0.5	<0.5	1.65	4.565	5	<1.9136	1.3981	0.29807	<1.4281	2.2783	9.1	11.3	22.2	268.8	35.7	197
	Iron	ug/g	22	0	1410	1590.5	12650	32699.99	91300	16020	18960.23	4042.33	9545.32	3.0244	n/d	n/d	n/d	n/d	n/d	n/d
	Lead	ug/g	22	0	1	1	7.3	10	13	6.0545	3.6694	0.78232	4.4383	2.5369	16.3	19.7	36.7	412.4	35	91.3
	Manganese	ug/g	22	0	22	22.55	195	388.5	1270	237.41	253.54	54.056	159.75	2.6446	n/d	n/d	n/d	n/d	n/d	n/d
	Molybdenum	ug/g	22	2	<0.1	0.1	0.65	11.95	13	<2.4455	4.1007	0.87428	<0.83873	4.1956	23	245	13.8	1,239	n/d	n/d
	Nickel	ug/g	22	3	<0.1	<0.1	5.6	11.895	12	<5.1	3.6738	0.78327	<2.7847	4.651	21	326	23.4	484	n/d	n/d
	Selenium	ug/g	22	7	<0.1	<0.1	0.8	1.49	1.6	<0.73182	0.49989	0.10658	<0.4781	3.0508	3.6	30	1.9	16.1	n/d	n/d
	Silver	ug/g	22	11	<0.1	<0.1	<0.1	0.68	2	<0.25455	0.41142	0.087714	<0.16407	2.1254	n/d	n/d	n/d	n/d	n/d	n/d
	Strontium	ug/g	22	0	16	17	26.5	39.75	42	26.545	7.076	1.5086	25.66	1.3072	n/d	n/d	n/d	n/d	n/d	n/d
	Thallium	ug/g	22	22	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0	0	<0.2	1	n/d	n/d	n/d	n/d	n/d	n/d

Annex 1 – FIRT IR Table – Technical Review of the **Wheeler River Project** draft EIS  
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Radionuclides	Tin	ug/g	22	7	<0.1	<0.1	0.2	0.4	0.4	<0.19091	0.10193	0.021731	<0.16863	1.6518	n/d	n/d	n/d	n/d	n/d	n/d
	Titanium	ug/g	22	0	31	31.25	200	446.5	480	205.36	139.5	29.741	147.31	2.5607	n/d	n/d	n/d	n/d	n/d	n/d
	Uranium	ug/g	22	0	0.2	0.2	0.7	1.395	1.5	0.67727	0.38537	0.08216	0.56276	1.9464	97	2,296	104.4	5,874	n/d	n/d
	Vanadium	ug/g	22	0	1.2	1.3	18	26.75	30	14.223	9.3994	2.004	8.7761	3.4375	35.1	31.8	35.2	160	n/d	n/d
	Zinc	ug/g	22	5	<0.5	<0.5	24	43.3	62	<19.85	16.079	3.4281	<8.2122	6.2729	n/d	n/d	n/d	n/d	123	315
	Lead-210	Bq/g	22	7	<0.04	<0.04	0.415	0.725	0.75	<0.35273	0.24914	0.053116	<0.21687	3.3521	n/d	n/d	0.9	20.8	n/d	n/d
	Polonium-210	Bq/g	22	1	<0.01	0.02	0.41	0.678	0.76	<0.35136	0.25533	0.054436	<0.17468	4.8038	n/d	n/d	0.8	12.1	n/d	n/d
	Radium-226	Bq/g	22	6	<0.01	<0.01	0.03	0.0495	0.05	<0.025909	0.012968	0.0027649	<0.0225	1.7702	n/d	n/d	0.6	14.4	n/d	n/d
	Thorium-228	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-230	Bq/g	22	20	<0.02	<0.02	<0.02	<0.02	0.03	<0.020455	0.002132	0.00045455	<0.020372	1.0903	n/d	n/d	n/d	n/d	n/d	n/d
	Thorium-232	Bq/g	22	22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	3.81E-09	8.13E-10	<0.02	1	n/d	n/d	n/d	n/d	n/d	n/d

**Notes:**

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.

2. The reporting locations are: "LA-1-1", "LA-1-2", "LA-1-3", "LA-5-1", "LA-5-2", "LA-5-3", "LA-5-4", "LA-5-5", "LA-6-1", "LA-6-2", "LA-6-3", "LA-6-4", "LA-6-5", "LAB-1-1", "LAB-1-2", "LAB-1-3", "LAB-2-1", "LAB-2-2", "LAB-2-3", "LAB-2-CORE".

**0.7**

indicates exceedance of CCME ISQG

## Attachment: IR-131

Number	IR-131
Dept.	CNSC
Project effects link	Migratory birds, Wildlife and Wildlife Habitat
Reference to EIS, appendices, or supporting documentation	Section 9, Terrestrial Environment
Context and Rationale	<p>Context and Rationale: As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</p> <p>As per the CNSC's Generic Guidelines for the Preparation of an EIS pursuant to the Canadian Environmental Assessment Act, 2012: "The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable recovery strategy and/or action plan".</p> <p>The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.</p>
Information Requirement	Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.

### Response:

A new appendix to the final EIS (Appendix 9-D Species At Risk) is included below.





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## **Appendix 9-D Wildlife Species At Risk**

**New Appendix to final EIS, Section 9**

**Version 1**

**July 2023**

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## Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	<i>Species at Risk Act</i>
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component



# 1 Introduction

## 1.1 Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 1.2 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 1.1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

**Table 1.1 Wildlife Species at Risk Listed by Environment and Climate Change Canada**

Common Name	Scientific Name	Discussed in the draft EIS
Nine-spotted lady beetle	<i>Coccinella overnotata</i>	No
Transverse lady beetle	<i>Coccinella transversoguttata</i>	No
Yellow-banded bumble bee	<i>Bombus terricola</i>	No
Northern leopard frog	<i>Lithobates pipiens</i>	No
Little brown myotis	<i>Myotis lucifugus</i>	No
Northern myotis	<i>Myotis septentrionalis</i>	No
Wolverine	<i>Gulo gulo</i>	Yes
Woodland caribou	<i>Rangifer tarandus caribou</i>	Yes
Bank Swallow	<i>Riparia riparia</i>	No
Barn Swallow	<i>Hirundo rustica</i>	No
Common Nighthawk	<i>Chordeiles minor</i>	Yes
Horned Grebe	<i>Podiceps auritus</i>	No
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes
Rusty Blackbird	<i>Euphagus carolinus</i>	Yes



Common Name	Scientific Name	Discussed in the draft EIS
Short-eared Owl	<i>Asio flammeus</i>	Yes
Yellow Rail	<i>Coturnicops noveboracensis</i>	Yes

Of the 16 species listed in Table 1.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

## 1.2 Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 1.2 and Table 1.3, which formed the basis for the subsequent VC-specific assessment.

**Table 1.2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project**

Valued Component	Rationale
<b>Biophysical Environment</b>	
<b><i>Terrestrial Environment</i></b>	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., <i>Species at Risk Act</i> [SARA; Government of Canada 2022], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], <i>The Wildlife Act, 1998</i> [Government of Saskatchewan 2020]).
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], <i>Migratory Birds Convention Act 1994</i> [Government of Canada 2017], <i>Saskatchewan Activity Restriction Guidelines for</i>

Valued Component	Rationale
	<i>Sensitive Species</i> [Government of Saskatchewan 2017], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).

**Table 1.3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project**

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities. The number of Yellow Rail mortalities directly or indirectly attributable to the Project.

The five bird species identified in Table 1.3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

## 2 Supplemental Information

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As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 2.1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

**Table 2.1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement**

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Arthropods</b>						
Nine-spotted lady beetle	<i>Coccinella novemnotata</i>	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.1 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	<i>Coccinella transversoguttata</i>	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.2 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	<i>Bombus terricola</i>	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 2.1.3 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
<b>Amphibians</b>						
Northern leopard frog	<i>Lithobates pipiens</i>	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom; (2) breeding and larval waterbodies with	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow marshes, moist upland meadows where grass height is less than 1 m. See Section 2.2.1 for further details.	observations to date. Amphibian nocturnal call and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs ( <i>Pseudacris maculata</i> ) were detected (Appendix 9-C).	
<b>Bats</b>						
Little brown myotis	<i>Myotis lucifugus</i>	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.1 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	<i>Myotis septentrionalis</i>	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.2 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA (Appendix 9-C).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.



Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Terrestrial Wildlife Species</b>						
Wolverine	<i>Gulo gulo</i>	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	<i>Rangifer tarandus caribou</i>	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
<b>Avian Species</b>						
Bank Swallow	<i>Riparia riparia</i>	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of open habitats. See Section 2.4.1 for further details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Barn Swallow	<i>Hirundo rustica</i>	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of	Documented during the breeding bird surveys as part of the baseline field	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 2.4.2 for further details.	program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	<i>Chordeiles minor</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	<i>Podiceps auritus</i>	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 2.4.3 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5)..
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Rusty Blackbird	<i>Euphagus carolinus</i>	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	<i>Asio flammeus</i>	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	<i>Coturnicops noveboracensis</i>	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

- 1 Schedule 1 under the *Species at Risk Act*.
- 2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

## 2.1 Arthropods

### 2.1.1 Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

### 2.1.2 Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



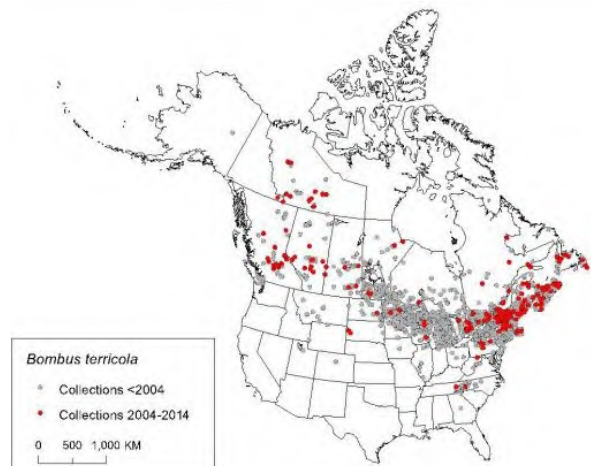
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section 2.1.1.

### 2.1.3 Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015). After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure)

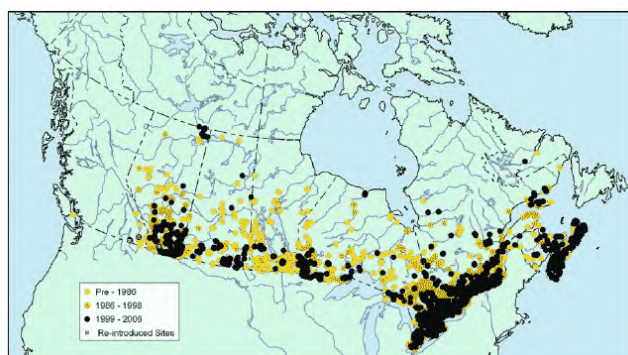
(Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015). The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

## 2.2 Amphibians

### 2.2.1 Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three distinct habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a,



NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

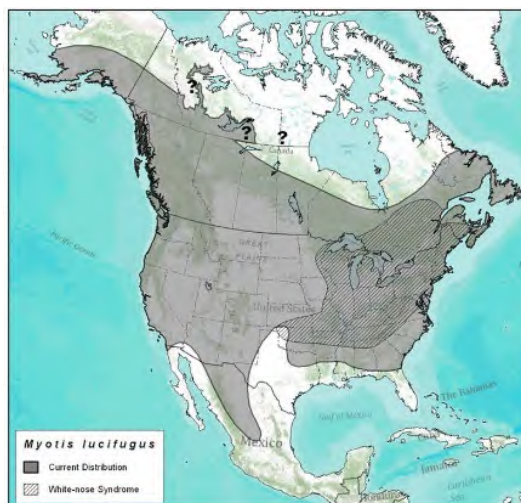
## 2.3 Bats

### 2.3.1 Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).



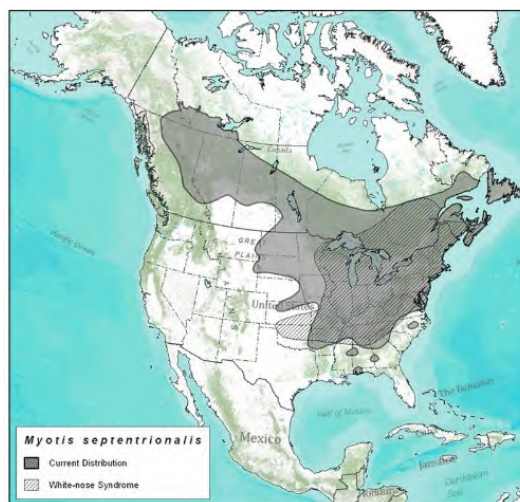
Source: COSEWIC (2013a).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease that causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

### 2.3.2 Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).



Source: COSEWIC (2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has

been identified as the main threat for northern myotis populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a)

## 2.4 Avian Species

### 2.4.1 Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making



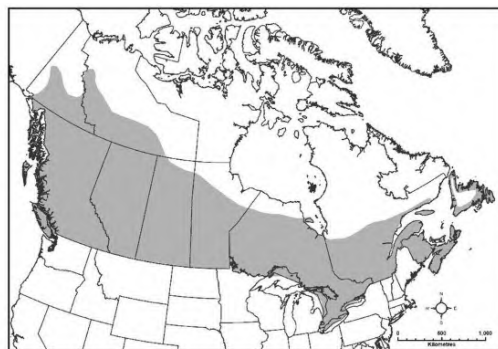
Source: COSEWIC (2013b).

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

## 2.4.2 Barn Swallow

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).

Historically, suitable nesting sites were likely provided by caves, cliff faces, rock ledges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).



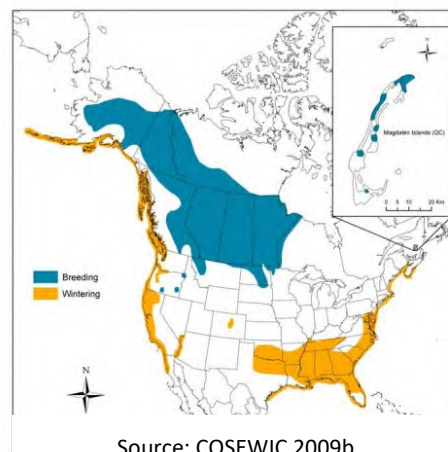
Source: COSEWIC (2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021).

## 2.4.3 Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation,



Source: COSEWIC 2009b



anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

### 3 Mitigation Measures

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The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

#### 3.1 Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;



- controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.
- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
  - The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
  - Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
  - Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
  - A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
  - Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
  - Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
  - Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
  - The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.
  - All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

## 3.2 General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**.

### 3.2.1 Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.

### 3.2.2 Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- **Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.**

### 3.2.3 Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

### 3.2.4 Wildlife Deterrence and Prevention of Wildlife Entrapment

- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**
- **Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.**
- **Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).**
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- **Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.**

- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

### 3.2.5 Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- **Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.**
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

### 3.2.6 Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- **Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.**
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interact.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.

- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

### 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**. These will be added to the final EIS.

#### 3.3.1 Arthropod Species

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.

- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species.**

### 3.3.2 Amphibian Species

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).**
- **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.**
- **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.**

### 3.3.3 Bat Species

- Vegetation clearing activities will occur outside of roosting periods, when practical.
- **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**
- **In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.**



- **Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.**

### **3.3.4 Avian Species**

- **Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.**
- **In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.**
- **Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).**
- **Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.**
- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**

## 4 Residual and Cumulative Effects Summary

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The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 4.1. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 4.2.

**Table 4.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk**

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
<b>Terrestrial Environment</b>	Nine-spotted lady beetle Transverse lady beetle Yellow-banded bumble bee	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>Waste management (composting, domestic and industrial landfill operation, recycling).</li> <li>Water management (including treatment).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on these species, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the arthropod SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to groundwater and/or surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			

<sup>1</sup> Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>• Site water management, treatment, and release</li><li>• Process water treatment and release.</li><li>• Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Reclamation of disturbed areas.</li></ul>	Decommissioning	<div>roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</div> <div>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</div>		
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>• Development of access roads and air strip.</li><li>• Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>• <b>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on arthropod species.</b></li></ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the arthropod SAR to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>• Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Reclamation of disturbed areas.</li></ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials</li> </ul>	Operation	<ul style="list-style-type: none"> <li>• <b>Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>Reclamation of disturbed areas).</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li>• <b>Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li>• <b>Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.</b></li> </ul>		



Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<ul style="list-style-type: none"> <li>Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.</li> </ul>		
Terrestrial Environment	Little brown myotis Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>Vegetation clearing activities will occur outside of roosting periods, when practical.</b></li> <li><b>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).</b></li> <li><b>In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat</b></li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bat species within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> </ul>	Construction		Change in mortality: predicted to be low	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		attributable to the Project.	<ul style="list-style-type: none"> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>		<p><b>exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.</b></p> <ul style="list-style-type: none"> <li><b>Locations of these site-specific habitat features used by bats will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li><b>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</b></li> </ul>	magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of the bat species to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
<b>Terrestrial Environment</b>	Bank Swallow Barn Swallow Common Nighthawk Horned Grebe Olive-sided Flycatcher Rusty Blackbird	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to</li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the avian SAR within the Terrestrial RSA to the

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
	Short-eared Owl Yellow Rail		<ul style="list-style-type: none"> <li>Air transportation for workers.</li> </ul>		<p>August 31; however, the dates differ for certain species.</p> <ul style="list-style-type: none"> <li><b>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.</b></li> <li><b>Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance</b></li> </ul>		point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the avian SAR to the point where they are not sustainable or available to
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"> <li>Air transportation for workers.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<p>and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</p> <ul style="list-style-type: none"> <li>Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li> <li>Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been previously described in Section 3.2.4 of the EIS.</li> <li>Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible</li> </ul>		contribute to ecological functions.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<div>barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces</div> <ul style="list-style-type: none"><li>Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.</li></ul>		

Table 4.2      Summary of Significance of the Cumulative Effects on Wildlife Species At Risk

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	<ul style="list-style-type: none"><li>Nine-spotted lady beetle</li><li>Transverse lady beetle</li><li>Yellow-banded bumble bee</li><li>Northern leopard frog</li><li>Little brown myotis</li><li>Northern myotis</li><li>Bank Swallow</li><li>Barn Swallow</li></ul>	Alteration and/or loss of habitat.	<b>Not significant:</b> The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
		<ul style="list-style-type: none"><li>Common Nighthawk</li><li>Horned Grebe</li><li>Olive-sided Flycatcher</li><li>Rusty Blackbird</li><li>Short-eared Owl</li><li>Yellow Rail</li></ul>	Change in mortality.	<b>Not significant:</b> The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.



## 5 References

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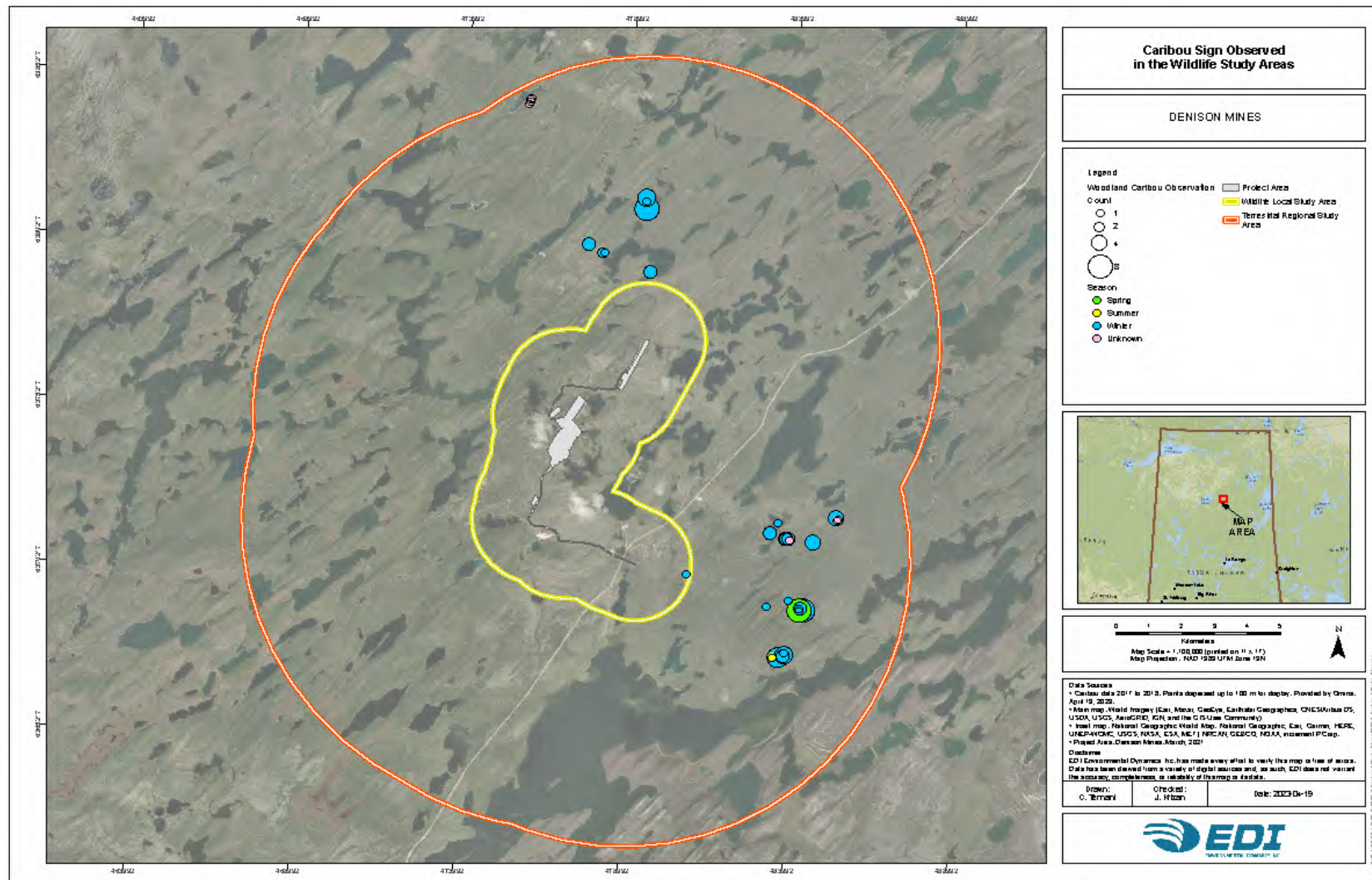
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## Attachment: IR-143

Number	IR-143
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Baseline Studies
Context and Rationale	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>
Information Requirement	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"> <li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li> <li>• Description of seasonal use of the LSA, RSA and caribou range.</li> <li>• Description of Project areas used by caribou.</li> <li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li> </ul> <p>Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).</p> <p>See also related: IR-152.</p>

Supporting figure to the response provided in table: revised Figure 9.3-8



Attachment IR-143 Figure 9.3-8 Caribou Sign Observations in the Wildlife Study Areas (updated)

## Attachment: IR-145

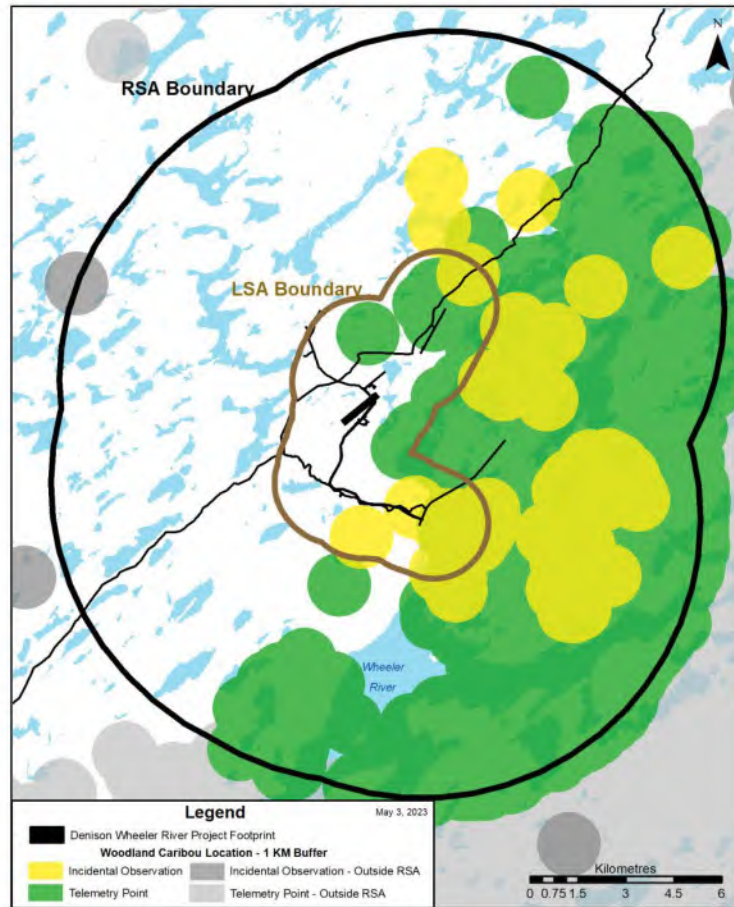
Number	IR-145
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.3.3, Woodland Caribou
Context and Rationale	<p>Context and Rationale: The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).</p> <p>The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.</p> <p>The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”</p> <p>ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.</p> <p>[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a></p>

Information Requirement	<p>1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada:</p> <ul style="list-style-type: none"><li>• information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>• a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,</li><li>• mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul> <p>2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.</p> <p>See also related IRs: IR-143 and IR-152.</p>
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Supporting figure to the response provided in table:



**Denison-Wheeler Study Area - Woodland Caribou Location Data**



RSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.

## Attachment: IR-149

Number	IR-149
Dept.	ECCC CNSC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures
Context and Rationale	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>
Information Requirement	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical</p>

	<p>habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"> <li>1. <b>AVOID:</b> Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li> <li>2. <b>MINIMIZE:</b> Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li> <li>3. <b>RESTORE ON-SITE:</b> describe the measures that will be taken to restore disturbed areas of the project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li> <li>4. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li> <li>5. <b>OFFSET:</b> Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</li> <li>6. Characterize the risk of the adverse effects that are likely to result from the project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</li> </ol> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-149 and IR-157.</p>
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**Response:**

Conceptual Caribou Mitigation Plan is included below.





 Denison Mines

*Powering*  
**PEOPLE, PARTNERSHIPS  
AND PASSION**

# Denison Mines Corp.

## Conceptual Caribou Mitigation Plan

**Version 1**

**June 2023**

### Revision History

Version	Date	Description of Revision
1	June 30, 2023	Conceptual plan to support provincial and federal review of the draft environmental impact statement

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## Acronyms and Abbreviations

Term	Definition
Anthropogenic	Caused or produced by humans
BSCs	biological soil crusts
Boreal Caribou	The boreal ecotype of woodland caribou occurs within the boreal forest of Canada. These non-migratory caribou form small aggregations throughout the year and disperse for solitary calving.
Committee on the Status of Endangered Wildlife in Canada (COSEWIC)	A committee made up of experts from academic, government and non-government organizations that assess the conservation status of wildlife species that may be at risk of extinction in Canada.
Critical Habitat	The habitat that is necessary for the survival of a listed wildlife species and is identified as the species critical habitat in the recovery strategy or action plans for the species.
DERT Project	Developing Eco-Restoration Together Project
Disturbed habitat (per ECCC 2020)	Habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer).
ECCC	Environment and Climate Change Canada
EA	environmental assessment
EIS	environmental impact statement
EMS	environmental management system
ENV	Saskatchewan Ministry of Environment
ha	hectare
Local Populations (ECCC 2020)	Group of boreal caribou occupying a defined area distinguished spatially from areas occupied by other groups of boreal caribou. Local population dynamics are driven primarily by local factors affecting birth and death rates, rather than immigration or emigration among groups. In this recovery strategy, “local population” refers to a group of boreal caribou occupying any of the three types of boreal caribou ranges (i.e., conservation unit, improved conservation unit, local population unit).

Plan	Conceptual Caribou Mitigation Plan
Project	Wheeler River Project
Range (per ECCC 2020)	<p>The geographic area occupied by a group of individuals that are subject to similar factors affecting their demography and used to satisfy their life history processes (e.g., calving, rutting, wintering) over a defined time frame.</p> <p>Environment and Climate Change Canada (2011) identified three types of boreal caribou ranges categorized based on the degree of certainty in the delineated range boundaries (i.e., conservation unit, improved conservation unit, local population unit).</p>
Recovery strategy	A planning document that identifies what needs to be done to stop or reverse the decline of a species.
SARA	Species at Risk Act
Self-sustaining local population (ECCC 2020)	A local population of boreal caribou that on average demonstrates stable or positive population growth over the short-term ( $\leq 20$ years) and is large enough to withstand stochastic events and persist over the long-term ( $\geq 50$ years), without the need for ongoing active management intervention.
Threatened species	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Undisturbed habitat (per ECCC 2020)	Habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.

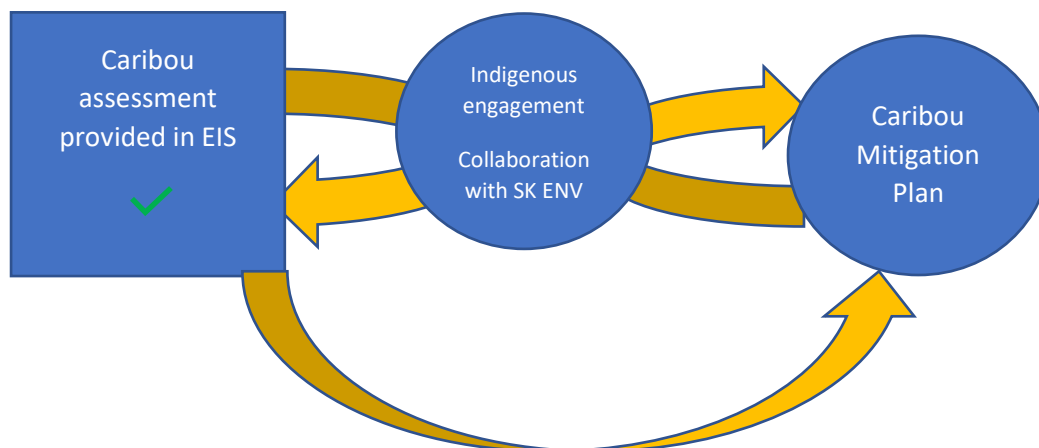
# 1 Introduction

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The Wheeler River Project (the Project) environmental impact statement (EIS) evaluates and assesses potential Project-related effects on the Boreal population of woodland caribou (*Rangifer tarandus caribou*; referred to herein as caribou or boreal caribou) following standard environmental assessment (EA) methodology. The assessment of potential effects considered both direct (i.e., habitat loss) and indirect effects (i.e., habitat alteration) on caribou and their habitat, while assuming that caribou were present year-round and during all of their life stages (i.e., calving, rearing, mating, over wintering). In this way, the EIS took a precautionary or conservative approach to understanding/addressing the likely residual effects (i.e., effects remaining after mitigation measures were considered) of the Project on caribou and their habitat and is using this approach as a planning tool to inform/support future Project-related regulatory approvals processes and follow-up monitoring. The EIS has demonstrated that the Project, as proposed and assessed, is predicted to minimize the potential for environmental adverse effects on caribou and their habitat before any Project specific construction occurs. The conclusions of the assessment predicted that the likely residual effects of the Project on caribou were not significant.

This Conceptual Caribou Mitigation Plan (the Plan), developed proactively by Denison, has a different objective than the EIS. The Plan builds on the assessment of potential Project effects and commitments to mitigate such effects made in the EIS and is expected to be advanced with ongoing consultation with the Saskatchewan Ministry of Environment (ENV), as ENV finalize the caribou range plan for SK1. The EIS is a conservative planning tool, whereas the Plan is a practical, living document designed to define management works associated with caribou. The Plan is not a requirement for EA determination but is provided as a guidance document to help Denison proactively describe and inform the development and implementation of appropriate mitigation measures related to caribou and their habitat.

The Plan is an evergreen document. It will be consistent with the management goals of ENV for the SK-1 caribou conservation unit, and will be developed/refined in consultation with local communities including English River First Nation and Kineepik Métis Local in Pinehouse and regulators (e.g., ENV). As noted above, the boreal caribou range plan for SK-1 is under development and it is understood that this Plan will be updated as more information becomes available. The conceptual nature of the Plan is in part due to the absence of range plan priorities and reflects Denison's commitment to continue to work with the province to meet the management objectives and management strategies for the SK1 range.



## 2 Guidance and Regulatory Framework

A brief review highlighting federal and provincial considerations of boreal caribou is provided below for reference.

### 2.1 Federal

Boreal caribou have been designated as *threatened* under the federal *Species at Risk Act* (SARA). Environment and Climate Change Canada (ECCC) released amended recovery strategy for woodland caribou in 2020 (ECCC 2020). A recovery strategy is a planning document that identifies what should be done to stop or reverse the decline of a species.

The Project is located in the Boreal Shield West ecoregion of the Boreal Shield ecozone. The Boreal Shield West ecoregion stretches from Alberta to Ontario (Figure 2-1).

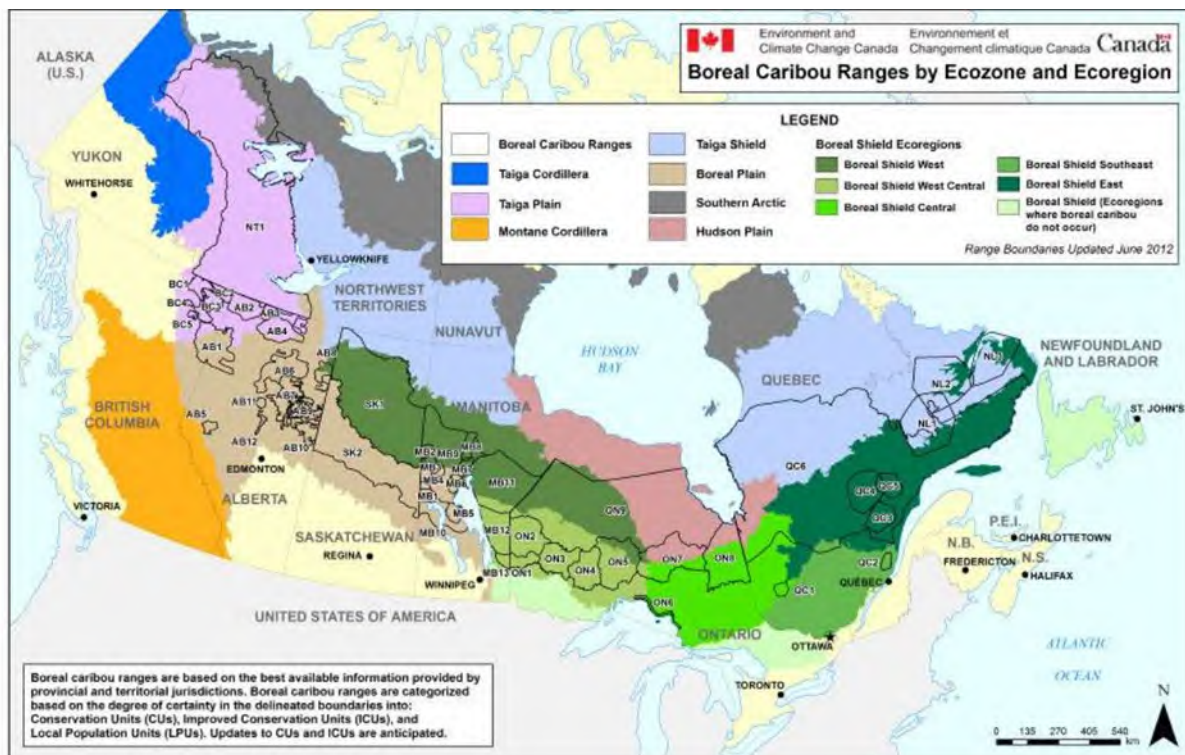


Figure 2-1: Boreal Caribou Distribution Across Ecozones and Ecoregions in Canada (source: ECCC 2020)

The SK1 range comprises more than 18,000,000 hectares (ha) and is characterized by high fire disturbance and low anthropogenic disturbance (ECCC 2020). The likelihood of caribou self-sustainability in the boreal shield range in SK1 is “likely” (ECCC 2020). For SK1, the amended recovery strategy (ECCC 2020) identifies 40% undisturbed habitat in the range as the disturbance management threshold, which provides a measurable probability (71%) for the local population to be self-sustaining. This threshold is considered a minimum threshold because at 40% undisturbed habitat there remains a risk (29%) that the SK1 local population cannot be self-sustaining. Disturbed habitat (ECCC 2020) is habitat showing: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the

anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Undisturbed habitat (ECCC 2020) is habitat not showing any: i) anthropogenic disturbance visible on Landsat at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.

Studies (e.g., McLoughlin et al. 2019) indicate that the SK1 local caribou population is likely self-sustaining at current levels of disturbance (60% total disturbance), with a 71% probability of persistence. Environment and Climate Change Canada's analyses also indicate that the SK1 local population is sensitive to small increases anthropogenic disturbance and sensitive to small decreases in adult survival. For these reasons, a higher probability of persistence was selected for critical habitat identification in SK1 (71%) than was selected for the other 50 ranges across Canada (60%) (ECCC 2019).

The precise location of the 40% undisturbed habitat within the range is expected to vary over time. The habitat within the SK1 range should exist in an appropriate spatial configuration such that boreal caribou can move throughout the range and access required habitat when needed. The key to this habitat delineation is achieving and maintaining an overall, ongoing range condition that allows for the dynamic habitat supply system, containing the biophysical attributes upon which caribou depend, to remain sustainable. It is this dynamic habitat supply system within the SK1 range that is the habitat condition considered to be necessary for the caribou.

## 2.2 Provincial

The responsibility for woodland caribou management lies with the Province of Saskatchewan. Broadly, the province is responsible for developing range plans or management plans which build on the federal recovery strategy by setting goals and objectives for maintaining sustainable population levels.

The Saskatchewan Conservation Data Centre (SK-CDC) is responsible for evaluating and assigning a conservation rank to each taxon, resident or transient, found in the province. Woodland caribou's subnational or S-rank conservation rank is S3. This ranking indicates that, provincially, the species is vulnerable/rare to uncommon which is associated with a moderate risk of extinction or extirpation due to a restricted range, relatively few populations, recent and widespread declines, threats, or other factors. Currently, the caribou population in SK-1 is stable (ENV 2023) and the range plan is under development. Engagement is a key component of the range plan process and will be completed with representatives from First Nation, Métis, industry, non-governmental organizations, and communities.

The provincial goal is to sustain and enhance woodland caribou populations, and maintain the ecosystems they require, throughout their current range (ENV 2013). Through the woodland caribou range assessment and range planning program, the province is:

- Gaining a better understanding of woodland caribou ecology;
- Working toward meeting objectives identified in provincial and federal strategies; and
- Improving how the province manages the species and related habitat.

The province's woodland caribou range assessment and range planning program incorporates two key components:



- Woodland caribou range assessment, which enhances the understanding of woodland caribou populations and their interactions with the environment; and
- Woodland caribou range planning, which provides a framework, strategies and objectives that allow for better decisions involving habitat management and self-sustaining caribou populations.

Although the management objectives and management strategies for caribou in SK1 are not yet defined, Denison is committed to working with ENV as the range plan is developed. The Plan will be updated as the Project advances so that it aligns with the conservation objectives as determined by the province as the primary steward of caribou in the province.

## 3 SK 1 Caribou Population – Background Information

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Background information concerning the condition of the SK 1 caribou population is provided below.

### 3.1 Population Trends

The SK1 Boreal Shield management unit contains high-quality conifer-dominated caribou habitat with greater than 40-year-old stands of jack pine and black spruce forests suitable for lichen colonization, black spruce swamps, and open muskegs supporting relatively high densities of caribou, at 36.9 caribou/1,000 km<sup>2</sup> or approximately 4,000 caribou across the SK1 Boreal Shield Woodland Caribou Management Unit (McLoughlin et al. 2019).

Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens. If the quantity of available lichen forage is low, caribou can exist without relying entirely on lichens (McLoughlin et al. 2019). Due to their physiology, lichens are resilient to periods of drought and cold temperatures, but because of their slow growth rate, exhibit a slow recovery time after depletion and fire events. In the SK1 range, McLoughlin et al. (2019) found that stand types with the highest potential for adequate lichen biomass for caribou are jack pine and poorly drained black spruce sites.

McLoughlin et al. (2019) observed that, from 2014 to 2018, the caribou population exhibited a high average adult female survival rate and moderate recruitment (0.192 calves per cow in March), ranging from a low of 0.134 calves/cow in March 2016 to 0.244 calves/cow in March 2018. These demographic parameters led the authors to assess the SK1 Boreal Shield caribou population as being stable at the time of their study (McLoughlin et al. 2019).

While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).

Neufeld et al. (2021) summarized results from aerial surveys over a period of eight years in an 87,193 km<sup>2</sup> study area in the Athabasca Plain and Churchill River Upland ecoregions in the north, that are inclusive of the Terrestrial RSAs that were used in the EIS. During 11 of 16 aerial caribou surveys conducted between 2008 and 2015, woodland caribou were detected in the surveyed areas. The average density of the 16 surveys was estimated at 36.9 caribou/1,000 km<sup>2</sup> (95% CI = 26.7 to 47.2 caribou/1,000 km<sup>2</sup>). Across the Neufeld et al. (2021) study area and all years, estimated caribou densities were higher in comparison to averages reported for most other boreal woodland caribou ranges in Canada (i.e., caribou density reported in other areas ranged 4.3 to 18.7/1,000 km<sup>2</sup>) indicating that caribou can tolerate natural disturbance. One exception to the relatively high caribou densities in northern Saskatchewan was noted: the 2,285 km aerial the Millennium Project in March 2014, 10 km west of the Terrestrial RSA, resulted in lower woodland caribou densities at 5 caribou/1,000 km<sup>2</sup> (Neufeld et al. 2021).

Eight of the sixteen caribou surveys reported the ratios of male to female and calf to female in their results with the average male:female ratio calculated at 0.571 (95% CI = 0.444 to 0.699) and calf:female at 0.195 (0.158 to 0.232). Again, the 2014 Millennium survey reported a different male:female ratio, outside the reported range (1.6), concurring with the reported low caribou densities.

## 3.2 Predation

In addition to relatively low predator densities in their study area, McLoughlin et al. (2019) found some spatial separation between caribou and wolves. Caribou did not seem to avoid existing linear features (such as roads, trails, and transmission lines) in the area, while wolves established their territories away from linear features. Unlike caribou, who preferred mature conifer stands, wolves selected for wetlands and patches of deciduous-mixed forest, avoiding stands of mature conifers. Other prey species, such as moose, also occurred at relatively low densities (i.e., 45.7 moose/1,000 km<sup>2</sup>) (McLoughlin et al. 2019).

McLoughlin et al. (2019) observed that mortality of adult caribou occurred mostly during the snow-free season and only 1 of 94 collared caribou was harvested by a hunter during the four years of the study.

While predation is believed to be a key limiting factor for woodland caribou (Bergerud 1974; Stuart-Smith et al. 1997, DeMars et al. 2011 from ECCC 2020), Neufeld et al. (2021) suggested that habitat- or disturbance-mediated apparent competition only plays a minor role in the Saskatchewan woodland caribou population. Habitat- or disturbance-mediated apparent competition occurs when natural (e.g., forest fires) and anthropogenic (e.g., human development or activities) disturbances increase the abundance of other ungulates, which in turn may increase predator densities, which then increases predation risk to caribou. Neufeld et al. (2021) concluded that Northern Shield and Taiga ecoregions are of low productivity where caribou may compete with only one ungulate species (i.e., moose) and therefore, caribou and wolf dynamics do not follow general habitat- or disturbance-mediated apparent competition models.

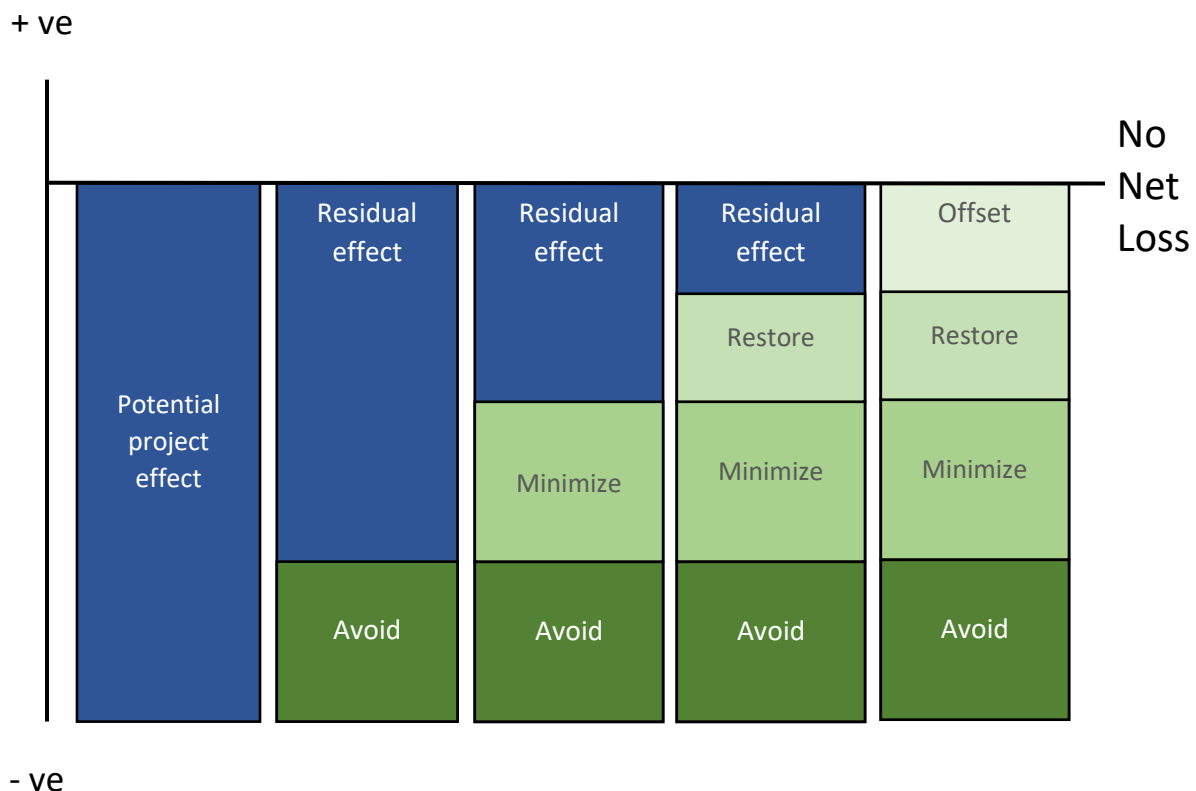
## 3.3 Harvest

Indigenous peoples in Saskatchewan have an inherent right to harvest woodland caribou for subsistence purposes (ENV 2013). No other harvest of woodland caribou is currently permitted. Under provincial and federal recovery planning and effective species management, self-sustaining caribou populations will support long-term subsistence use of the species and protect treaty rights. Subsistence harvest levels are assumed to be low but actual numbers are not available because most communities or Indigenous groups are not collecting and/or publishing this information.

## 4 No Net Loss and Mitigation Hierarchy

A generic biodiversity mitigation hierarchy (OECD 2016) to achieve no net loss is provided in Figure 4-1. As shown in the hierarchy, an offset can be used to achieve no net loss if residual effects remain following efforts to avoid, minimize, and restore potential project effects. This generic hierarchy is generally consistent with the approach of ENV to manage effects on caribou and their habitat.

The balance of Section 4 of this Plan outlines Denison's approach to avoid, minimize, and restore caribou habitat per commitments made in the draft EIS associated with the Wheeler River Project.



**Figure 4-1: Generic No Net Loss and Mitigation Hierarchy (modified from OECD 2016)**

### 4.1 Avoid

Potential adverse effects on the caribou have been avoided to the extent possible through Project design, including:

- Selection of in-situ recovery (ISR) mining avoids some direct and indirect effects compared to conventional underground or open-pit mining methods. ISR mining avoids the need for spatially expansive infrastructure such as waste rock piles and tailings management facilities reducing the Project footprint (i.e., avoids direct effects on caribou and their habitat). ISR mining also reduces the potential for interactions between caribou and Project components / activities as it concerns sensory disturbance as it is inherently a less intensive form of mining with reduced noise/light/vibration generation (i.e., avoids indirect effects on caribou and their habitat).

- Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for caribou (for example, outside of wintering/calving period from April 1-July 31, per ENV 2013), where practical, to avoid disturbance during sensitive time periods.
- Pre-disturbance wildlife surveys will be completed to identify caribou presence and work will be postponed if caribou are present.

## 4.2 Minimize

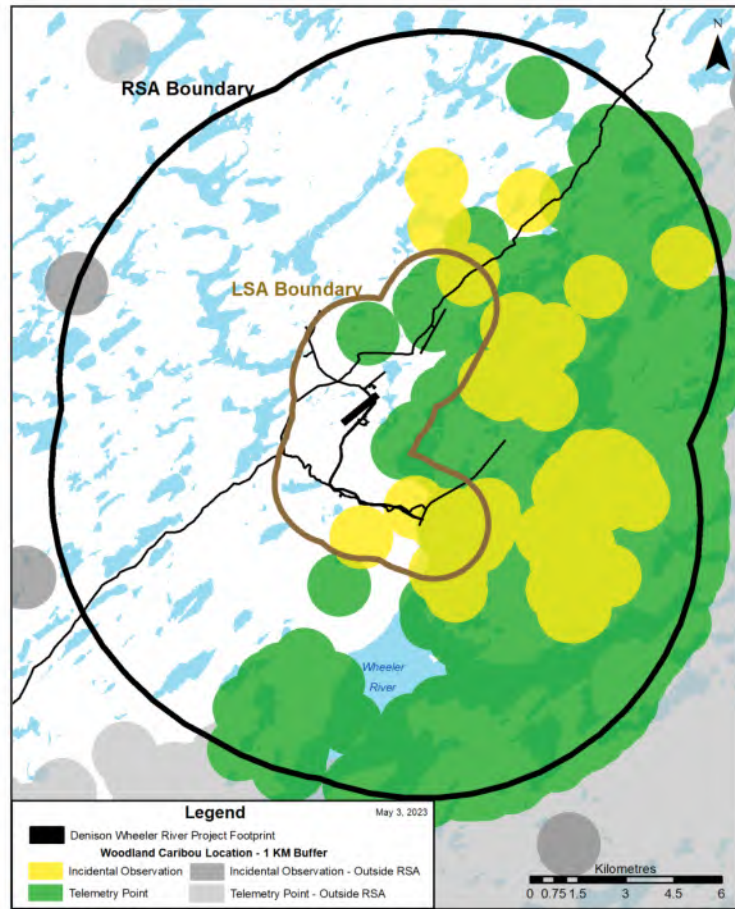
Additional mitigation measures to minimize effects on caribou and their habitat and tailored to Project features have been incorporated into the various Project management and monitoring plans within the Environmental Management System (EMS) including but limited to erosion and sediment controls, soil and vegetation monitoring, Decommissioning Plan, air quality monitoring, fuel spill control and response, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.

The Project's EMS plans provide direction on monitoring and adaptive management so that issues are identified and mitigation measures are developed and implemented in a timely and effective manner. Mitigation measures specific to caribou are applicable during all Project phases, within all seasons and expected to be effective following appropriate implementation. Examples of the measures to minimize Project effects on wildlife in general, and caribou in particular, are highlighted below.

### 4.2.1 Disturbance Footprint

- Siting Project components in close proximity to the ISR mining area minimizes indirect effects on caribou and their habitat. The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area. . Appropriate siting is anticipated to minimize the potential for interactions with woodland caribou and Project activities.
- The Project footprint (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable, resulting in limited/minimal habitat loss/disturbance and noise propagation.
- Portions of the proposed Project footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.

# Denison-Wheeler Study Area - Woodland Caribou Location Data



RSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	1987, 2017 – 2022	89
Telemetry Point*	2013 – 2016	3,848

\*Data from 15 individual woodland caribou cows

LSA Boundary		
Data Type	Years	Number of Locations
Incidental Observation	2017 – 2022	19
Telemetry Point*	2013, 2015 – 2016	62

\*Data from 4 individual woodland caribou cows

NOTE: Absence of data does not mean absence of woodland caribou.

**Figure 4-2 Saskatchewan Ministry of Environment Woodland Caribou Location Data Provided to Denison**



#### **4.2.2 Wildlife and Habitat Protection**

- Project activities have been assessed for their potential to disturb or remove wildlife and/or wildlife habitat (e.g., site clearing, soil disturbance) to determine potential effects on wildlife and wildlife habitat and the assessment, including proposed mitigation measures, for the Project will guide Project activities.
- Pre-disturbance wildlife clearance surveys will be conducted within the Project Area; results of the clearance surveys will inform the development and implementation of appropriate mitigation (e.g., delay of work) to address the identified issue (e.g., presence of caribou).
- Personal firearms for employees and contractors will be prohibited within the Project Area to prevent hunting activities.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing wildlife species within the Project Area.
- To support wildlife habitat regeneration, progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Decommissioning Plan.

#### **4.2.3 Wildlife Deterrence and Prevention of Wildlife Entrapment**

- In addition to installing secure fencing around all contaminated areas to prevent accidental contaminant exposure, buildings and other Project components will be designed and maintained to exclude wildlife from using buildings for refuge or shelter, and to deter wildlife from potentially becoming entrapped.

#### **4.2.4 Sensory Disturbance**

- Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife, especially during sensitive time periods, such as calving. This would include:
  - locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;
  - directing the generator discharge openings away from sensitive locations; and
  - making use of available on-site obstructions to control sound exposure at sensitive areas (i.e., locate sources behind buildings).
- The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. Low sound emission equipment and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities. There will be regular maintenance of equipment to ensure it is in proper working order and not emitting noise unduly.

- Lighting will be focused on work sites and not surrounding areas, to minimize light trespass and other light-related pollution sources.
- Facilities will be illuminated only to meet standards set for the protection of workers to avoid over-illumination.
- Battery-powered, light vehicles and mobile equipment, and an AC powered dual rotary drill will be used for ISR wellfield development instead of a traditional diesel-powered unit, where practical, to reduce air emissions and noise levels and improve energy efficiency.
- Fugitive dust sources that could lead to deposition of dust on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - dust suppression techniques on site roadways, such as road watering and traffic management;
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;
  - making a wash bay available to clean items, equipment, and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge; and,
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area.

#### **4.2.5 Road and Traffic Management**

- Traffic and access control measures will be implemented, including managing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic) to the Project site and roads with both north and south security access gates. It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it was safe to do so given Project activities in the area.
- Appropriate road signage will be installed (e.g., speed limits, identification of wildlife crossings and areas of high activity) along Project roads to minimize the risk of wildlife-vehicle collisions.
- Speed limits will be implemented to reduce the risk of wildlife-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage caribou to move off Project roads and processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow caribou to move away or off the road before resuming normal road speeds for the area.

- Road watering and regular road maintenance to limit dust dispersion.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be promptly reported to ENV and disposed of as directed to prevent scavenging.
- Vegetation along Project roads will be managed to reduce attractiveness to wildlife (e.g., forage plants) and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable, to limit the use of specialty chemicals and potential exposure of wildlife including caribou to them.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate caribou crossing and escape and, with that, reducing their risk of vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water as roadside pools may attract caribou.

#### **4.2.6 Water Management, Waste Management, Emissions, and Hazardous Materials Management**

- Education on and enforcement of proper water, waste, emissions and hazardous materials management practices will be provided to employees and contractors.
- A freeze wall will be established around the uranium deposit to reduce potential for groundwater disturbance or contamination mitigating the likelihood of exposure of caribou to contaminants in local areas of groundwater discharge to surface.
- The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit, reducing water use requirements to the extent feasible. Make-up water will be preferentially sourced from site runoff (instead of freshwater) where possible.
- Contaminated wastes (e.g., mineralized drill cuttings, process precipitates) will be temporarily stored on double lined pads with leak detection capabilities and an associated monitoring program until final disposal at an approved facility. An adjacent pond will be used to collect contact water from these pads.
- All contact water will be routed to the Industrial Wastewater Treatment Plant for treatment and eventual release to the environment. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits. This will mitigate exposure of caribou to Project-related contaminants released to the environment.

- Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations to mitigate the likelihood of the release of such chemicals to the environment that could result in exposure of caribou to the chemicals.
- Double-walled high-density polyethylene (HDPE) or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement to mitigate the likelihood of the piping failure and the associated release of wellfield chemicals to the environment that could result in exposure of caribou to the chemicals.
- Denison is proposing to segregate and compost organic wastes on site in a composting system, reducing the volume of material in the domestic landfill generating odours and thereby minimizing wildlife attractants.
- Domestic waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting wildlife and reduce the risk for human-wildlife interactions. The wildlife-proof containers will be inspected regularly for evidence of wildlife presence or access to waste disposal facilities. If evidence of wildlife presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal/incineration frequencies will be increased.
- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- Air emissions will be reduced to the extent practical through implementation of the development of air emissions management and monitoring plans within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited to reduce emissions.
- The use of hazardous materials will be limited as much as possible.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines to minimize the risk of accidental spills or leakage. This will mitigate the likelihood of release to the environment that could result in exposure of caribou to the hazardous materials.
- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance to avoid attracting wildlife (e.g., wildlife-proof containers, exclusion fencing) to mitigate the likelihood of exposure of caribou to hazardous materials.
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use / interaction. The deterrents will be monitored and maintained .
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan to mitigate the likelihood of

the release of hazardous material to the environment that could result in exposure of caribou to the material.

- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan. This will mitigate the likelihood of a fuel spill to water that could result in exposure of caribou to fuel.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials and mitigate the likelihood of exposure of caribou to such chemicals.
- All vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.

#### **4.2.7 Wildlife Education**

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential caribou issues on site and training on the mitigation measures summarized with the EMS and specifically in this Plan to avoid or minimize potential Project effects on caribou and caribou habitat.
- Employees and contractors will be educated on waste and hazardous waste management practices / policies that limit human-wildlife interactions and the potential exposure of wildlife to those wastes.
- Designated employees will be trained in appropriate wildlife deterrent techniques to minimize wildlife interactions with the Project.
- Employees and contractors will be requested to report wildlife observations, including prompt reporting of caribou observations and immediate communication to on-site staff. Wildlife encounters and outcomes will be monitored, and logbooks will be used to record wildlife observations. Logbooks and reports will be available to employees. Incidental observations recorded by staff will be entered into Species Detection Loadforms and submitted to the Saskatchewan Conservation Data Centre annually.

### **4.3 Restore**

The temporal bounds for the Project as stated in the EIS are years 1 to 3 for construction, years 3 to 18 for operation, years 18 to 23 for decommissioning, and fifteen years of post-decommissioning monitoring and inspections from years 23 to 38. Importantly, during physical decommissioning the majority of Project components are scheduled to be removed from site which is expected to facilitate restoration activities. Also, because of the selected ISR mining method, there are no large, permanent Project components, such as waste rock piles or tailings management facilities, for which large scale and potentially complex restoration strategies are needed.

Denison's decommissioning commitment is to return the land back to the Province of Saskatchewan for unrestricted surface land use post-closure. The Project's Conceptual Decommissioning Plan (CDP) is included in the draft EIS. The details of decommissioning and restoration will be refined over time as the Project proceeds. A Preliminary Decommissioning Plan (PDP) will be developed by Denison to support licensing and permitting applications. Prior to executing decommissioning activities, Denison will prepare and submit a Detailed Decommissioning Plan (DDP) to regulators for their review and acceptance, which builds on the PDP.

The CDP outlines plans for physical decommissioning (mining area remediation; asset removal; and decontamination, demolition, and disposal), followed by restoration. A summary of the CDP is provided here.

- Ongoing decommissioning of Project components will be completed when possible.
- Denison has committed to progressively restore areas no longer necessary to support/facilitate Operations to limit the amount of disturbance at any given time. Restoration of inactive areas will take place when/as these areas become available. The progress and success of these activities will be assessed regularly at a schedule commensurate with the expectations of the activities per the decommissioning plan. Progressive restoration including ecosystem-based revegetation will be conducted on disturbed areas as soon as safely and logistically practicable with the use of suitable/appropriate native species and in accordance with the decommissioning plan.
- Once the asset removal, decontamination, demolition, and disposal are completed, and the site has been cleared and leveled, restoration activities, including planting, will take place. Currently this would largely be with jack pine seedlings, but the mix of plants will depend on location and available species. Restoration activities monitored until it is deemed self-sustaining and viable wildlife habitat.
- Future discussions will be held with Indigenous and general public Interested Parties to determine the amount of access to the area they wish to maintain in the future (post-decommissioning). Based on results of these discussions, transportation corridors including roads or trails associated with the Project site that are no longer needed will be graded, scarified, and vegetated with native, self-sustaining species as required. Access to facilitate safe post-closure monitoring or requested by appropriate Interested Parties (e.g., to facilitate land use) may be left in place. Access to the site may be restricted by gates and/or berms.
- Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species. The footprints of other infrastructure, such as the camp, will be scarified and vegetated with native, self-sustaining species as required. The topsoil and brush stockpiled during pre-construction activities will be used during restoration.
- Lessons learned from progressive decommissioning and any site-specific restoration studies will be incorporated into the DDP. Additionally, information from other northern Saskatchewan mine



sites will be examined to help Denison select the restoration tools, including revegetation options, that will contribute towards decommissioning success.

Closure of the entire Project will be completed in accordance with provincial and federal regulations and guidance documents with the fundamental considerations being to confirm physical and chemical stability of the site to protect human health and the environment.

Progressive decommissioning and restoration will be completed throughout the life of the Project, whenever feasible, and reported to the regulatory agencies as part of the annual reporting requirements throughout Operation. Associated activities will focus on the decontamination, demolition, and disposal of unused buildings and infrastructure, as well as the removal of unused equipment and machinery. Progressive decommissioning and restoration are expected to continue and result in positive effects as revegetation is continued and regeneration occurs. Following decommissioning and restoration, wildlife habitat is expected to recover to baseline conditions.

## 5 Habitat Loss Calculation

### 5.1 Habitat Loss in Context of the Disturbance Management Threshold for SK1

To support the Plan with respect to the calculation of habitat loss, a mapping exercise was completed to provide context on the Project-related habitat loss in consideration of the woodland caribou range (SK1) disturbance management threshold (ECCC 2020).

#### 5.1.1 Approach

First the Project infrastructure footprint area was delineated and estimated to be 80 ha. Next, a 500 m buffer was applied to the Project footprint, resulting in a total potential disturbance area of 1,350 ha. This is consistent with the approach for determining direct and indirect effects, as outlined in ECCC (2020).

Finally, an analysis was undertaken to quantify the amount of caribou habitat that is currently disturbed within the Project footprint + 500 m buffer. According to ECCC (2020), there are two contributors to disturbed habitat in SK1: 1. anthropogenic disturbance + 500 m buffer and 2. fire disturbance in the last 40 years, without a buffer. The two factors for disturbed habitat were considered as follows:

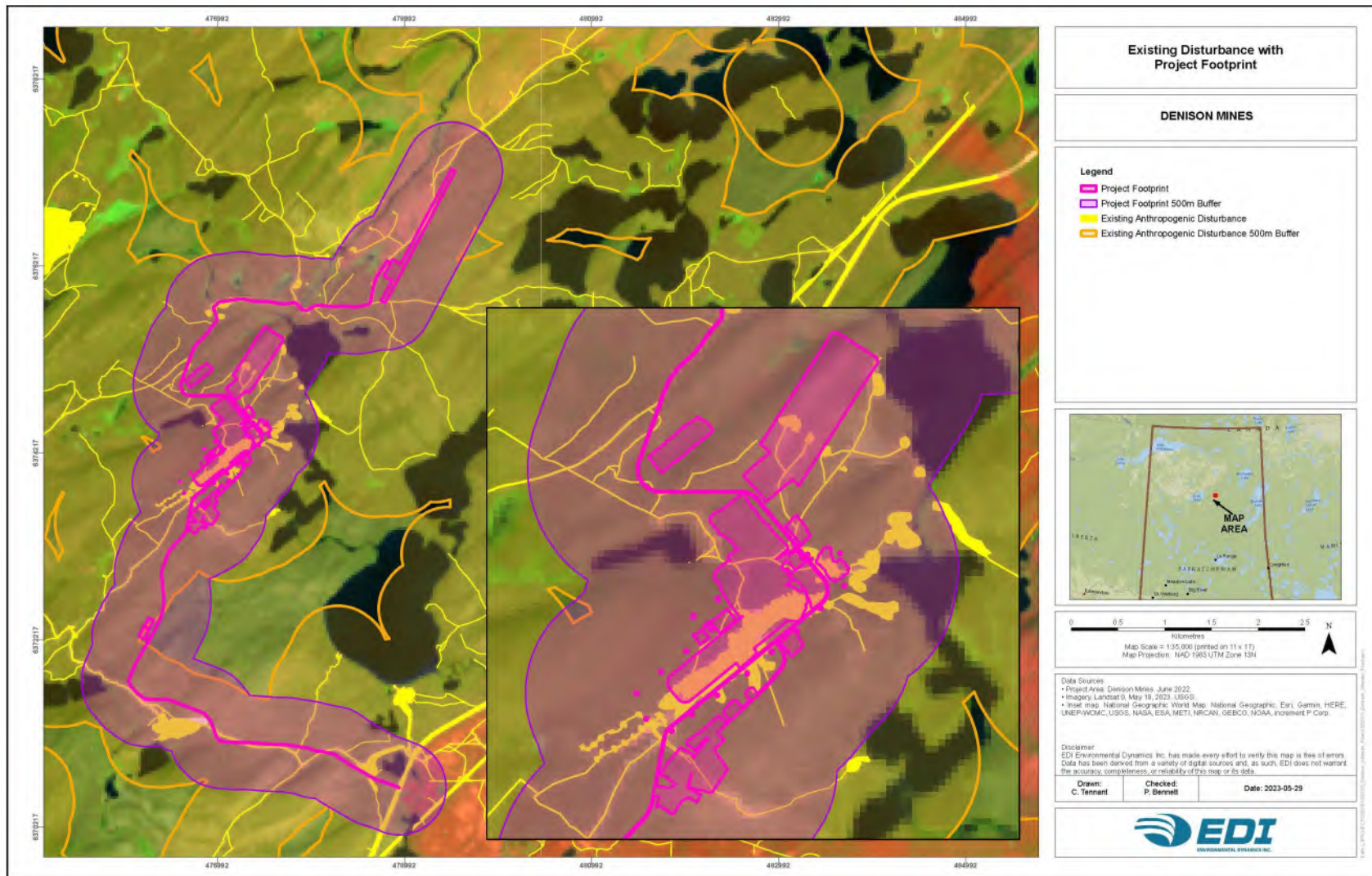
1. Existing anthropogenic disturbance + 500 m: For anthropogenic disturbance calculations to inform the Plan, mapping was completed and evaluated to determine the existing anthropogenic disturbance. Although the EIS considered anthropogenic disturbances on IKONOS imagery at the 1:5,000 scale, the mapping exercise to support habitat loss calculations in the Plan used anthropogenic disturbances visible on Landsat at the 1:50,000 scale, to be consistent with the definitions of disturbed habitat from the amended recovery strategy (ECCC 2020).
2. Fire disturbance in the last 40 years, without buffer: To determine ecosites that were in a regenerating phase or having experienced fire disturbance in the last 40 years, the ecosites BS3/BS7-Jack pine-blueberry/Black spruce-blueberry/lichen were used, based on previous ecosite classification work completed to support the EIS.

#### 5.1.2 Results

As shown in Table 5-1 and Figure 5-1, the proposed Project footprint + 500 m buffer is almost entirely located within existing, buffered anthropogenic disturbance. This means the Project footprint + 500 m buffer is located within already disturbed habitat, according to ECCC (2020). Additionally, the mapping exercise shows that approximately half of the Project footprint + 500 m buffer is located within regenerating forest, i.e., forest burned less than 40 years ago (Figure 5-2).

**Table 5-1: Existing Disturbed Habitat within Buffered Project Footprint**

	Area within Project Footprint + 500 m buffer (1,350 ha)
Existing anthropogenic disturbance (+ 500 m buffer)	1,298 ha
Regenerating forest (fire disturbance in the last 40 years; no buffer)	730 ha



**Figure 5-1: Proposed Project Footprint (+ 500 m buffer) with Existing Anthropogenic Disturbance (+ 500 m buffer) Visible on Landsat at 1:50,000**



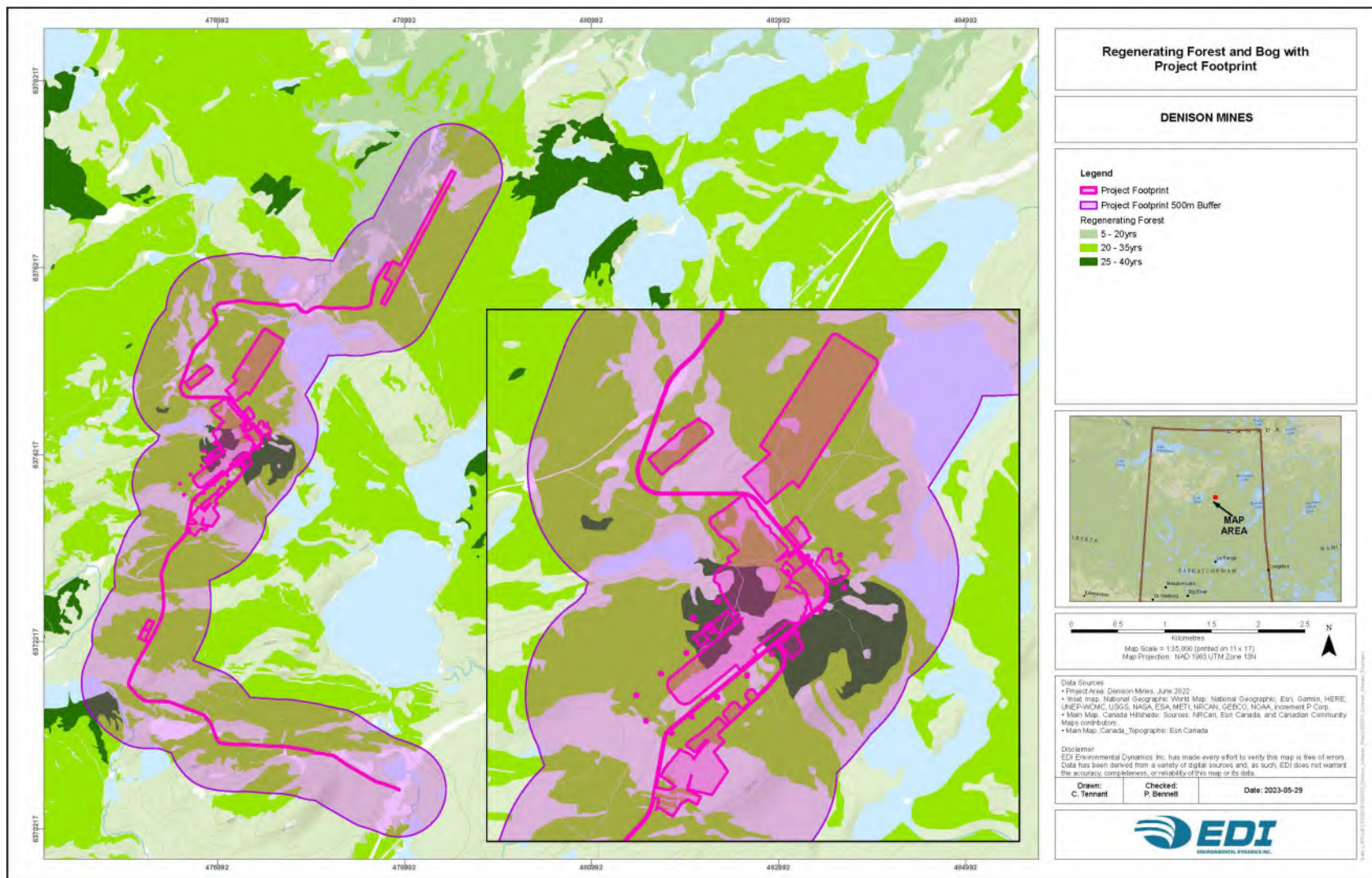


Figure 5-2: Proposed Project Footprint (+ 500 m buffer) with Regenerating Forest

Based on the above analysis using ECCC (2020) criteria, should the Project proceed, the disturbance management threshold for SK1 range would remain unchanged.

Additionally, ECCC (2020) identified the caribou population in the SK1 range as being self-sustaining at a threshold of 40% undisturbed habitat and recommended that total anthropogenic disturbance in the SK1 Boreal Shield range should not exceed 5% with the remainder (i.e., 55%) being attributed to natural disturbance (while maintaining a minimum of 40% undisturbed habitat in the range). ECCC (2020) calculated that approximately 58% of the SK1 Boreal Shield range is currently affected by past forest fires and 3% of the range is affected by anthropogenic disturbances. For additional context, the size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020). The Project footprint + 500 m buffer (1,350 ha) would represent an estimated Project-related disturbance of 0.007% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit.

## 5.2 Direct Loss Calculation

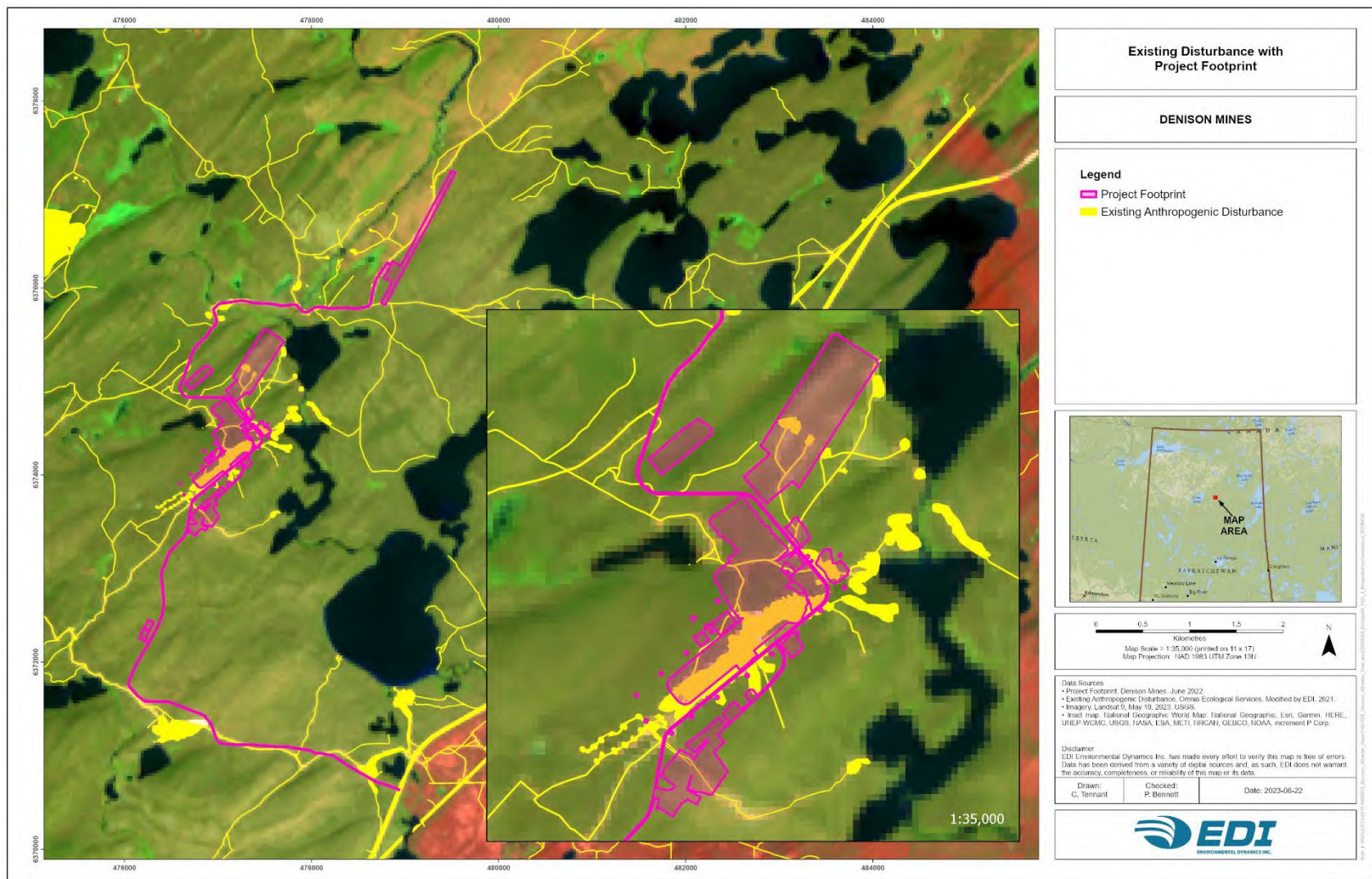
The Project infrastructure footprint has been delineated and the area was determined to be 80 ha. Of this area, 12 ha are comprised of previously disturbed land resulting from past activities (e.g., access, exploration camp and laydown areas). The remainder of the Project footprint is comprised of regenerating forest (forest less than 40 years old) habitat which is typically considered to be low quality habitat for caribou (Figure 5.3).

**Table 5-2: Land Cover Types within the Project Footprint**

	<b>Total Area</b>
<b>Project footprint</b>	80 ha
<b>Existing anthropogenic disturbance</b>	12 ha
<b>Regenerating forest habitat (i.e., low quality caribou habitat)</b>	68 ha

Denison understands that the Project will likely result in a limited residual effect on caribou and their habitat within the RSA; however, these effects are considered to be small in a relative sense when considered in the context of the SK1 range, as described in Section 5.1.





**Figure 5-3: Proposed Project Footprint with Existing Anthropogenic Disturbance Visible on Landsat at 1:50,000**



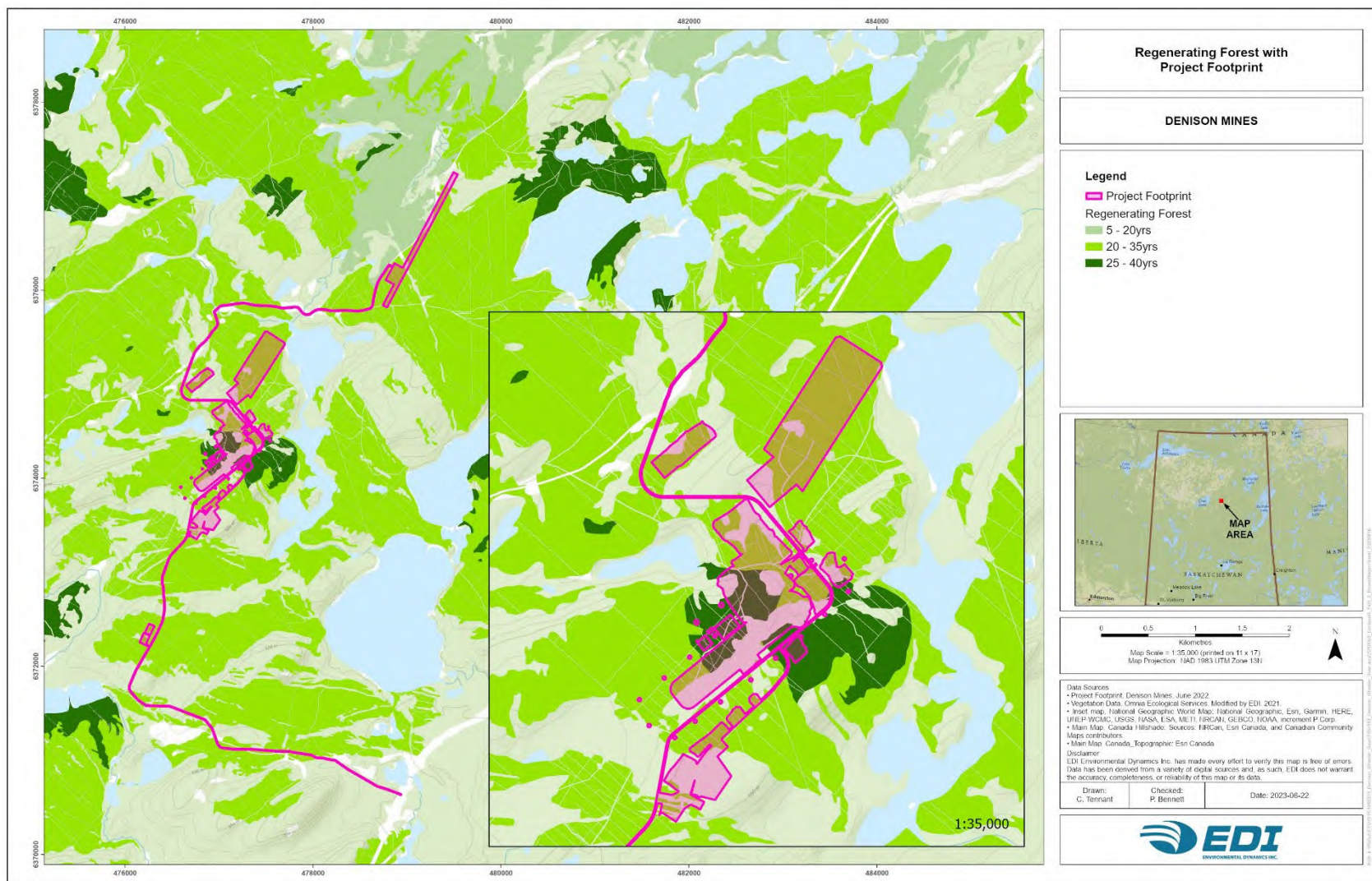
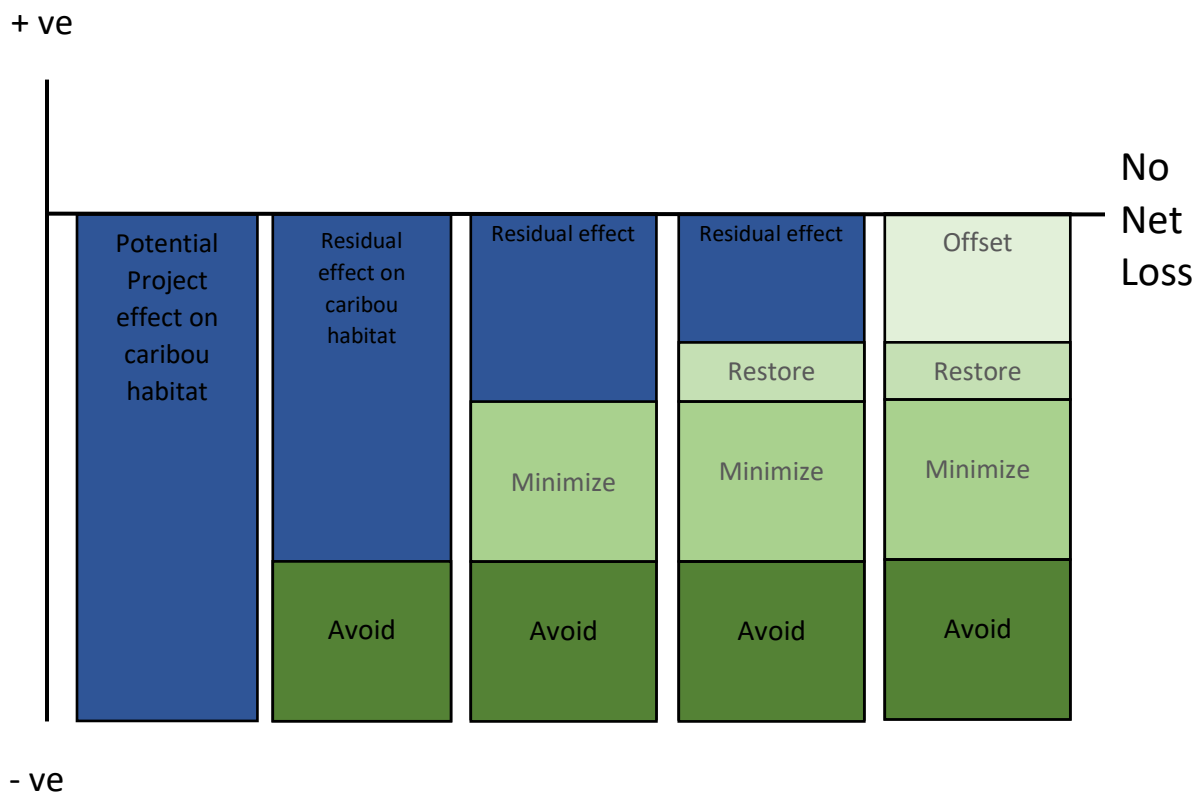


Figure 5-4: Proposed Project Footprint with Regenerating Forest

It is Denison's understanding that currently there are no provisions/requirements for caribou habitat offset by the ENV for projects within the SK1 range. Denison recognizes the importance of woodland caribou to Indigenous groups, the general public, other Interested Parties in Saskatchewan, and Canada. As such, as part of this Plan, Denison is proposing to continue to work with ENV to determine an appropriate offset based on the habitat loss as a result of the Project. Denison expects that the proposed offset calculations would likely include aspects of additionality, temporal considerations, spatial considerations, and other aspects, depending on the expectations/requirements of the caribou habitat offset process that the ENV is currently refining/finalizing. The proposed offset calculations are expected to be refined through ongoing communications with ENV to appropriately address issues at the provincial level related to caribou and habitat.

Future versions of the Plan will include detailed options to develop and advance restoration work and initiatives to provide responsible, proactive environmental stewardship. These offsets (Figure 5-5) are expected to be further refined/defined through Plan updates as the Project proceeds and consultations with ENV advance. Some initial options are presented at a conceptual level in Section 6.



**Figure 5-5: Wheeler River Project Conceptual Caribou Mitigation Plan to Achieve No Net Loss**

## 6 Offset Framework

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This section provides a discussion on offset options will become more defined as the Plan advances, in consultation with ENV. This is expected to offset residual effects over the life-of-the-Project and enhance the restoration activities occurring within the Project footprint to result in no net loss of habitat within the RSA as a result of the Project.

### 6.1 Conceptual Offset Opportunities

An opportunity that Denison has proactively identified is a combined linear feature mitigation and restoration option. Denison has implemented a practical and experimental pilot study to investigate the design, implementation, testing, and monitoring of several functional and structural habitat mitigation options. This opportunity involves two components: 1) applying treatments to address (i.e., reduce) lines-of-sight and discourage linear feature use by both caribou and their predators, and 2) restoration focused on re-establishing terrestrial lichen communities co-established with a biological soil crust (BSC) component.

Importantly, to complete this pilot program, Denison has partnered with the University of Saskatchewan and Northwest Communities Environmental Services (an Indigenous-owned environmental company) under the Developing Eco-Restoration Together (DERT) program. This unique project aims to co-create ecological restoration practices that centre Indigenous peoples, worldviews, and values while also braiding knowledge from the land, Indigenous knowledge, and western science. The project is supported by the three partners but is ultimately guided by the Indigenous Project Advisory Board, and the Community Liaison/Education Coordinator. Through restoration trials, community engagement, and various planting techniques, Denison, with their partners are seeking to return ecosystem functions in areas where they have been previously disturbed (e.g., exploration cutlines). Through collaboration with community members, University of Saskatchewan, industry partners, two graduate students, and local youth, this project is expected to ultimately inform the creation of a framework for effective restoration practices in northern Saskatchewan that centre on caribou and Indigenous communities.

#### 6.1.1 Caribou Trail Study

Wildlife, particularly bears, wolves, and woodland caribou, are using anthropogenic linear features to move throughout their habitat with greater ease. This can result in increased chance encounters between predators and prey and could contribute to the reduction in woodland caribou populations (Omnia 2022). Denison is conducting research on the use of linear features predators and prey in the Athabasca Basin to collect relevant data to inform an effective plan designed to disrupt the current risk related to predator/prey movements/interactions.

Currently, ENV has no guidelines or protocols for assessing the status of disturbance features or for evaluating the need for linear feature mitigation. Denison proactively initiated research to collect field-based findings on the effectiveness of linear disruption features on predator/prey movements in the vicinity of the Project. This field program was designed and implemented to deploy and monitor the effectiveness of five linear feature treatments across nine locations. Treatment types include, seeding and/or planting of jack pine, spreading coarse woody debris, tree tipping, constructing biodegradable fencing, and earth/debris mounding. Methods vary by location but have a common goal: to discourage prolonged disturbance and encourage new growth in areas of disturbance (Omnia 2022). Each

treatment area is monitored by game cameras year-round to determine how wildlife interact with the created physical and visual barriers. All treatments are temporary and biodegradable with the purpose of reducing trail use in the near-term so that the forest can regenerate naturally.

Preliminary results are encouraging and indicate that bear use of treated lines was reduced by 43% compared to untreated lines, caribou use was reduced by 95%, and wolf and moose use was reduced by approximately 94%. Overall, use of treated lines by species of interest was reduced by approximately 83% when compared to baseline monitoring rates. These successful preliminary results will guide future work to define potential offset options associated with linear feature mitigation and restoration.

### **6.1.2 Biological Soil Crust Research**

To support restoration planning, additional research will be designed to investigate BSCs and conducted by a soil science graduate student at the University of Saskatchewan. This research is expected to contribute to the goals of the Developing Eco-Restoration Together Project. BSCs are communities of lichen, bryophytes, cyanobacteria, and microorganisms found in the top layer of the soil (Heindel et al. 2019). These surface soil mats are rich in diversity, and play an important role in the broader ecosystem, especially in locations with extreme climate, little moisture, and nutrient-poor soil (Cowden et al., 2022). Research on BSCs has been focused on desert regions, and this research provides insight to BSC's role in boreal ecosystems, specifically in northern Saskatchewan. By gaining a better understanding of how to support BSC establishment and growth, it is expected that the findings can inform restoration activities that would ultimately benefit caribou.

Sampling of BSCs within the region will be based on a fire chronosequence. This is expected to provide a foundation to better understand the functions and species present in BSCs, and how they develop post-disturbance (Coxson and Marsh 2001). Understanding how these communities develop and interact is important, especially considering the gap in knowledge on soil microbial communities, non-vascular species, and their role in restoration techniques.

A critical element in supporting caribou populations is the consideration of caribou forage lichens. Due to the slow-growing nature of lichens, it can be difficult to include them in restoration activities (McMullin and Rapai 2020). Denison is planning to focus on caribou forage, primarily through transplanting and propagation of the appropriate lichen species. Natural regrowth of lichen communities after fires takes place in a complex setting, where BSCs and bryophyte communities stabilize soil surfaces, providing habitats where lichen propagules can establish and grow (Coxson and Marsh 2001). Denison hypothesizes that reestablishment of terrestrial lichen communities will have a better chance of success where these supporting BSC components can be co-established at the same time. The findings from the BSC research within post-fire environments is expected to support lichen communities, restoration activities for the DERT project, and ultimately caribou and caribou habitat within the Wheeler River Project area.



## 7 Monitoring and Adaptive Management Framework

An adaptive management framework will be developed to support the implementation of this Plan (Figure 7-1). In this context the adaptive management framework provides the means for the integration of Plan scope, management, and monitoring to systematically evaluate assumptions to adapt and learn. In practical terms the framework will consider the outcomes of actions taken/implemented, whether they have been successful and, if not, how can such actions be adapted to increase the likelihood of success. Outcomes of the Plan would be measured by establishing performance indicators as the way to define and measure progress toward achieving the objectives.

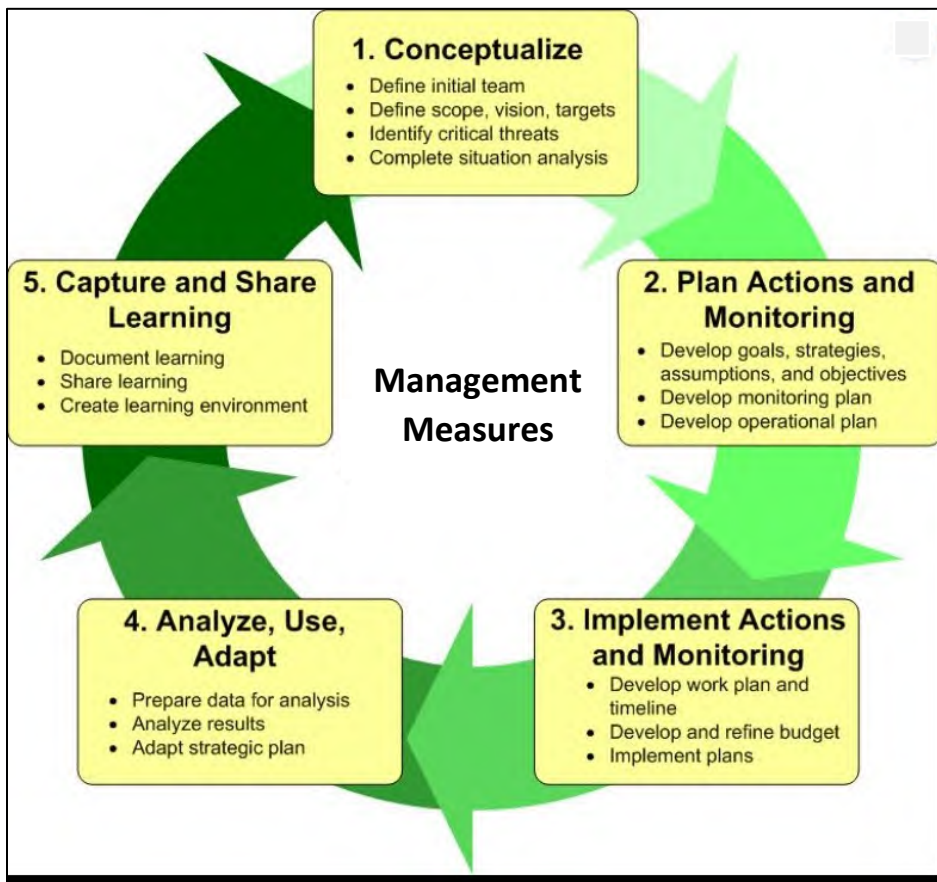


Figure 7-1: Adaptive Management Cycle

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## Attachment: IR-150

Number	IR-150
Dept.	ECCC
Project effects link	Wildlife and Wildlife habitat
Reference to EIS, appendices, or supporting documentation	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan
Context and Rationale	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>
Information Requirement	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.

### Response:

The requested report titled *Pilot Program: Linear Feature Mitigation Interim Report- Status Update and Preliminary Results* is included below.

**Denison Mines Corporation  
Wheeler River Project**

**Pilot Program: Linear Feature Mitigation  
Interim Report- Status Update and Preliminary Results**

*Prepared for:*

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November 2022  
Omnia Project ID: 2103-01

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Denison Wheeler River Project.

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## 1 INTRODUCTION

Federal and provincial planning documents and woodland caribou (*Rangifer tarandus caribou*) population assessments have indicated that much of the Saskatchewan woodland caribou population is at risk from landscape-level disturbance. There exist no guidelines for evaluating reclamation requirements or outlining what the criteria for reclamation are. Omnia Ecological Services (Omnia) has been engaged by Denison Mines Corporation (Denison) to continue to support the project application (e.g., assessment of impacts and regional mapping/inventory) with respect to reclamation/offset planning to assist with developing potential woodland habitat reclamation selection and criteria protocol through the use of cost effective and practical functional habitat restoration/mitigation options. If successful, these mitigation techniques could be deployed at a larger scale within the SK Boreal Shield and may assist government in developing mitigation/reclamation criteria.

A pilot project of potential mitigation options to disrupt predator-prey movement patterns on linear features by creating a physical, visual, and/or line-of sight barriers has been deployed at 12 sites within the Wheeler River study area ([Figure 1](#)). Detailed background information and full details of site-specific treatments, including preliminary planning and consultation, can be accessed in Omnia (2022). Also included in that report are preliminary findings from the first five months of monitoring.

The objectives of this interim report are to outline preliminary results gathered from monitoring data thus far (year 1) and outline program follow-up requirements and recommendations for future consideration.

## 2 MONITORING

A site visit was completed in May 2022 as part of the planned bi-annual inspection/data collection with the following objectives:

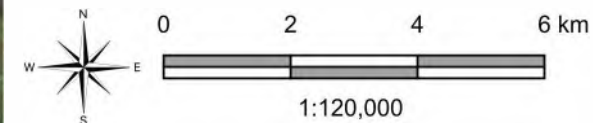
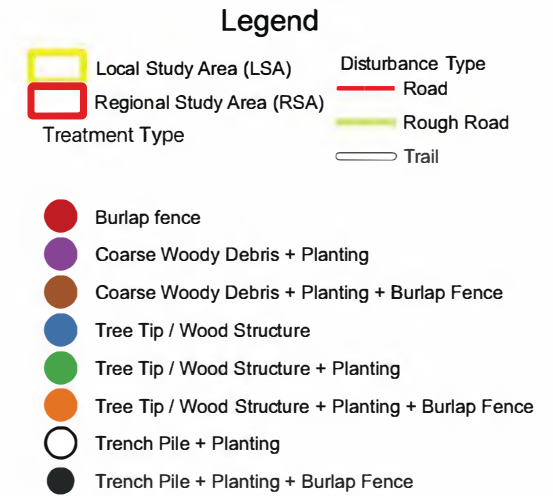
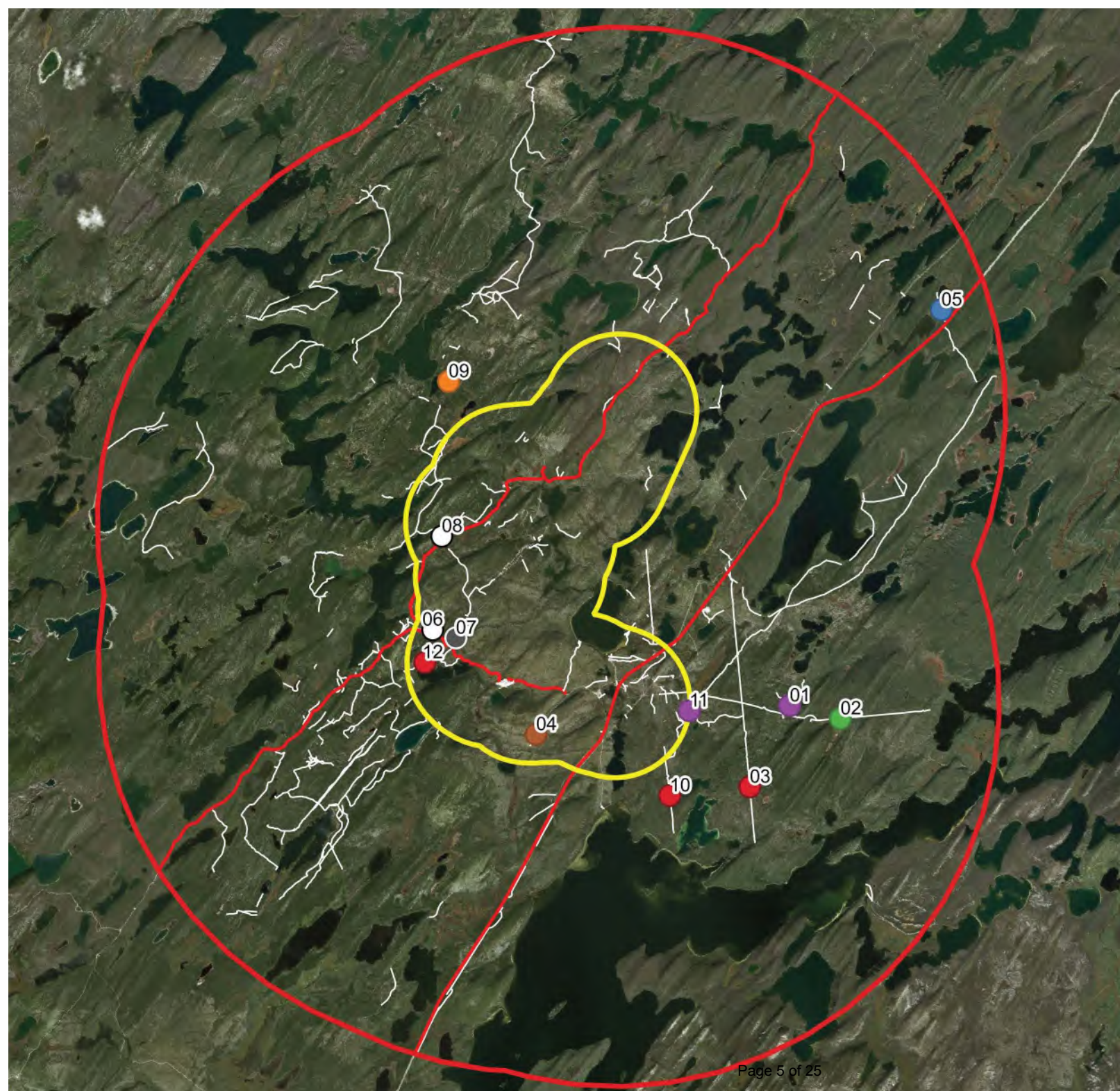
- Revisit and check the status of all 12 treatment sites.
- Make any repairs or modifications as required.
- Remove and replace covert camera memory cards to collect wildlife use data collected since deployment.
- Replace covert camera batteries to support ongoing monitoring.
- Measure height and assess health status of planted Jack pine seedlings.

### 2.1 Methods

The linear feature mitigation sites were visited from May 24-25, 2022. Photographs were taken at each site and notes were taken on overall conditions of the installation, durability, effect of snow cover/melt, issues encountered, and modifications or repairs conducted. Any signs of wildlife use in the area were also noted (i.e., tracks, pellets). Covert camera cards were replaced and camera setups were adjusted where required to prevent unnecessary false trigger events (such as from burlap flapping in the wind). All camera batteries were replaced. Camera photographs were retrieved and analyzed for wildlife use along the 12 treated linear features (LFs) and six reference/untreated parallel linear features.



Figure 1. Installed mitigation features for the linear feature reclamation and mitigation trial.  
- Denison Wheeler River Project





For treated and untreated LFs, each wildlife trigger event was characterized as a “use” event if the animal appeared to be travelling on the line and/or displaying non-avoidance behavior, such as approaching/interacting with the burlap or other treatment features. Behavior such as crossing the LF, traveling in the adjacent forest, or paralleling the LF was characterized as “non-use” of the LF. Cameras were programmed to take five photographs per trigger event, often allowing for movement trajectory to be determined. However, if field of view was limited, body language and movement cues of the animals were used to best determine appropriate categorization, such as angle of head/body, no assumption of sharp turns, etc. Photograph analysis findings were compared to results gathered from multi-year baseline linear feature camera monitoring across the project area, and between treated and reference sites. Effects of treatments on wildlife use of LFs was then analyzed across all species of interest and between individual species types.

Each seedling that was planted when treatments were installed in July 2021 was measured for height, and a relative health score was assigned to each seedling: 1=healthy, 2=average, 3=poor 4=dead/missing. Evidence of browsing events by wildlife were also recorded.

## 2.2 Results

### 2.2.1 Treatment Visits

[Table 1](#) summarizes the overall status of the treatment types, wildlife sign observations and modifications completed. Coarse woody debris (CWD) treatments maintained reasonable coverage and withstood snow pack/snowmelt ([Photograph 1](#)). Tree hinging/structures treatments were holding up very well and only a few structures/tree hinges had fallen over and needed reinforcing ([Photograph 2](#)). Needles on the trees that were hinged were yellowing but remained intact ([Photograph 3](#)). Trench and pile treatments were holding up very well and didn't appear compressed following the winter snow ([Photographs 4](#)). Burlap installations, both on their own and when combined with other treatment types, required minimal repairs ([Photograph 5](#)).

Repairs consisted of:

- Replacement of ripped/ deteriorating burlap panels
- Replacing wooden lath ripped off by a bear (Site 10, [Photograph 6](#))
- Adding screws and staples to reinforce, where required

### 2.2.2 Wildlife Photograph Analysis

#### *Overall*

Photographs were analyzed from 18 different cameras totaling 4,861 camera days. One hundred-ninety-four (194) detections were recorded of 13 different species, averaging four detections per 100 cameras nights. The most commonly detected species from all cameras, treatment and reference, was snowshoe hare with 56 detections, followed by woodland caribou with 44 detections, and black bear with 25 detections ([Table 2](#)). [Table 2](#) summarizes the detections rates of species of interest (caribou, moose, black bear, wolf) by treatment type / reference linear feature. Detection rates of species of interest and human (ATV) use were compared with baseline covert camera results from multi-year linear feature monitoring conducted in the Denison Wheeler

River study area ([Table 2a](#)). Results were separated into desired non-use and use of linear feature type (treated versus untreated monitoring/reference trails). The results for trails (approximately 5m wide) were included for direct comparison and data from hand-cut lines and roads were excluded. A similar comparison was completed for treatments where no burlap was present, either on its own or in combination with other blocking techniques ([Table 2b](#)). This was to assess for trends without the potential wildlife attractant effects of the burlap. When treatments including burlap were included in the analysis, detection rates of all species of interest on treated lines are less than those of multi-year linear feature monitoring in the area. Bear use of treated lines was reduced with 61% compared with untreated lines, moose use was reduced with a 92%, and caribou use was reduced with 94% ([Table 2a](#)). No wolves were detected using treated lines. Overall use of treated lines by species of interest was reduced by approximately 85% when compared to monitoring rates. When installations including burlap are excluded from analysis, the reduction in detection rates along the treated sites are even more pronounced. No bears or wolves were observed using treated lines, while only a single caribou and moose were detected using treated lines.

#### *Treatment Sites*

[Figures 2 and 3](#) highlight the relative effectiveness of the individual treatment types on wildlife species of interest detections and their use of the treated linear features. Non-use of the treated line by wildlife via travel in the adjacent forest, crossing, or paralleling the line was the desired effect and was therefore rated as positive. Use of a treated LF via traveling down the line/interacting with the treatment features was an undesired effect and was therefore rated as negative.

[Figure 2](#) shows the results of the treatments for all species of interest combined. CWD treatment sites had the most wildlife detections (20) of three species, (bear, caribou and moose) and all interactions were positive (non-use of the line). Tree hinging/structures had ten detections of bear and caribou, 92% of these interactions were rated as positive. Trench and pile treatments had three moose detections; two thirds positive. Trench and pile + burlap had a split response between bears (all use) and moose (all non-use). CWD + burlap and burlap only had all negative interactions.

[Figure 3](#) shows the results of the treatments for each species of interest. Caribou showed positive interactions (avoidance) with CWD and tree hinging/structures (100% and 83% of detections, respectively) and a negative interaction with burlap (100% of detections). Moose response to CWD and trench and pile + burlap was 100% positive, and was two-thirds positively associated with trench and pile. Black bears responded positively to CWD and tree hinging/structures, and negatively to CWD + burlap, trench and pile + burlap, and burlap only. Wolf responded negatively to burlap.

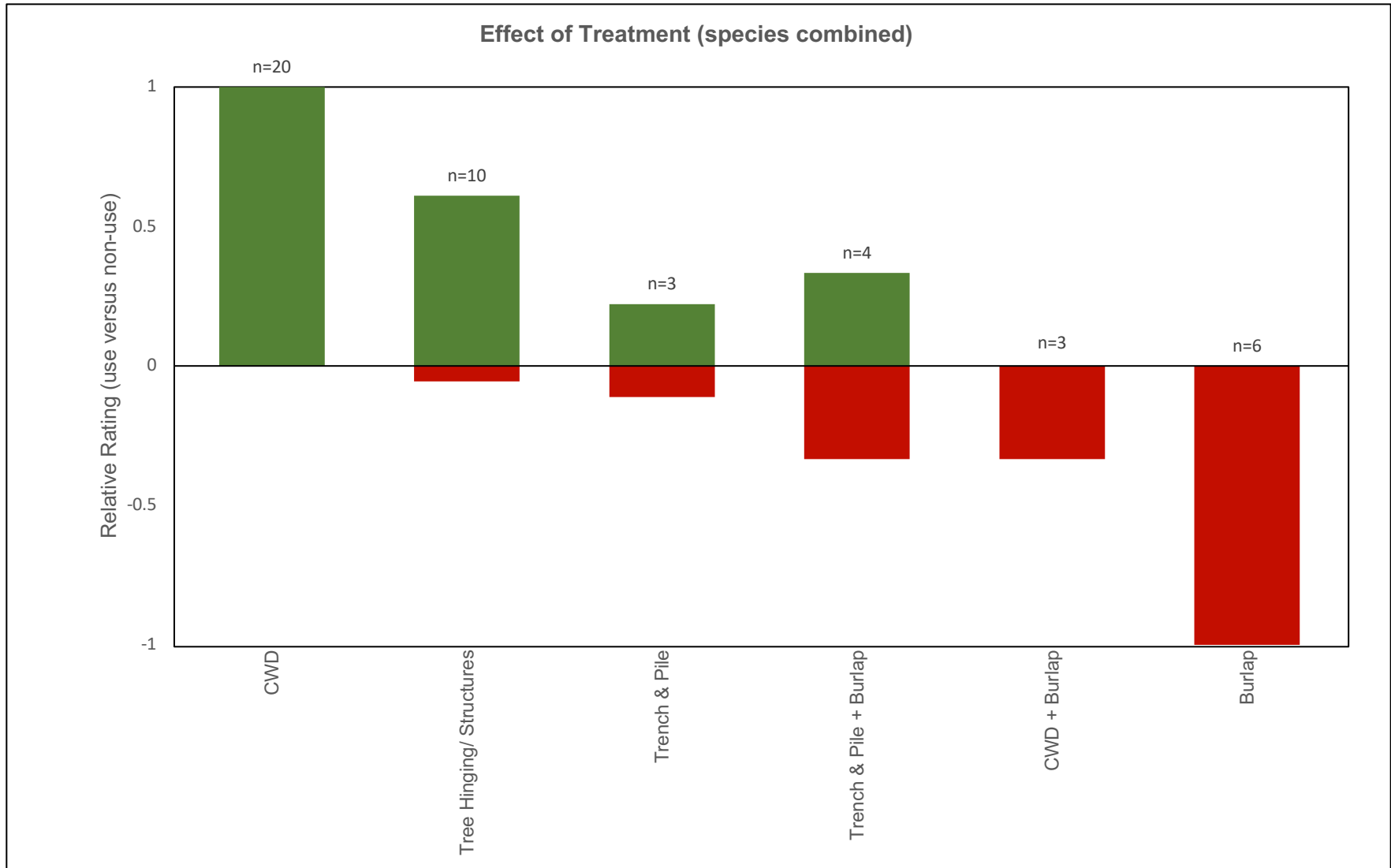


Figure 2. Wildlife detections by treatment type, all species combined (caribou, moose, black bear and wolf). Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

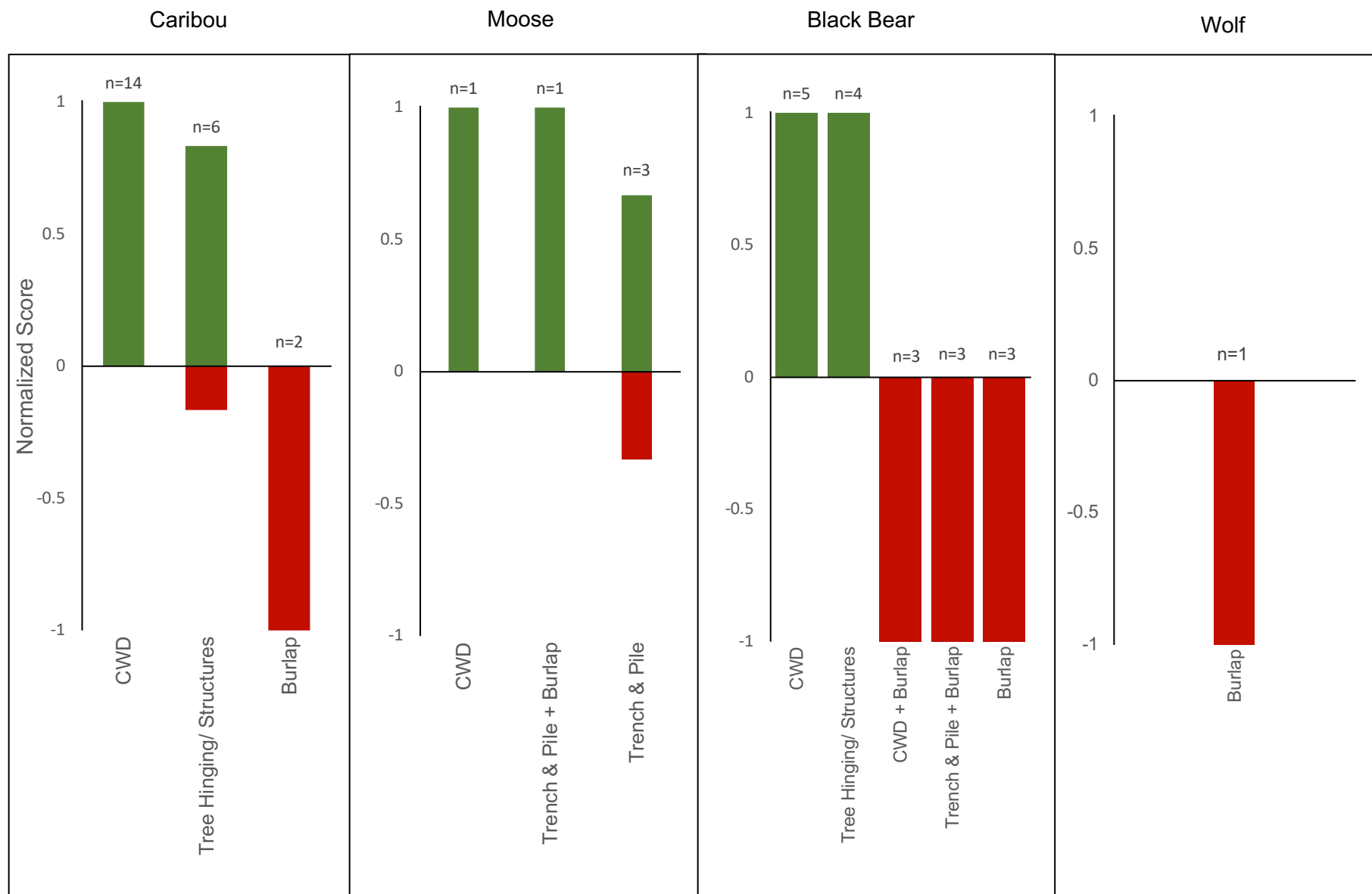


Figure 3. Caribou, moose, black bear and wolf detections by treatment type. Green/positive indicates desired avoidance of the treated LF; red/negative indicates undesired use of treated LF.

### 2.2.3 Seedling Health Assessment

A total of 476 seedlings were counted and measured, out of the initial 500 planted. Seedling height averaged 15cm (range 12-18cm) when planted and average height when measured in May 2022 was 18.8 cm ([Table 4.](#)). Average health status was 1.8. [Photograph 7](#) illustrates representative examples of each health status, ranging from 1-4, healthy, average, poor, and dead, respectively. Mortality/loss averaged 4.8%.

## 3 SUMMARY PRELIMINARY CONCLUSIONS – Year 1

- Detection rates of all species of interest on treated lines (including burlap) are less than those of multi-year linear feature monitoring in the area (bears 61% reduction, moose 92% reduction and caribou 94% reduction; no wolves). When burlap is removed from analysis, the frequency of detection on treated lines is further reduced (no bears or wolves; only 1 caribou and 1 moose)
- CWD, tree hinging/structures, and trench & pile treatments elicited all/mostly positive avoidance responses from species of interest.
- Burlap, when used alone or in combination with other treatments, elicited the most negative responses from species of interest. Although preliminary, early results indicate that burlap may act as an unwanted attractant for curious wildlife or is not perceived as a barrier to species movement ([Photograph 8](#)).
- Burlap remains the most labor-intensive treatment in terms of maintenance and repairs required.
- Overall planted seedling health was strong and growth progression is promising.

## 4 NEXT STEPS

- Continuation of multi-annual site visits to monitor the status of treatment types, make repairs or adjustments as necessary.
- Continuation of multi-annual inspection/service and data collection of covert cameras and analysis of covert camera photographs.
- Assess potential impacts of a 2022 forest fire on several treatment locations/cameras and determine suitability for continued monitoring and/or redeployment.
- Analysis of potential snow depth/weather effects on wildlife activity over time are anticipated as more winter data is collected.
- Evaluate seedling status once again in 2023 to ensure status.
- Verify tree-hinge/structure counts to ensure replicability at other sites.
- Quantify coarse woody debris (CWD) stem counts and volume estimates to ensure replicability at other sites.
- Monitoring is ongoing and an increased monitoring period, and associated sample size, will facilitate further analysis, including potential use of statistics.



## TABLES

**Table 1. Summary of treatment status, observations, and modifications.**

<b>Treatment</b>	<b># Linear Features</b>	<b>Overall</b>	<b>Wildlife Sign</b>	<b>Modifications</b>
CWD	2	Holding up well after snow melt, minor compression	Faint caribou tracks at start of treatment, appear to deflect away from treatment; other caribou tracks on edge	none
CWD + Burlap	1	CWD holding up well, burlap corners lifted	none	reinforced burlap
Tree Hinging/ Structures	3	In great shape; needles on tree hinges yellowing but intact	none	Lifted/ reinforced a few structures/hinges that had fallen
Trench & Pile	2	Holding up very well, no compression	moose tracks avoid treatment and stay on parallel trail	none
Trench & Pile + Burlap	1	Trenches in good shape, burlap had a few holes	none	replaced 2 burlap panels
Burlap	3	Repairs made in December 2021 held up well, minor repairs needed	none	reinforced stakes pulled off by a bear, added more screws/ fixed burlap holes where needed

**Table 2. Wildlife detection results by treatment type/ reference.**

Treatment	# Linear Features	Camera Days	Detections/ 100 Camera Nights												ATV	Comments
			Bear			Caribou			Wolf			Moose				
			Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total	Non-Use	Use	Total		
CWD	2	613	0.82	0	0.82	2.28	0	2.28	0	0	0	0.16	0	0.16	0	-
CWD + Burlap	1	306	0	0.98	2.27	0	0	0	0	0	0	0	0	0	0	-
Tree Hinging/ Structures	3	745	0.54	0	0.54	0.67	0.13	0.81	0	0	0	0	0	0	0	-
Trench & Pile	2	610	0	0	0	0	0	0	0	0	0	0.33	0.16	0.49	0	-
Trench & Pile + Burlap	1	305	0	0.98	0.98	0	0	0	0	0	0	0.33	0	0.33	0	-
Burlap	3	622	0	0.48	0.48	0	0.32	0.32	0	0.16	0.16	0	0	0	0	-
TOTAL Treatments	12	3201	0.28	0.28	0.56	0.59	0.09	0.69	0	0.03	0.03	0.12	0.03	0.16	0	-
TOTAL Reference	6	1660	0.24	0.18	0.42	0.60	0.72	1.33	0	0.18	0.18	0	0.12	0.12	1.02	removed site 6 reference camera Dec2021

**Table 3a. Comparison of caribou mitigation trial covert camera wildlife detections with baseline linear feature wildlife use inventory results.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	3201	9	0.28	19	0.59	1	0.03	4	0.12	33	1.03	89	2.78	0	0.00
	Treatment- Use		9	0.28	3	0.09	0	0.00	1	0.03	13	0.41	39	1.22	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc

**Table 3b. Comparison of caribou mitigation trial covert camera wildlife detections with linear feature monitoring results, all burlap installations excluded.**

Denison Program	Associated Feature	Total Camera Days	Bear		Caribou		Wolf		Moose		Species of Interest (bear, caribou wolf, moose)		All Animals*		ATV	
			Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days	Total	/100 cam days
Caribou Mitigation Trial	Treatment- Non-Use	1837	9	0.49	19	1.03	1	0.05	3	0.22	32	1.74	83	4.52	0	0.00
	Treatment- Use		0	0.00	1	0.05	0	0.00	1	0.05	2	0.11	19	1.03	0	0.00
Covert Camera Monitoring 2019-2021 + Reference Cameras	Trail- Use	6115	44	0.72	95	1.55	18	0.29	22	0.36	179	2.93	509	8.32	122	2.00

\*includes mesocarnivores, small mammals, hares, birds, etc.

**Table 4. Seedling health assessment results.**

Plot ID	Treatment	# Planted July 2021	# Seedlings May 2022	Average Height (cm)	Average Status <sup>a</sup>	% browsed	% Missing / Dead	Comments
1	CWD	65	61	19.9	1.5	36.1	6.2	
2	Tree Hinging/Structures	70	67	12.3	2.4	97.0	4.3	
4	CWD + Burlap	65	62	17.9	1.9	14.5	4.6	
6	Trench & Pile	60	57	22.2	1.54	33.3	5.0	
7	Trench & Pile + Burlap	60	60	21	1.2	1.7	0.0	
8	Trench & Pile	60	59	22.3	1.3	32.2	1.7	
9	Tree Hinging/Structures	60	53	12.7	2.2	88.7	11.7	lost ~5 due to burlap log being cut down and landing on seedlings
11	CWD	60	57	21.8	2	75.4	5.0	
<b>Total / Average</b>		<b>500</b>	<b>476</b>	<b>18.8</b>	<b>1.8</b>	<b>47.4</b>	<b>4.8</b>	

a: 1= healthy, 2=average, 3=poor, 4=dead

## REFERENCES

Omnia Ecological Services. 2022. Linear Feature Mitigation Trial. Project Update Report. Prepared for Denison Mines Corporation. 58pp.



## FIELD PROGRAM PHOTOGRAPHS



Photograph 1. Status of CWD treatment May 2022.





Photograph 2. Status of tree hinge/structures treatment May 2022.





Photograph 3. May 2022 status of needles on tree that was hinged.





Photograph 4. Status of trench & pile treatment May 2022.





Photograph 5. Burlap repairs May 2022, before and after.





Photograph 6. Wooden lath removed by bear.





Photograph 7. Seedling health assessment examples 1-4, left to right, respectively.





Photograph 8. Burlap challenges with wildlife.

## Attachment: IR-165

Number	IR-165
Dept.	CNSC ECCC
Project effects link	Birds (all species)
Reference to EIS, appendices, or supporting documentation	<p>Section 9.4.4.2.2</p> <p>Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment</p> <p>Appendix 10-A (ERA)</p>
Context and Rationale	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p> <p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkowsky Lake.</p> <p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>
Information Requirement	Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:

	<p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p> <p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p>Suggestions for mitigation and follow-up measures: CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>
--	--

Response:

**Water Management Context and Risk of Exposure**

Details on water management and treatment facilities are provided in Section 2 Project Description, Section 2.2.3 Water Management. Importantly, the Project does not include a tailings management facility because of the nature of the proposed mining and processing methods. A summary of water management plans is provided herein; please refer to the marked-up Figure 2.2-15 below.

Clean, non-contact runoff will be diverted around Project components where possible. Contact water will be collected in various ponds and routed to the process water pond (shown in yellow in figure below). These contact water management ponds have been designed to manage event driven runoff and are not intended to be “wet” ponds. That is, the contact water ponds are not designed to hold standing water for long periods of time; rather, they would contain / manage runoff volumes up to the design event and subsequently be pumped down to ensure ongoing management capacity. As a result, the quality of water in these ponds is expected to be relatively good as it would largely comprise precipitation and runoff from natural surfaces.

Additionally, given the design basis of the contact water management ponds (i.e., they are not wet ponds that are meant to hold water at all times), birds and wildlife are not likely to interact with them in a material fashion from a contaminant exposure perspective.

Considering the Project design, the ponds with potential to contain water for any period of time in consideration of potential temporary use by avian species are:

- the process water pond, and the
- effluent monitoring and release ponds.

Process water pond

The process water pond can hold up to 30,000 m<sup>3</sup> of water. It will be a central pond collecting water from a variety of areas, including:

- water from the wash bay (shown in green in figure below),

- water from the domestic wastewater treatment plant,
- water from the dewatering of IWWTP precipitates (non-radioactive, gypsum type material), and
- precipitation-related contact water (shown in yellow in figure below; includes water from the wellfield runoff pond, clean waste rock pond, process precipitate pond, and landfill leachate collection [which is expected to be primarily surface contact water during the Operation phase]).

Water in the process water pond can be used directly in the processing plant or be directed to the industrial wastewater treatment plant (IWWTP) for treatment prior to release to Whitefish Lake. The majority of the flows into the process water pond during Operation (approximately 61% or 10.7 m<sup>3</sup>/hour out of total 17.5 m<sup>3</sup>/hour) are contact waters. As noted above, the quality of the contact water is expected to be relatively good given its sources. As such, a screening was conducted to evaluate the main non-contact water input to the pond, namely the water from the IWWTP precipitate pond. This input represents about 20% of the expected inflow to the process water pond and using this as an estimate for quality of the entire pond is considered conservative.

#### Effluent monitoring and release ponds

The effluent monitoring and release ponds will receive treated water from the IWWTP. Each of the three ponds will have capacity for 3,300 m<sup>3</sup> of water and a composite liner system. The ponds have been designed to hold effluent for a period of 80 hours for testing before discharge to the environment. Having three ponds allows for increased operational flexibility, as one pond can be undergoing maintenance when required. A minimum of two ponds are required to be operational at all times to make sure all effluent released to surface water meets federal and provincial discharge limits. Each pond will be operated with the following stages: 1) filling, 2) holding while awaiting quality confirmation; and 3) releasing to Whitefish Lake once water quality is confirmed to meet discharge limits. There is potential for wildlife to be in contact for short periods of time with the ponds during the holding stage. Table 2.2-1 outlines the upper bound effluent quality proposed for the Project.

In addition to the above that considers where exposure to water management facilities could reasonably occur on the Project site, the following is also relevant as it concerns the likelihood that such exposure would occur. During construction and operations, bird and other wildlife species are expected to avoid the Project Area and Local Study Area (LSA) because of sensory disturbance from project activities that generate noise, artificial light, vibration, dust, etc. and the presence of workers (Adams et al. 2019, Habib et al., 2007; Narins, 1990). While some habituation to sensory disturbance is anticipated that could result in individuals of some species returning to the LSA, generally it is expected that many individuals will be displaced into available habitat elsewhere outside the LSA in the Regional Study Area (RSA). The LSA is not within a major flyway and the LSA currently provides limited waterfowl habitat relative to the neighbouring parts of the RSA. Overall, based on these considerations we characterize the likelihood of bird and other wildlife species exposures to water management facilities on the site as low.

#### **Potential Toxicity to Aquatic Migratory Birds and Species at Risk (SAR)**

A comparison of the expected water quality from the IWWTP precipitate pond, a conservative representation of the process water pond, to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines (WQG) for the protection of livestock and considered protective of



animals potentially exposed to contaminated waste ponds on the Project site was completed. This comparison shows that the expected IWWTP precipitate pond water quality was below the CCME WQG for the protection of livestock for most constituents except selenium (**Table IR 165-1**), and as such, risks to birds, species at risk and other wildlife that may contact or ingest this water are not expected for those constituents below the CCME WQG protective of livestock.

Oviparous birds and fish are the most sensitive to selenium in aquatic environments with toxicity to birds and fish being associated with organic selenium primarily in the diets and tissues of exposed biota.<sup>3</sup> Selenium toxicity to these organisms is manifested through the maternal transfer of selenium which may cause embryotoxicity and teratogenicity<sup>4</sup>. Considering the mitigation measures described below to deter avian use of the ponds, including vegetation management such as managing areas around the waste ponds being free of vegetation to limit the attraction of waterfowl and other wildlife to these areas for foraging and/or breeding, potential risks to avian birds exposed to selenium at this pond would be low.

A CCME WQG protective of livestock was not available for antimony, barium, iron, manganese, silver, strontium, tin and titanium. Potential risks to avian species are unlikely for silver and titanium as these parameters were not detected in the IWWTP precipitate pond. Avian species and wildlife are not expected to be at increased risk for antimony, barium, iron, manganese, strontium and tin because the IWWTP precipitate pond water concentrations for these parameters represents about 20% of the expected inflow to the process, and the mitigation measures, discussed below, to deter avian species and wildlife from these ponds, will reduce the receptor's exposure to these constituents.

**Table IR165-1: Comparison of Expected IWWTP precipitate pond Water Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Aluminum, dissolved	mg/L	0.018	5
Antimony, dissolved	mg/L	0.0007	NV
Arsenic, dissolved	ug/L	0.4	25
Barium, dissolved	mg/L	0.097	NV
Beryllium, dissolved	mg/L	<0.0001	0.1
Boron, dissolved	mg/L	0.36	5
Cadmium, dissolved	mg/L	0.00045	0.08
Chromium, dissolved	mg/L	0.0064	0.05
Cobalt, dissolved	mg/L	0.0002	1
Copper, dissolved	mg/L	0.0021	0.5 <sup>a</sup>
Iron, dissolved	mg/L	0.001	NV
Lead, dissolved	mg/L	<0.0001	0.1
Manganese, dissolved	mg/L	0.0012	NV

<sup>3</sup> Young, T.F., Finley, K., Adams, W., Besser, J., Hopkins, W.A., Jolley, D., McNaughton, E., Presser, T.S., Shaw, D.P., & Unrine J.(2010). What You Need to Know about Selenium. In: P.M. Chapman, W.J. Adams, M.L. Brooks, C.G. Delos, S.N. Luoma, W.A. Maher, H.M. Ohlendorf, T.S. Presser & D.P. Shaw (Eds.), Ecological Assessment of Selenium in the Aquatic Environment. Boca Raton (FL): CRC. p 7–45.

<sup>4</sup> Ibid

Constituent	Unit	C1-ETS2-SN	CCME Protection of Livestock
Molybdenum, dissolved	mg/L	0.018	0.5
Nickel, dissolved	mg/L	0.0004	1
Selenium, dissolved	mg/L	0.19	<b>0.05</b>
Silver, dissolved	mg/L	<0.00005	NV
Strontium, dissolved	mg/L	4.1	NV
Thallium, dissolved	mg/L	0.0007	1
Tin, dissolved	mg/L	0.0044	NV
Titanium, dissolved	mg/L	<0.0002	NV
Uranium, dissolved	ug/L	25	200
Vanadium, dissolved	mg/L	0.0064	0.1
Zinc, dissolved	mg/L	0.0027	50

Notes:

NV – no CCME WQG

a- lowest value between the sheep, cattle, swine and poultry value

**Bold indicates that the predicted water quality exceeds the CCME WQG for protection of livestock.**

A comparison of the proposed effluent quality in Table 2.2-1 of the EIS to the CCME WQG for the protection of livestock was also completed. This comparison shows that the proposed effluent quality was below the CCME WQG protective of livestock for most constituents except molybdenum and sulphate (**Table IR 165-2**). As such, birds, species at risk and other wildlife that may contact or ingest the proposed effluent quality are not expected to be at increased risk for those constituents below the CCME WQG protective of livestock.

**Table IR165-2: Comparison of Proposed Effluent Quality to the CCME WQGs for the Protection of Livestock**

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
<b>General Chemistry</b>			
Chloride	mg/L	600	NV
Sulphate	mg/L	3915	<b>1000</b>
Total Dissolved Solids	mg/L	6420	NA
<b>Metals and Metalloids (Dissolved)</b>			
Arsenic	mg/L	0.006	0.025
Cadmium	mg/L	0.0018	0.08
Chromium	mg/L	0.025	0.05
Cobalt	mg/L	0.003	1
Copper	mg/L	0.022	0.5 <sup>a</sup>
Molybdenum	mg/L	2.5	<b>0.5</b>
Selenium	mg/L	0.042	0.05
Uranium	mg/L	0.057	0.2
Zinc	mg/L	0.042	50
<b>Radionuclides</b>			

Constituent	Unit	Proposed Effluent Quality	CCME Protection of Livestock
Uranium-238	Bq/L	0.7	0.2 <sup>b</sup>
Uranium-234	Bq/L	0.7	95 <sup>b</sup>
Thorium-230	Bq/L	0.9	22 <sup>b</sup>
Radium-226	Bq/L	0.15	13.5 <sup>b</sup>
Lead-210	Bq/L	0.419	8 <sup>b</sup>
Polonium-210	Bq/L	0.15	7 <sup>b</sup>

Notes:

NV – no CCME WQG

NA- not applicable.

a - lowest value between the sheep, cattle, swine and poultry value

b - US DOE Standard (2019) for aquatic biota, including riparian animals

**Bold indicates that the proposed effluent quality exceeds the CCME WQG for protection of livestock.**

For molybdenum and sulphate increased risks to avian species and wildlife exposed to effluent in the ponds are not expected as the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the potential receptor's exposure to these constituents.

A CCME WQG protective of livestock was not available for chloride and for the radionuclides. Avian species and wildlife are not expected to be at increased risk to those constituents without a CCME WQG protection of livestock because the mitigation measures, discussed below, to deter avian species and wildlife from the ponds, will reduce the receptor's exposure to these constituents.

A comparison of the proposed effluent quality for radionuclides to the US Department of Energy (DOE) Standard<sup>5</sup> for *a graded approach for evaluating radiation doses to aquatic and terrestrial biota* (Table IR165-2), that is protective of wildlife exposed to radionuclides, suggests that wildlife are not expected to be at increased risks to these radionuclides, as the proposed effluent quality for these radionuclides were below the US DOE Standard. As such, increased risk are not expected to avian species, species at risk and other wildlife exposed to constituents in contaminated waste ponds on the Project site.

## Mitigation Measures

Mitigation measures outlined in the draft EIS to minimize the potential for avian exposure to pond water include:

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential avian issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on avian species and their habitat.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.

<sup>5</sup> US Department of Energy. 2019. DOE Standard: A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. U.S. Department of Energy, Washington, DC. DOE-STD-1153-2019.

- Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.
- Physical, visual, and/or auditory deterrents and exclusion measures will be employed around hazardous materials to discourage avian use, as required.
- Vegetation management will be incorporated in the vicinity of waste ponds to discourage avian use of potentially affected vegetation.

Adaptive management will be a component of the wildlife management plan which will be developed to support licensing. If birds are observed on site ponds, additional deterrent techniques could be employed. Examples of other deterrent options to dissuade birds from landing on ponds under an adaptive management framework are provided here:

- Visual deterrents: Reflective tape/flagging could be properly and appropriately installed on infrastructure and/or over the ponds. Predator decoys (i.e., plastic hawks, owls) could be strategically installed on visible high points, such as building roofs and fence posts. Brightly coloured flags flown from posts and/or inflatable tube dancers could be installed along the perimeter of the ponds and/or on the facilities, as appropriate. Inflatable tube dancers are similar to scarecrows, but determined to be more effective (Lukas et al. 2020<sup>6</sup>) likely resulting from the constant motion caused by the wind. A combination of the above visual deterrents would be expected to provide the best results.
- Auditory deterrents: Ultrasonic deterrent systems create a “net” that has been shown to repel birds from an area (Ezeonu et al. 2012<sup>7</sup>). Propane cannons are another effective method shown to deter birds. The use of propane cannons has been more widely studied and are recommended over ultrasonic deterrent systems. Propane cannons have been shown to be more effective when paired with a radar-activated on-demand system that fires cannons when birds are entering the area (Ronconi and Cassady St. Clair, 2006<sup>8</sup>), as birds can habituate to a timely, consistent firing/noise event.

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<sup>6</sup> Lukas, S, Clark, L, Davis, A, Sanchez, D, Brewer, L. 2020. Nonlethal Bird Deterrent Strategies: Methods for reducing fruit crop losses in Oregon. Oregon State University Extension Service.

<sup>7</sup> Ezeonu, SO, Amaefule, DO, Okonkwo, GN. 2012. Construction and Testing of Ultrasonic Bird Repeller. Journal of Natural Sciences Research 2(9): 8-17.

<sup>8</sup> Ronconi, RA, St. Clair, CC. 2006. Efficacy of a radar-activated on-demand system for deterring waterfowl from oil sands tailings ponds. Journal of Applied Ecology 43: 111-119

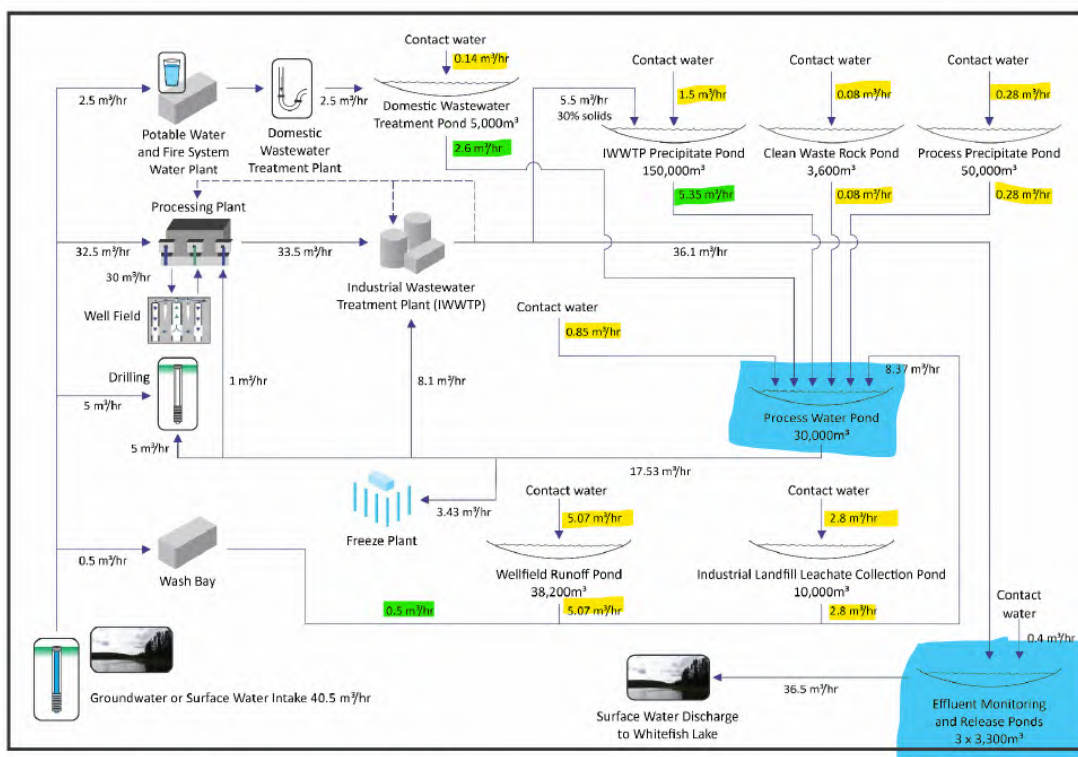


Figure 2.2-15: Operation Water Balance for the Project

## References

- Adams, C. A., A. Blumenthal, E. Fernández-Juricic, E. Bayne, and C. C. St. Clair. 2019. Effect of anthropogenic light on bird movement, habitat selection, and distribution: a systematic map protocol. *Environmental Evidence* 8(S1): 1–16.
- Habib, L., E.M. Bayne and S. Boutin. Chronic industrial noise affects pairing success and age structure of ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology*, 44: 176–184.
- Narins, P.M. 1990. Seismic communication in anuran amphibians. *Bioscience* 40 (4):268-274

## Attachment: IR-183 to 187

Number	IR-183
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C
Context and Rationale	<p>Context: Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.</p> <p>Rationale: The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.</p>
Information Requirement	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

Number	IR-184
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2 Appendix 10-C, 2.0
Context and Rationale	<p>Context: It is stated in Appendix 10-C, section 2.0 that: “In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”</p> <p>As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.</p>



	Rationale: The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.
Information Requirement	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

Number	IR-185
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2 Appendix 10-C Table 3.10-3.12
Context and Rationale	Context: The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.  Rationale: The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.
Information Requirement	The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

Number	IR-186
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	Section 10.2.3.2.4, Section 10.2.3.2.6, Section 10.2.4 Appendix 10-C, Section 3.2
Context and Rationale	Context: In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.

	<p>Further in section 10.2.4, which elaborates mitigation measures, it is stated: “For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA.”</p> <p>The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: No licensee shall rely on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</p> <p>The proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.</p> <p>Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.</p> <p>Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.</p>

Number	IR-187
Dept.	CNSC
Project effects link	Human Health with respect to radiation exposure
Reference to EIS, appendices, or supporting documentation	<p>Section 10.2.3.2.4, Section 10.2.3.2.6</p> <p>Appendix 10-C, Section 3.3, 6.0</p>

Context and Rationale	<p>Context: The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, Radiation Protection.</p> <p>Rationale: At this stage of the project, the proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, Radiation Protection.</p>
Information Requirement	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>

### **Summary of IRs 183 to 187 and Responses:**

**IR-183 (CNSC):** Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.

**Response:** *Example dose calculations are provided in Appendix A of the Worker Dose Assessment, which is Appendix 10-C of the EIS. As noted in response to IRs 185, 186, and 187, some revisions to Appendix A are detailed in an attached memo.*

**IR-184 (CNSC).** As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period. The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.

**Response:** *The text cited by the reviewer from Section 2.0 of Appendix 10-C about a proposed additional limit for 5-year equivalent dose to lens of eye will be deleted to be consistent with the Regulation.*

**IR-185 (CNSC).** The proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.

**Response:** *The source radiochemistries, geometries, and distance/time assumptions that are inputs to the external dose calculation are provided in the Worker Dose Assessment, which is Appendix 10-C of the EIS.*

*The calculation of external dose is detailed in Appendix A (Table A.3) of the Worker Dose Assessment. This calculation uses dose rates at distance as output from MicroShield. As we have noticed several typos in Table A.3, and have changed inputs for drying and packaging in response to IR-186, a revised table is provided (see Table A.3 below).*

**IR-186 (CNSC).** Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant. Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant. Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.

**Response:** *We had used a very conservative dust level in drying and packaging areas (representing equipment sources of dust to the exhaust system). While the hazard cannot be eliminated or substituted, engineering controls will minimize the pathway. As a primary engineering control, the equipment and exhaust will be in a negative pressure enclosure. Under normal operation, workers will not be inside the enclosure. To support a more realistic exposure assessment for drying and packaging, a conservative design estimate for potential dust levels in the main room has been obtained. It is anticipated that workers in these areas will not require PAPR under normal circumstances. As an administrative control, dust levels in the room will be monitored, and individual worker exposures will be monitored and managed. PAPR will be available if needed as a control of last resort. The approach will respect the hierarchy of control and will comply with Section 13 of the Uranium Mines and Mills Regulations. A new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below).*

**IR-187 (CNSC).** Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility. Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle. Identify mitigation measures as per the hierarchy of control for radiological protection.

**Response:** *As described in response to IR-186, a new worker exposure assessment has been completed for drying and packaging areas, using the design estimate for dust levels in the main room, a revised time spent in the area, and no routine use of PAPR (see revised Tables A.1 and A.3 below). The in-design engineering controls will include negative pressure enclosure of source equipment and exhaust, as well as ventilation controls in the main rooms (drying and packaging areas). Administrative controls will include area and individual monitoring and time-exposure management. It is shown that CNSC regulatory dose limits can be met without PAPR. This will be confirmed by air and dose monitoring during the commissioning phase as the control system is optimized. PAPR will be available as needed for non-routine situations, such as any necessary work within the enclosures.*

#### **Changes to the Worker Dose Calculations and Report:**

The Worker Dose Assessment (Appendix 10-C of the EIS) will be revised to reflect the information provided in Responses to IRs above. References to routine use of PAPR as an exposure control will be deleted. The primary engineering controls on dust exposure in the drying and packaging areas will be explained. Section 6.0 (Radiation Protection Strategies) will be updated to reflect the hierarchy of controls – elimination > substitution > engineering > administrative > PPE. Neither elimination nor substitution of the hazard are feasible controls for the Project, given its purpose to produce uranium

concentrate, and given the radioactive nature of uranium. Elimination of an exposure pathway would typically involve engineering controls. Engineering controls will be utilized as a first line of defense.

As noted in the responses, a design estimate has been obtained for dust levels in the main room for the drying area and the packaging/loading area. This value of 0.5 mg/m<sup>3</sup> is a conservative representation of potential dust levels for workers under normal operations. It translates to a respirable dust value of 0.4 mg/m<sup>3</sup> and a U-238 activity of 3.9 Bq/m<sup>3</sup>. This value has been used in revised calculations of the dust inhalation dose (presented herein). In addition, time spent in the room has been reduced from 8 to 4 hours per day. The revised dose calculations show that the CNSC regulatory dose limits can be met without use of PAPR.

Because the dust sources (dryer and calciner in the drying area; drum loader in the packaging area) will be fully enclosed under negative pressure, workers will not be in the enclosure, and time spent at 1 m from source will be zero. The time at distance allocation has been revised to:

0 h/d at 1 m, 3 h/d at 5 m, and 1 h/d at 10 m

This time at distance allocation is relevant to the external dose, which is a minor dose component for the drying and packaging/loading areas.

To accommodate these new assumptions, the worker dose calculations have been revised. In addition, several typos in the tables of the June 2022 Worker Dose Assessment have been corrected. For completeness, all the tables from the report that have any changes are provided below, including the example calculations from Appendix A of the Worker Dose Assessment. Any word or numeric value that has changed is shown in red font.

The revised effective dose from dust inhalation, in both drying and packaging areas, without use of PAPR, is calculated to be 11.7 mSv/a (Table 5.1 and Table A.1) well below the 5-year average effective dose limit of 20 mSv/a. Actual dust levels will be confirmed during the commissioning phase, using both area monitoring and sampling pumps worn by workers, and the control system will be optimized to ensure that doses are ALARA. Monitoring will continue through the operations phase, in accordance with the Radiation Protection Program.

**Section 2.0 of the Worker Dose Assessment** (on Regulatory Context) will be updated to align with the Radiation Protection Regulations, by deleting the following text:

~~“In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”~~

**Section 6.0 of the Worker Dose Assessment** (on Radiation Protection Strategies) will be updated to describe the planned mitigations, consistent with the hierarchy of controls. Text in this section relevant to dust exposure will be revised as follows:

“Doses to workers at the Wheeler River Project are expected to be maintained below the average annual dose limit of 20 mSv/a for NEWs. Several mitigations have been assumed and will be important

in keeping doses ALARA. For the drying and packaging/loading areas of the ISR Plant, ~~the engineering controls will include negative pressure enclosures around source equipment and exhaust, as well as ventilation controls in the main rooms (beyond enclosures). Administrative controls will include area and individual monitoring and time-exposure management. Actual dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. Use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce dose from inhalation of uranium dust. Dust levels in these areas should be monitored and kept as low as reasonably achievable.”~~

~~“Powered Air Purifying Respirators (PAPR) should be available in these areas in case of need for any non-routine work that may involve high dust exposures. However, PAPR is a control of last resort. Under the Radiation Protection Program, a radiation work permit process will be in place for any non-routine work that may involve unusually high exposures, ensuring that risks are assessed and exposure controls are optimized in accordance with the ALARA principle. protection factor of 1000 is provided by several types of respirators such as Powered Air Purifying Respirators (PAPR) with a full facepiece or hood, and Supplied-Air Respirators (SAR) in positive-pressure mode or continuous flow mode. Alternatively, a Self-Contained Breathing Apparatus will provide protection factors over 10,000 if used in positive-pressure mode. It should be noted that Air Purifying Respirators will not offer protection against radioactive gases such as radon.”~~

~~“Dust inhalation is also a potentially significant component of dose at the core shack. At this location, PAPR will not be required; however, dust levels should be monitored here too. An administrative level of respirable dust equal to ¼ of the ACGIH TLV of 0.27 mg/m<sup>3</sup> has been assumed. Again, dust levels will be confirmed during the commissioning phase and the control system will be optimized to ensure that doses are ALARA. It may be possible to increase air exchange in the core shack, above the planned 6 exchanges per hour, should this be necessary. This would help also with radon exposure in the core shack.”~~

Radiation Protection Program documents, now in preparation, to be completed during licensing, will provide more detail regarding radiation protection processes and procedures.

**Tables of the Worker Dose Assessment** (in Section 3, Section 5, and Appendix A) will be revised as discussed above. The revised tables are shown below.



**Table 3.1: Exposure Locations and Sources**

Location	Work Area	Source	Worker Function
Wellfield	Wellfield drilling	Cuttings in drum	Driller 1
	Pump houses	UBS in pump house piping	Wellfield Operator 1
	UBS Pond	UBS in storage pond	Wellfield Operator 1
	Wellfield piping	UBS in piping	Wellfield Operator 2 <sup>a</sup>
ISR Plant	Process Precipitate Removal Area	UBS feed tank	Plant Operator 1 <sup>a</sup>
		Totes of filter cake	
		Precipitate thickener	
	Yellowcake Precipitation Area	Yellowcake precipitation tank	Plant Operator 2 <sup>a</sup>
		Yellowcake conveyor	
		Yellowcake thickener	
	Water Treatment Area	WTP clarifier	Plant Operator 3 <sup>a</sup>
	Drying Area	Yellowcake	Plant Operator 4 <sup>a</sup>
	Packaging Loading Area	Yellowcake	Plant Operator 5 <sup>a</sup>
Site Ponds Pads	Special Waste Pad	Drill cuttings	Equipment Operator 1
	Contaminated Landfill	none	Equipment Operator 1
	Process Precipitate Pond	Process precipitate	Equipment Operator 1
Site infrastructure	Core Shack	3 cores	Geologist/Geotech Loggers

(a) Operator and Maintenance worker have the same exposure characteristics

**Table 3.2: Concentrations in Dust and Occupancy in Work Area for the Indoor and Outdoor Dust Inhalation Scenarios**

Work Area	Worker	Respirable Dust in Air (kg/m <sup>3</sup> )	U-238 in Dust (Bq/kg)	Ra-226 in Dust (Bq/kg)	U-238 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>d</sup>
Wellfield	Driller 1	-	-		9.49E-04 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	-	-		9.49E-04 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	-	-		3.41E-03 <sup>a</sup>	8	12
Yellowcake Precip Area	Plant Operator 2	-	-		3.41E-03 <sup>a</sup>	8	12
Water Treatment Area	Plant Operator 3	-	-		3.41E-03 <sup>a</sup>	8	12
Drying Area	Plant Operator 4	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Packaging Loading Area	Plant Operator 5	4.00E-07	9.74E+06		3.90E+00 <sup>b</sup>	4	12
Special Waste Pad	Equipment Operator 1	-	-		6.83E-03 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	-	-		9.95E-04 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	-	-		4.25E-04 <sup>a</sup>	3	12
Core Shack	Geologist/	6.75E-08	2.99E+06	2.06E+06	2.02E-01 <sup>c</sup>	11	6
	Geotech Logger						

(a) U-238 (Bq/m<sup>3</sup>) in air calculated from IEC (2022) µg/m<sup>3</sup> in outdoor air at each location, operations phase, with calciner

(b) U-238 in air shown for drying and packaging areas is an ambient concentration, based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

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- (c) U-238 in air for core shack based on an administrative level for respirable dust equal to ¼ of the ACGIH Threshold Limit Value (TLV); U-238 concentration in dust from ore assays by R and D Enterprises (2018)
- (d) Workers are assumed to work 20 days per month

**Table 3.3: Concentrations of Radon and Occupancy in Work Area for the Indoor and Outdoor Radon Inhalation Scenarios**

Work Area	Worker	Source	Rn-222 in Air (Bq/m <sup>3</sup> )	Daily Occupancy h/d	Active months per year <sup>b</sup>
Wellfield	Driller 1	Outdoor	6.75E+01 <sup>a</sup>	11	8
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01 <sup>a</sup>	8	12
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Cake	2.72E+01		
		Thickener	7.35E+02		
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Thickener	4.96E+02		
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02 <sup>a</sup>	8	12
		Clarifier	1.28E+02		
Drying Area	Plant Operator 4	Outdoor	1.17E+02 <sup>a</sup>	4	12
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02 <sup>a</sup>	4	12
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02 <sup>a</sup>	2	12
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01 <sup>a</sup>	4	12
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01 <sup>a</sup>	3	12
Core Shack	Geologist/Geotech Logger	Outdoor	6.75E+01 <sup>a</sup>	11	6
		Cores	1.18E+03		

(a) Rn-222 (Bq/m<sup>3</sup>) in air taken from IEC (2022) value in outdoor air at each location, operations phase, with calciner

(b) Workers are assumed to work 20 days per month

**Table 3.9: Exposure Factors for External Exposures.**

Location	Source <sup>a</sup>	Worker Function	h/d in area	h/d at 1 m	h/d at 5 m	h/d at 10 m	active months per year
Wellfield	Cuttings in Drum	Driller 1	11	2	4	5	8
	UBS Solution in pump house piping	Wellfield Operator 1	4	2	1	1	12
	UBS solution in storage pond	Wellfield Operator 1	4	2	1	1	12
	UBS Solution in piping	Wellfield Operator 2	8	4	2	2	12
ISR Plant	UBS feed tank	Plant Operator 1	8	6	1	1	12
	Totes of filter cake						
	Precipitate Thickener						
	Yellowcake precipitation tank	Plant Operator 2	8	6	1	1	12
	Yellowcake conveyor						
	Yellowcake Thickener						
	WTP Clarifier	Plant Operator 3	8	6	1	1	12
	Drying Area, Dryer	Plant Operator 4	4	0	3	1	12
	Drying Area, Calciner						
	Packaging/Loading Area	Plant Operator 5	4	0	3	1	12
Site Ponds Pads	Special Waste Pad	Equipment Operator 1	2	0	2	0	12
	none	Equipment Operator 1	3	0	2	1	12
	Process Precipitate Pond	Equipment Operator 1	4	0	3	1	12

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Core Shack	3 cores	Geologist/Geotech Loggers	11	2	8	1	6
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(a) When there are several sources in one work area, the worker is assumed to divide his time roughly equally among those sources (see Appendix Table A.3).



Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant



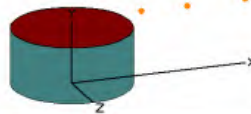

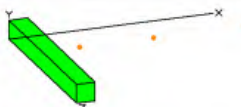
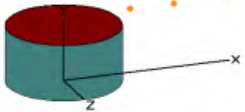
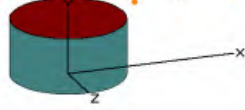
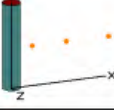

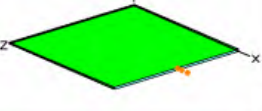
Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
UBS Feed Tank	Height: 5.2m, diameter: 3.3m	UBS Feed		4.45E+01	6.35	Steel	Liquid	1.00E+03
Totes of Filter Cake	3 totes of filter cake, each 1m height, 1m diameter	Process Precipitates		3.00E+00	6.35	PET	Cake	1.88E+03
Precipitate Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	Process Precipitates		3.93E+02	6.35	Steel	Slurry	1.30E+03
Precipitation Tank	Height: 5.2m, Diameter: 3.3m	Yellowcake Precipitation Solution		4.45E+01	6.35	Steel	Liquid	1.00E+03
Yellowcake in Screw conveyor	Height: 1m, Length: 10m, Width: 1m	UO <sub>4</sub>		1.00E+01	6.35	Steel	Cake	2.40E+03

Table 3.11: Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in the ISR Plant (continued)

Source	Geometry	Source Type	MicroShield Geometry	Volume (m <sup>3</sup> )	Shielding Thickness (mm)	Shielding material	Source form	Density (kg/m <sup>3</sup> )
Yellowcake Thickener	Height: 5m, Diameter: 10m, drum 1.7m above the floor	UO <sub>4</sub>		3.93E+02	6.35	Steel	Slurry	1.30E+03
WTP Clarifier	Height: 5m, Diameter: 10m, drum 1.7m above the floor	NA		3.93E+02	6.35	Steel	Slurry	1.00E+03
Dryer	Horizontal cylinder, Length: 10m, Diameter: 2m	UO <sub>4</sub>		3.14E+01	6.35	Steel	powder	2.03E+03
Calciner	Horizontal cylinder, Length: 20m, Diameter: 2m	UO <sub>4</sub>		6.28E+01	6.35	Steel	powder	2.03E+03
Drum Storage	350 barrels on a pad, each height: 0.89m, diameter: 0.58m	UO <sub>4</sub>		1.08E+02	1.20	Steel	powder	1.71E+03

**Table 5.1: Internal Annual Dose from Dust Inhalation**

Work Area	Worker	Effective Dose from Inhalation U-238 <sup>+</sup> (mSv/a)	Effective Dose from Inhalation Ra-226 <sup>+</sup> (mSv/a)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	5.21E-03	-	5.21E-03 <sup>a</sup>
Wellfield	Wellfield Operator 1, 2	5.68E-03	-	5.68E-03 <sup>a</sup>
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	-	2.04E-02 <sup>a</sup>
Yellowcake Precip Area	Plant Operator 2	2.04E-02	-	2.04E-02 <sup>a</sup>
Water Treatment Area	Plant Operator 3	2.04E-02	-	2.04E-02 <sup>a</sup>
Drying Area	Plant Operator 4	1.17E+01	-	1.17E+01 <sup>b</sup>
Packaging Loading Area	Plant Operator 5	1.17E+01	-	1.17E+01 <sup>b</sup>
Special Waste Pad	Equipment Operator 1	1.02E-02	-	1.02E-02 <sup>ac</sup>
Process Precipitate Pond	Equipment Operator 1	2.98E-03	-	2.98E-03 <sup>ac</sup>
Contaminated Landfill	Equipment Operator 1	9.54E-04	-	9.54E-04 <sup>ac</sup>
Core Shack	Geologist/	5.63E+00	1.02E+00	6.65E-00 <sup>d</sup>
	Geotech Logger			

(a) Based on outdoor concentration of U dust from IEC (2022); U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(b) Based on indoor concentration of U dust, which dominates; U-238<sup>+</sup> DCF 2.60E-06 Sv/Bq from ICRP 137 includes U-238+U-234

(c) Equipment Operator 1 frequents 3 locations; the 3 doses must be added for this worker

(d) Based on indoor concentration of ore dust, which dominates; U-238<sup>+</sup> DCF 2.08E-05 Sv/Bq from ICRP 137 includes the entire U-238 series; doses shown for U-238<sup>+</sup> and Ra-226<sup>+</sup> reflect the portions from U-238 to Th-230, and from Ra-226 to Po-210, respectively.

Table 5.2: Internal Annual Dose from Radon Inhalation

Work Area	Worker	Source	Dose from Radon in Air (mSv/a)	Total Radon Dose for Worker (mSv/a)
Wellfield	Driller 1	Outdoor	9.44E-02 <sup>a</sup>	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	1.03E-01 <sup>a</sup>	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.78E-01 <sup>a</sup>	2.27E+00
		Cake	7.47E-02 <sup>b</sup>	
		Thickener	2.02E+00 <sup>b</sup>	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.78E-01 <sup>a</sup>	1.54E+00
		Thickener	1.36E+00 <sup>b</sup>	
Water Treatment Area	Plant Operator 3	Outdoor	1.78E-01 <sup>a</sup>	5.30E-01
		Clarifier	3.52E-01 <sup>b</sup>	
Drying Area	Plant Operator 4	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	8.89E-02 <sup>a</sup>	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	3.37E-01 <sup>a</sup>	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	6.89E-02 <sup>a</sup>	
Contaminated Landfill	Equipment Operator 1	Outdoor	1.70E-02 <sup>a</sup>	
Core Shack	Geologist/	Outdoor	7.08E-02 <sup>a</sup>	2.30E+00
	Geotech Logger	Cores	2.23E+00 <sup>b</sup>	

(a) Based on outdoor concentration of radon from IEC (2022)

(b) Based on an indoor source of radon to indoor air

**Table 5.3: Effective Dose and Equivalent Dose to the Lens of the Eye for Workers from External Exposure**

Work Area	Worker	Source	By Exposure Scenario		By Worker	
			External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)	External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	10.16	16.40	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	0.05	0.07	0.05	0.07
	Wellfield Operator 1	Pump House Piping	0.24	0.34	0.53	0.81
		UBS Pond	0.29	0.47		
Process Precipitate Removal Area	Plant Operator 1	Feed Tank	0.24	0.39	12.59	20.40
		Cake	8.19	13.15		
		Thickener	4.16	6.86		
Yellowcake Precip Area	Plant Operator 2	Precip Tank	0.08	0.13	0.10	0.15
		Cake	0.02	0.02		
		Thickener	0.001	0.001		
Water Treatment Area	Plant Operator 3	Clarifier	1.70	2.61	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0.002	0.002	0.004	0.004
		Calciner	0.002	0.002		
Packaging Loading Area	Plant Operator 5	Drums	0.009	0.009	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	<0.0001 <sup>a</sup>	0.0001 <sup>a</sup>	5.68	9.33
Process Precipitate Pond	Equipment Operator 1	Precip Pond	5.68	9.33		
Contaminated Landfill	Equipment Operator 1	No source	0.000	0.000		

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Core Shack	Geologist/ Geotech Logger	Cores	2.02	3.25	2.02	3.25
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(a) Dose to Equipment Operator 1 at the Special Waste Pad is mitigated by a 2m wide berm, which provides shielding.



**Table 5.4: Total Dose from Internal and External Pathways for Workers**

Work Area	Worker	Internal Dose (mSv/a)		External Dose (mSv/a)	Total Effective Dose (mSv/a)
		Dust	Radon		
Wellfield	Driller 1	5.21E-03	9.44E-02	10.16	10.26
Wellfield	Wellfield Operator 2	5.68E-03	1.03E-01	0.05	0.16
	Wellfield Operator 1	5.68E-03	1.03E-01	0.53	0.64
Process Precipitate Removal Area	Plant Operator 1	2.04E-02	2.27E+00	12.59	14.88
Yellowcake Precip Area	Plant Operator 2	2.04E-02	1.54E+00	0.10	1.66
Water Treatment Area	Plant Operator 3	2.04E-02	5.30E-01	1.70	2.25
Drying Area	Plant Operator 4	1.17E+00 <sup>a</sup>	8.92E-02	0.004	11.77
Packaging Loading Area	Plant Operator 5	1.17E+00 <sup>a</sup>	8.92E-02	0.009	11.78
Special Waste Pad	Equipment Operator 1	1.02E-02	3.37E-01	- <sup>b</sup>	6.11
Process Precipitate Pond	Equipment Operator 1	2.98E-03	6.89E-02	5.68	
Contaminated Landfill	Equipment Operator 1	9.54E-04	1.70E-02	-	
Core Shack	Geologist/	6.65E+00 <sup>a</sup>	2.30E+00	2.02	10.97
	Geotech Logger				

(a) Dust exposures in work area to be monitored and kept ALARA.

(b) External dose mitigated by a berm around the Special Waste Pad, which provides shielding

## Appendix A Example Calculations

**Table A.1: Dust Inhalation Dose Calculation**

Work Area	Worker	U-238 in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	DCF (Sv/Bq)	Total Effective Dose (mSv/a)
Wellfield	Driller 1	9.49E-04	1760	2.60E-06	5.21E-03
Wellfield	Wellfield Operator 1, 2	9.49E-04	1920	2.60E-06	5.68E-03
Precipitate Removal Area	Plant Operator 1	3.41E-03	1920	2.60E-06	2.04E-02
Yellowcake Precip Area	Plant Operator 2	3.41E-03	1920	2.60E-06	2.04E-02
Water Treatment Area	Plant Operator 3	3.41E-03	1920	2.60E-06	2.04E-02
Drying Area	Plant Operator 4	3.90E+00	960	2.60E-06	1.17E+01
Packaging Loading Area	Plant Operator 5	3.90E+00	960	2.60E-06	1.17E+01
Special Waste Pad	Equipment Operator 1	6.83E-03	480	2.60E-06	1.02E-02
Precipitate Pond	Equipment Operator 1	9.95E-04	960	2.60E-06	2.98E-03
Industrial Landfill	Equipment Operator 1	4.25E-04	720	2.60E-06	9.54E-04
Core Shack	Geologist/	2.02E-01	1320	2.08E-05	6.65E+00
	Geotech Logger				

Total Effective Dose (mSv/a) =  $C_{air}$  (Bq/m<sup>3</sup>) x I (m<sup>3</sup>/h) x ET (h/a) x DCF (Sv/Bq) x 1000 (mSv/Sv)

### Notes:

Concentrations from indoor sources for Drying/Packaging and Core Shack

Concentrations in Drying and Packaging are respirable activity based on a design value for dust in the main room of the drying area (0.5 mg/m<sup>3</sup> total)

DCFs (Sv/Bq) from ICRP 137: U238+U234 (2.60E-6); U238 to Po-210 (2.08E-5)

Inhalation Rate (I) from ICRP 119 is 1.2 m<sup>3</sup>/h

**Table A.2: Radon Dose Calculation**

Work Area	Worker	Source	Radon in Air (Bq/m <sup>3</sup> )	Exposure Time (h/a)	Equilibrium Factor F	Radon Dose (mSv/a)	Total (mSv/a)
Wellfield	Driller 1	Outdoor	6.75E+01	1760	0.10	9.44E-02	9.44E-02
Wellfield	Wellfield Operator 1, 2	Outdoor	6.75E+01	1920	0.10	1.03E-01	1.03E-01
Process Precipitate Removal Area	Plant Operator 1	Outdoor	1.17E+02	1920	0.10	1.78E-01	2.27E+00
		Cake	2.72E+01	1920	0.18	7.47E-02	
		Thickener	7.35E+02	1920	0.18	2.02E+00	
Yellowcake Precip Area	Plant Operator 2	Outdoor	1.17E+02	1920	0.10	1.78E-01	1.54E+00
		Thickener	4.96E+02	1920	0.18	1.36E+00	
Water Treatment Area	Plant Operator 3	Outdoor	1.17E+02	1920	0.10	1.78E-01	5.30E-01
		Clarifier	1.28E+02	1920	0.18	3.52E-01	
Drying Area	Plant Operator 4	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Packaging Loading Area	Plant Operator 5	Outdoor	1.17E+02	960	0.10	8.89E-02	8.89E-02
Special Waste Pad	Equipment Operator 1	Outdoor	8.82E+02	480	0.10	3.37E-01	4.23E-01
Process Precipitate Pond	Equipment Operator 1	Outdoor	9.03E+01	960	0.10	6.89E-02	
Contaminated Landfill	Equipment Operator 1	Outdoor	2.97E+01	720	0.10	1.70E-02	
Core Shack	Geologist/ Geotech Logger	Outdoor	6.75E+01	1320	0.10	7.08E-02	2.30E+00
		Cores	1.18E+03	1320	0.18	2.23E+00	

Radon Dose (mSv/a) = (C<sub>air</sub> (Bq/m<sup>3</sup>)/3700 Bq/m<sup>3</sup> per WL) x F x (ET (h/a)/170 h per WL) \* 5 (mSv/a per WL)

**Table A.3: External Dose Calculation**

Work Area	Worker	Source	Exposure Time (h/d) at:			Max Effective Dose (mSv/h)			Max Lens Dose (mSv/h)			Exp Days (d/a)	By Exposure Scenario	
			1m	5m	10m	1m	5m	10m	1m	5m	10m		External Dose (mSv/a)	Dose to Lens of Eye (mSv/a)
Wellfield	Driller 1	Cuttings	2	4	5	2.68E-02	1.86E-03	4.84E-04	4.33E-02	3.01E-03	7.82E-04	160	10.16	16.40
Wellfield	Wellfield Operator 2	Piping	4	2	2	4.91E-05	9.10E-06	3.40E-06	6.85E-05	1.26E-05	4.68E-06	240	0.05	0.07
	Wellfield Operator 1	Pump House Piping	2	1	1	4.74E-04	4.13E-05	1.08E-05	6.74E-04	5.81E-05	1.52E-05	240	0.24	0.34
		UBS Pond	2	1	1	4.63E-04	1.80E-04	8.75E-05	7.59E-04	2.94E-04	1.43E-04	240	0.29	0.47
Precipitate Removal Area	Plant Operator 1	Feed Tank	2.2	0.33	0.33	4.35E-04	8.51E-05	2.82E-05	7.13E-04	1.39E-04	4.60E-05	240	0.24	0.39
		Cake	1.6	0.33	0.33	2.08E-02	1.92E-03	5.06E-04	3.34E-02	3.09E-03	8.14E-04	240	8.19	13.15
		Thickener	2.2	0.33	0.33	7.17E-03	3.26E-03	1.43E-03	1.18E-02	5.34E-03	2.34E-03	240	4.16	6.86
Yellowcake Precip Area	Plant Operator 2	Precip Tank	2	0.33	0.33	1.63E-04	3.18E-05	1.05E-05	2.65E-04	5.17E-05	1.71E-05	240	0.08	0.13
		Cake	2	0.33	0.33	3.69E-05	7.89E-06	2.50E-06	3.69E-05	7.89E-06	2.50E-06	240	0.02	0.02
		Thickener	2	0.33	0.33	2.33E-06	1.87E-06	8.74E-07	2.33E-06	1.87E-06	8.74E-07	240	0.001	0.001
Water Treatment Area	Plant Operator 3	Clarifier	6	1	1	1.06E-03	5.03E-04	2.22E-04	1.63E-03	7.51E-04	3.30E-04	240	1.70	2.61
Drying Area	Plant Operator 4	Dryer	0	1.5	0.5	9.12E-06	4.37E-06	1.55E-06	1.51E-05	4.37E-06	1.55E-06	240	0.002	0.002
		Calciner	0	1.5	0.5	1.52E-05	5.10E-06	2.30E-06	1.52E-05	5.10E-06	2.30E-06	240	0.002	0.002
Packaging Loading Area	Plant Operator 5	Drums	0	3	1	5.91E-05	1.19E-05	3.79E-06	5.91E-05	1.19E-05	3.79E-06	240	0.009	0.009
Special Waste Pad	Equipment Operator 1	Waste Pad	0	2	0	1.02E-07	8.54E-08	5.86E-08	1.84E-07	1.55E-07	1.06E-07	240	4.10E-05	0.0001
Precipitate Pond	Equipment Operator 1	Waste Pond	0	3	1	1.49E-02	6.78E-03	3.31E-03	2.45E-02	1.12E-02	5.43E-03	240	5.68	9.33
Industrial Landfill	Equipment Operator 1	No source	0	3	0	-	-	-	-	-	-	240	0	0
Core Shack	Geologist/ Geotech Logger	Cores	2	8	1	6.59E-03	4.39E-04	1.12E-04	1.06E-02	7.09E-04	1.81E-04	120	2.02	3.25

External Dose (mSv/a) = [  $\Sigma$  ET (h/d) x Max Effective Dose (mSv/h) ] x ED (d/a)

Dose to Lens (mSv/a) = [  $\Sigma$  ET (h/d) x Max Lens Dose (mSv/h) ] x ED (d/a)

**Notes:**

Maximum dose rates at distance (mSv/h) are output from Microshield scenarios; highest value considering all possible orientations.

Skin dose was less than or equal to lens dose, depending on the scenario.

## Attachment: IR-195

Number	IR-195
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.1
Context and Rationale	<p><b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.</p> <p><b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.</li> <li>2. Provide further information on predicted effluent quality during the Project decommissioning phase.</li> <li>3. Update ERA figures and conclusions as needed.</li> </ol>

Figures and tables to support response in IR table:

**Table IR195-1: Modelled Maximum COPC Concentrations in Water by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.53E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	5.80E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.50E+00	1.28E-04	7.30E-04	8.17E-04	2.39E-02	5.78E+01	4.12E-04	5.46E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.27E-05	4.46E+00	1.19E-04	6.53E-04	7.50E-04	1.57E-02	3.89E+01	2.58E-04	3.37E-04	3.28E-04	9.00E-04
Icelander River	1.26E-04	3.26E-05	4.42E+00	1.19E-04	6.52E-04	7.48E-04	1.56E-02	3.85E+01	2.56E-04	3.33E-04	3.26E-04	8.98E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.46E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	2.97E+01	1.95E-04	2.51E-04	2.68E-04	8.40E-04
	Non-radionuclides during Decommissioning Phase (mg/L)											
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Sulphate	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	1.19E-04	2.38E-05	3.22E-01	1.01E-04	5.30E-04	6.22E-04	1.07E-04	6.87E-01	3.35E-05	3.12E-05	1.67E-04	7.00E-04
Whitefish Lake North	1.10E-04	2.34E-05	3.22E-01	1.01E-04	5.24E-04	6.20E-04	1.07E-04	6.87E-01	3.28E-05	3.05E-05	1.55E-04	6.89E-04
Whitefish Lake Middle	1.46E-04	3.97E-05	6.14E+00	1.29E-04	7.46E-04	8.22E-04	2.43E-02	3.87E+01	4.33E-04	5.74E-04	6.70E-04	1.06E-03
Whitefish Lake South	1.49E-04	3.86E-05	6.11E+00	1.28E-04	7.30E-04	8.17E-04	2.40E-02	3.85E+01	4.12E-04	5.47E-04	5.64E-04	1.03E-03
McGowan Lake	1.26E-04	3.28E-05	4.20E+00	1.19E-04	6.54E-04	7.50E-04	1.58E-02	2.60E+01	2.59E-04	3.38E-04	3.28E-04	9.01E-04
Icelander River	1.26E-04	3.26E-05	4.16E+00	1.19E-04	6.52E-04	7.49E-04	1.56E-02	2.57E+01	2.56E-04	3.34E-04	3.26E-04	8.99E-04
Russell Lake Inlet	1.22E-04	3.01E-05	3.26E+00	1.14E-04	6.17E-04	7.17E-04	1.18E-02	1.99E+01	1.95E-04	2.52E-04	2.69E-04	8.40E-04
	Radionuclides during Operations Phase (Bq/L)											
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210	
Kratchkowsky Lake	3.85E-04		3.85E-04		1.01E-02		5.70E-03		6.22E-03		6.33E-03	
Whitefish Lake North	3.77E-04		3.77E-04		1.01E-02		5.63E-03		5.68E-03		5.78E-03	



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Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.35E-03	6.71E-03
Whitefish Lake South	6.71E-03	6.71E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.14E-03	4.14E-03	1.57E-02	6.32E-03	6.68E-03	6.23E-03
Icelander River	4.10E-03	4.10E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.08E-03	3.08E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/L)</b>					
Kratchkowsky Lake	3.85E-04	3.85E-04	1.01E-02	5.70E-03	6.22E-03	6.33E-03
Whitefish Lake North	3.77E-04	3.77E-04	1.01E-02	5.63E-03	5.68E-03	5.78E-03
Whitefish Lake Middle	7.05E-03	7.05E-03	1.87E-02	6.87E-03	8.36E-03	6.71E-03
Whitefish Lake South	6.72E-03	6.72E-03	1.85E-02	6.73E-03	8.25E-03	7.22E-03
McGowan Lake	4.15E-03	4.15E-03	1.57E-02	6.33E-03	6.68E-03	6.23E-03
Icelander River	4.11E-03	4.11E-03	1.56E-02	6.32E-03	6.66E-03	6.20E-03
Russell Lake Inlet	3.09E-03	3.09E-03	1.43E-02	6.14E-03	6.41E-03	6.16E-03

**Table IR195-2: Modelled Maximum COPC Concentrations in Sediment by Individual Project Phase**

	Non-radionuclides during Operations Phase (mg/kg dw)										
Location	Arsenic	Cadmium	Chloride	Cobalt	Chromium	Copper	Molybdenum	Selenium	Uranium	Vanadium	Zinc
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.07E+01	4.79E-01	-	3.02E-01	7.41E+00	2.28E+00	5.40E+01	4.90E+00	6.39E+00	3.40E+01	1.32E+01
Whitefish Lake South	1.03E+01	4.73E-01	-	3.02E-01	7.35E+00	2.28E+00	5.30E+01	4.70E+00	6.12E+00	3.06E+01	1.31E+01
McGowan Lake	9.33E+00	4.30E-01	-	2.88E-01	6.90E+00	2.16E+00	3.88E+01	3.33E+00	4.26E+00	2.08E+01	1.21E+01
Russell Lake Inlet	8.95E+00	4.06E-01	-	2.80E-01	6.63E+00	2.09E+00	2.95E+01	2.60E+00	3.26E+00	1.73E+01	1.15E+01
Location	Non-radionuclides during Decommissioning Phase (mg/kg dw)										
Kratchkowsky Lake	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake North	8.35E+00	3.38E-01	-	2.52E-01	5.86E+00	1.85E+00	3.37E-01	6.22E-01	5.78E-01	1.12E+01	9.93E+00
Whitefish Lake Middle	1.10E+01	4.97E-01	-	3.05E-01	7.59E+00	2.31E+00	5.72E+01	5.48E+00	7.18E+00	3.72E+01	1.36E+01
Whitefish Lake South	1.05E+01	4.90E-01	-	3.04E-01	7.53E+00	2.30E+00	5.62E+01	5.26E+00	6.87E+00	3.33E+01	1.35E+01
McGowan Lake	9.47E+00	4.43E-01	-	2.90E-01	7.03E+00	2.18E+00	4.11E+01	3.71E+00	4.78E+00	2.22E+01	1.24E+01
Russell Lake Inlet	9.04E+00	4.15E-01	-	2.81E-01	6.73E+00	2.10E+00	3.13E+01	2.88E+00	3.64E+00	1.82E+01	1.17E+01
	Radionuclides during Operations Phase (Bq/kg dw)										
Location	Uranium-238		Uranium-234		Thorium-230		Radium-226		Lead-210		Polonium-210
Kratchkowsky Lake	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake North	7.14E+00		7.14E+00		2.32E+01		6.51E+01		3.74E+02		3.80E+02
Whitefish Lake Middle	7.85E+01		7.85E+01		3.77E+01		7.46E+01		5.41E+02		5.42E+02
Whitefish Lake South	7.51E+01		7.51E+01		3.75E+01		7.41E+01		5.07E+02		5.09E+02

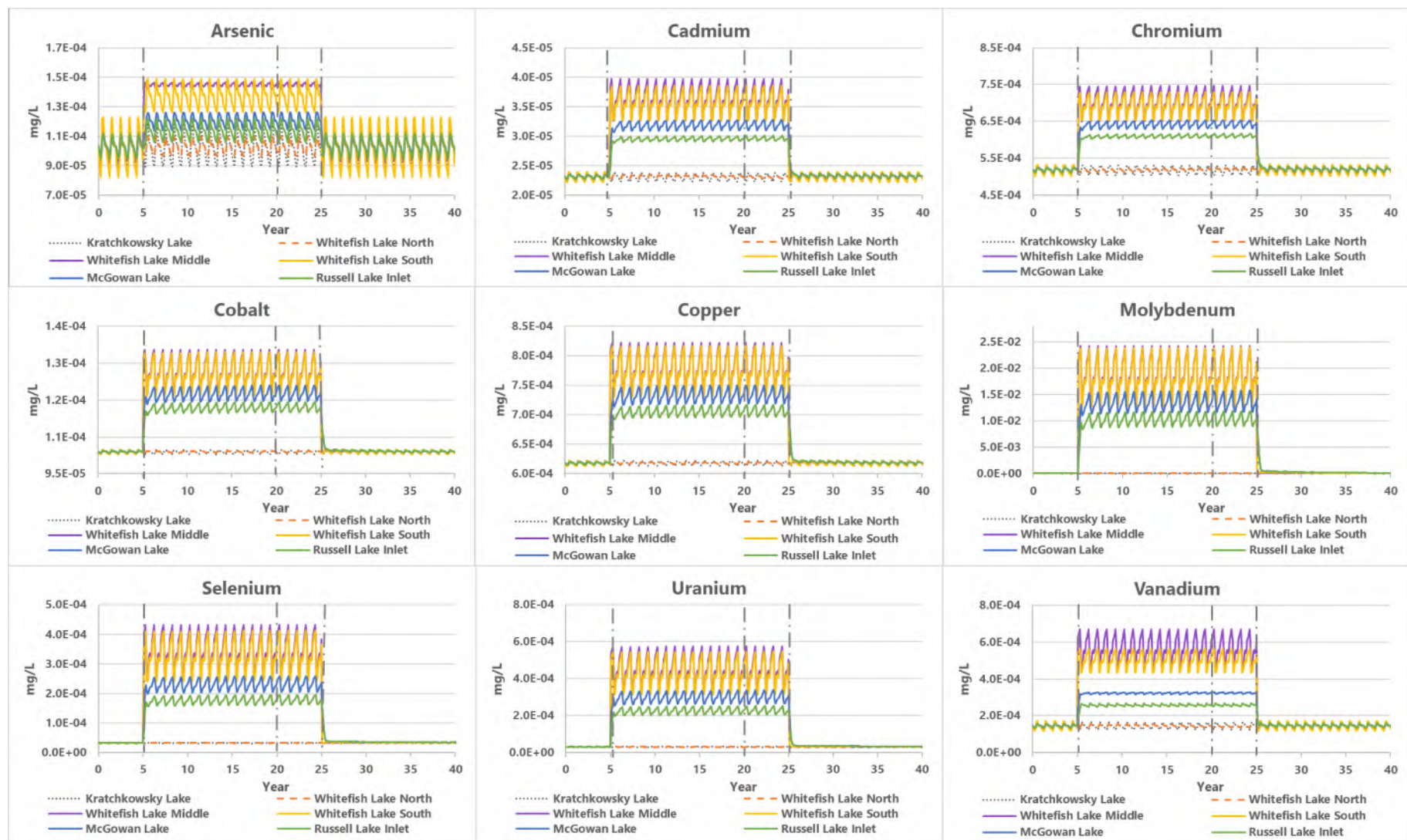
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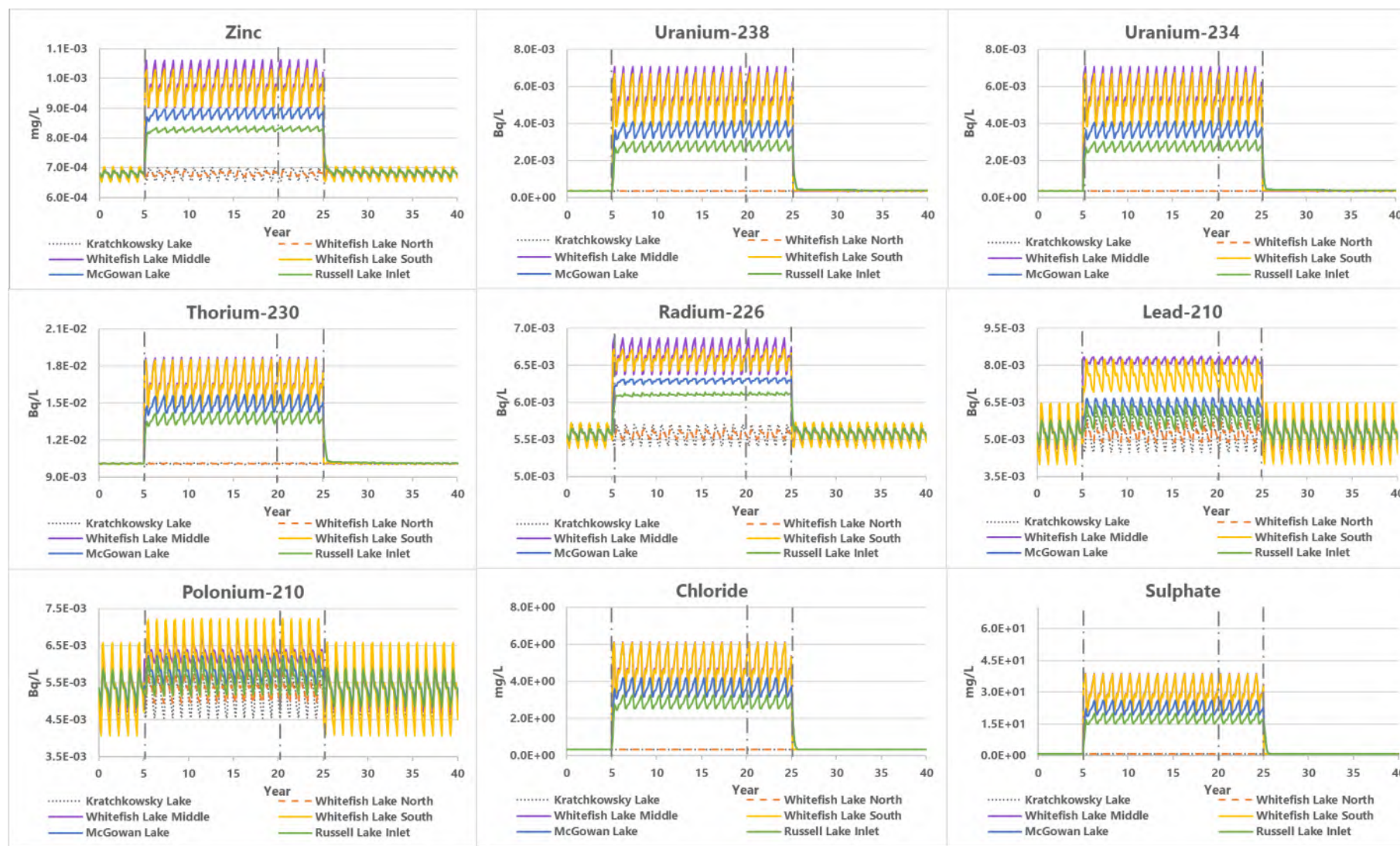
McGowan Lake	5.23E+01	5.23E+01	3.36E+01	7.15E+01	4.36E+02	4.41E+02
Russell Lake Inlet	4.01E+01	4.01E+01	3.11E+01	6.98E+01	4.11E+02	4.16E+02
<b>Location</b>	<b>Radionuclides during Decommissioning Phase (Bq/kg dw)</b>					
Kratchkowsky Lake	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake North	7.14E+00	7.14E+00	2.32E+01	6.51E+01	3.74E+02	3.80E+02
Whitefish Lake Middle	8.82E+01	8.82E+01	3.83E+01	7.57E+01	5.57E+02	5.58E+02
Whitefish Lake South	8.44E+01	8.44E+01	3.80E+01	7.52E+01	5.19E+02	5.22E+02
McGowan Lake	5.87E+01	5.87E+01	3.41E+01	7.23E+01	4.42E+02	4.47E+02
Russell Lake Inlet	4.48E+01	4.48E+01	3.15E+01	7.04E+01	4.14E+02	4.20E+02

Table IR195-2: Summary of Effluent Quality for the Wheeler River Project during Operations and Decommissioning Phase

Constituent of Potential Concern (COPC)	Unit	Effluent Quality
<b>General Chemistry</b>		
Chloride	mg/L	600
Sulphate	mg/L	3915
Total Dissolved Solids	mg/L	6420
<b>Metals and Metalloids</b>		
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.003
Copper	mg/L	0.022
Molybdenum	mg/L	2.5
Selenium	mg/L	0.042
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
<b>Radionuclides</b>		
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7
Thorium-230	Bq/L	0.9
Radium-226	Bq/L	0.15
Lead-210	Bq/L	0.419
Polonium-210	Bq/L	0.15

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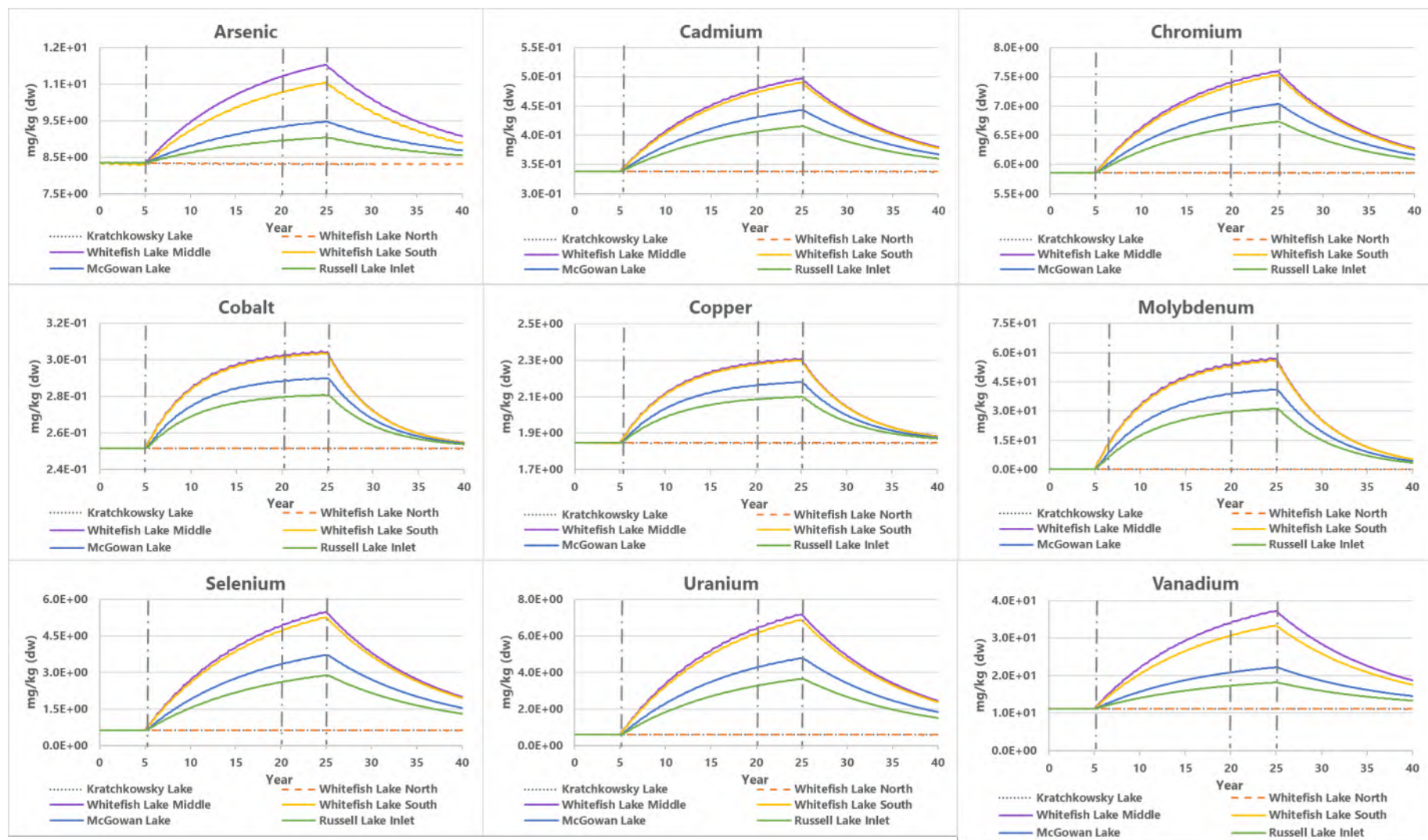


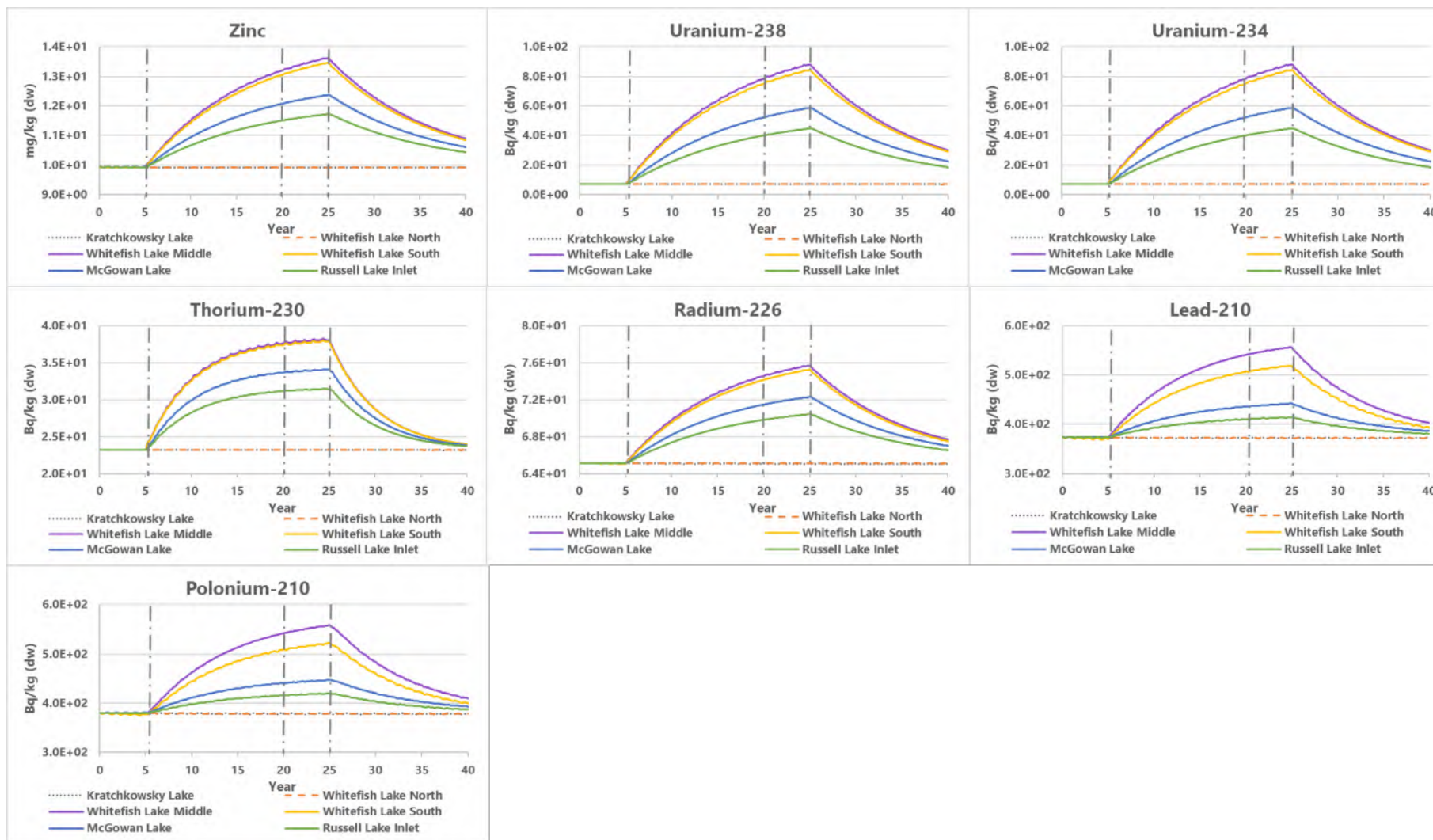
Long dash dot lines separate the time periods of project phases: 3 years baseline; 2 years construction; 15 years operations; 5 years decommissioning; first 15 years post-decommissioning

**Figure IR195-1: Modelled Concentrations of COPCs in Water during Project Phases**



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Long dash dot lines separate the time periods of project phases: 3 years baseline; 2 years construction; 15 years operations; 5 years decommissioning; first 15 years post-decommissioning

**Figure IR195-2: Modelled Concentrations of COPCs in Sediment during Project Phases**

## Attachment: IR-196

Number	IR-196
Dept.	ECCC
Project effects link	Change to an environmental component due to hazardous contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA), Section 3.1.2.3
Context and Rationale	<p><b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.</p> <p><b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.</p>
Information Requirement	<ol style="list-style-type: none"> <li>1. Provide further information and justification for the selection of less stringent thresholds.</li> <li>2. Update the ERA as needed.</li> </ol>

Updated Appendix 10-A Table 3-6 below (red text indicates a change from the existing table in the draft EIS) to support response in IR table:

Table 3-6: Sediment Quality Screening for the Wheeler River Project										
Constituent	Units	Maximum – Whitefish Lake (LA-5)	Sediment Quality Guidelines						Selected Sediment Screening Value	Is Concentration Greater than Selected Screening Value? (Y/N)
			Burnett-Seidel and Liber <sup>(b)</sup>		Thompson et al. <sup>(c)</sup>		CCME <sup>(d)</sup>			
			REF	NE2	LEL	SEL	ISQG	PEL		
Metals and Metalloids										
Arsenic	mg/kg dw	10.7	21	522	9.8	346	5.9	17	21	No
Cadmium	mg/kg dw	0.48	n/d	n/d	n/d	n/d	0.6	3.5	0.6	No
Chromium	mg/kg dw	7.41	31.5	26.2	47.6	115.4	37.3	90	31.5	No
Cobalt	mg/kg dw	0.3	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Copper	mg/kg dw	2.28	9.1	11.3	22	268.8	35.7	197	9.1	No
Lead	mg/kg dw	10.23	16.3	19.7	37	412	35	91.3	16.3	No
Molybdenum	mg/kg dw	53.99	23	245	14	1,239	n/d	n/d	23	Yes
Nickel	mg/kg dw	4	21	326	23	484	n/d	n/d	21	No
Selenium	mg/kg dw	4.9	3.6	30	1.9	16	n/d	n/d	3.6	Yes
Uranium	mg/kg dw	6.39	97	2,296	104	5,874	n/d	n/d	97	No
Vanadium	mg/kg dw	34.03	35.1	31.8	35.2	160	n/d	n/d	35.1	No
Zinc	mg/kg dw	13.2	n/d	n/d	n/d	n/d	123	315	123	No
Radionuclides										
Uranium-234	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Uranium-238	Bq/kg dw	78.53	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Thorium-230	Bq/kg dw	37.71	n/d	n/d	n/d	n/d	n/d	n/d	n/d	n/a
Radium-226	Bq/kg dw	74.55	n/d	n/d	600	14,400	n/d	n/d	600	No
Lead-210	Bq/kg dw	540.82	n/d	n/d	900	20,800	n/d	n/d	900	No
Polonium-210	Bq/kg dw	541.96	n/d	n/d	800	12,100	n/d	n/d	800	No
Bold and Grey shading indicates sediment concentration exceeds the REF or LEL value.										
a) Sediment concentrations predicted based on release of aqueous source-terms to LA-5 and interaction with sediment. Modelling performed in IMPACT according to the equations outlined in Appendix A.										

## Attachment: IR-198

Number	IR-198
Dept.	HC
Project effects link	Change to an environmental component due to radiological contaminants
Reference to EIS, appendices, or supporting documentation	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)
Context and Rationale	Context: Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals. Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species. Rationale: While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.
Information Requirement	1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).  2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.

### Response:

#### **1. Mammalian Organ Ingestion Rates**

The derivation of the Traditional Foods diet is explained in detail in Section 4.2.4.2 of Appendix 10-A (ERA), which states: “A dietary study was performed for residents of Patuanak and La Plonge to understand which traditional foods were consumed by each community and the approximate amounts consumed. The results of the survey were summarized in CanNorth (2017) by average daily intake in grams (fresh weight) of country foods by species and season, for Patuanak, La Plonge, and an average. A summary of the ERFN traditional food ingestion rates by food type is shown in Table 4-3 and the proportions of food types are shown in Figure 4-3.”

As shown in Table 4-3 in Appendix 10-A the mammalian organ ingestion rate was 6.2 g/d for La Plonge, and 16.2 g/d for Patuanak, and the average was 12.8 g/d for both areas combined. A more detailed breakdown of organ types is provided in IR-198 Table 1 below which indicates that organs are consumed from moose, woodland caribou, and barren-ground caribou. As shown in IR-198 Table 1 below, the greatest contribution to the total organ ingestion rate is from moose organs. Looking at the total organ ingestion rate, approximately 80% of the contribution is from moose liver, kidney, and other parts (see IR-198 Figure 1 below); therefore, it was decided for the ERA to assign the total organ ingestion rate to moose organs.

## **2. Rationale for Concentrations of Radionuclides in Moose Organs Only**

The reviewer also requested rationale for why concentrations of radionuclides are not provided for organs of animals other than moose. The reviewer acknowledges that they are “not aware of transfer factors to individual organs or to organs that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.” The transfer factor for moose organs was scaled based on the beef organs transfer factor from CSA N288.1-20 (see Table 3-15 in Appendix A to Appendix 10-A). Limited literature data is available for transfer factors for organs. It was decided to represent organs with moose organs based on the results from the ERFN diet explained above.

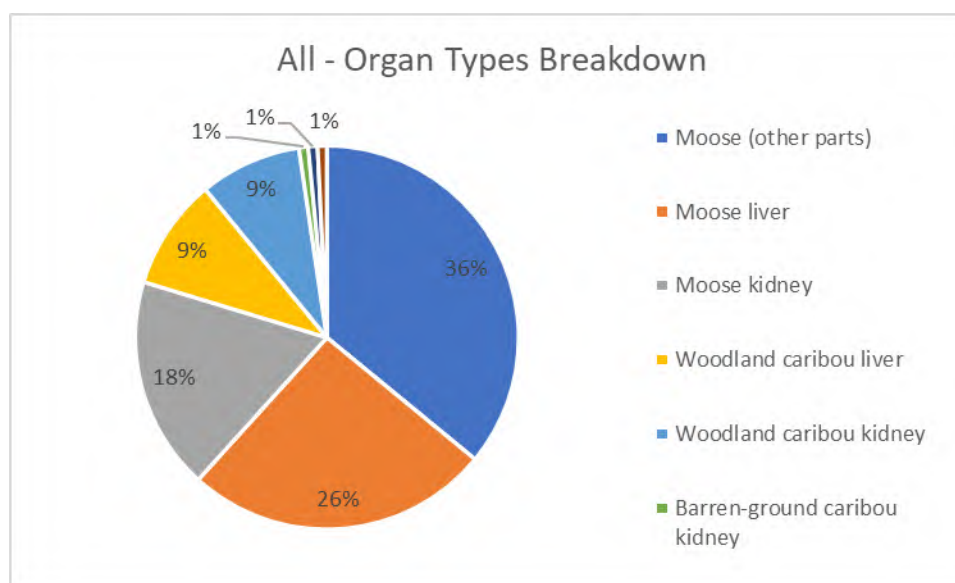
Denison acknowledges that the ingestion transfer factors for woodland caribou organs would be higher than the transfer factors for moose. These ingestion transfer factors are summarized in IR-198 Table 2 below for the relevant radionuclides, and the resulting tissue concentrations based on predicted concentrations at McGowan Lake are summarized in IR-198 Table 3. The predicted tissue concentrations for woodland caribou organs ranges from about 0.6 to 6.9 times higher than the predicted tissue concentrations for moose organs for radionuclides in the U-238 decay chain. However, based on the breakdown of organ ingestion rates shown in IR-198 Table 1 below, the caribou organ intake rate is ¼ of the moose organ intake rate, which roughly offsets the higher concentrations in caribou organs. Therefore, representing the organ intake as 100% moose organs is a reasonable approximation.

No changes to the EIS or ERA (Appendix 10-A) were made based on the response to this IR.



**IR-198 Table 1: Breakdown of Contribution of Organ Types to Total Organ Ingestion Rate**

Organ Types	La Plonge g/d	Patuanak g/d	All g/d	La Plonge % of Organs	Patuanak % of Organs	All % of Organs
Moose (other parts)	2.4	5.7	4.6	39%	35%	36%
Moose liver	1.8	4.1	3.3	29%	25%	26%
Moose kidney	1.8	2.5	2.3	29%	15%	18%
Woodland caribou liver	0.1	1.7	1.2	2%	10%	9%
Woodland caribou kidney	0.05	1.7	1.1	1%	10%	9%
Barren-ground caribou kidney		0.2	0.1	0%	1%	1%
Barren-ground caribou liver		0.2	0.1	0%	1%	1%
Caribou (other parts)	0.02	0.1	0.1	0%	1%	1%
<b>Total Organs</b>	<b>6.2</b>	<b>16.2</b>	<b>12.8</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>



**IR-198 Figure 1: Breakdown of Organ Types for ERFN Traditional Foods Diet**

**IR-198 Table 2: Ingestion Transfer Factors (d/kg fw) for Mammalian Organs**

<b>Radionuclide</b>	<b>Beef Organs</b>	<b>Moose Organs</b>	<b>Woodland Caribou Organs</b>
Body Weight (kg)	600	400	180
Uranium-238	6.90E-04	9.35E-04	1.70E-03
Uranium-234	6.90E-04	9.35E-04	1.70E-03
Thorium-230	6.30E-02	8.54E-02	1.55E-01
Radium-226	9.50E-04	1.29E-03	2.34E-03
Lead-210	2.20E-02	2.98E-02	5.43E-02
Polonium-210	5.00E-05	6.78E-05	1.23E-04

**IR-198 Table 3: Estimated Tissue Concentrations of Moose Organs and Woodland Caribou Organs at McGowan Lake**

<b>Tissue Type</b>	<b>Units</b>	<b>U-238</b>	<b>U-234</b>	<b>Th-230</b>	<b>Ra-226</b>	<b>Pb-210</b>	<b>Po-210</b>
Moose organs	mg/kg fw	7.84E-02	7.84E-02	3.04E+00	8.76E-02	7.15E+00	1.31E-02
Woodland caribou organs	mg/kg fw	3.31E-01	3.31E-01	3.30E+00	5.46E-02	4.94E+01	7.50E-02

## Attachment: IR-213

Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

Table to support response in IR table:

Table 3-2 in Appendix A of Appendix 14-A will be updated in the final EIS to include (new) Scenario 2.4 Well Casing Yield and/or Damage:

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.4	Scenario 2.4 Well Casing Yield and/or Damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Risk level is low, moderate consequence event (assume localized event to ground where clean up is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

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## Attachment: IR-214

Number	IR-214
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Section 14.5.3 Appendix 14-A, section 3.2.3
Context and Rationale	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <ul style="list-style-type: none"> <li>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</li> <li>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</li> <li>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</li> <li>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</li> <li>v. Hazard ID# 12.1 has a L=2 and S=3, but it's risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</li> <li>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</li> </ul> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>

Information Requirement	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.
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Tables to support response to IR-214:

The updated hazard screening tables on the following pages are provided in support of the response to IR-214.

It is noted that the revisions highlighted do not affect the outcome of the screening evaluation and do not necessitate consideration of additional bounding scenarios by way or more detailed analyses.



Site Works - Summary – Nine potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-1: Hazard Identification Evaluation – Site Works

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
1.1	Fall / slip	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment	5	23	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.2	Fall / slip	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.3	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	4	2	Low	Overall Risk level is low, <u>low-minor</u> consequence event, no further assessment
1.4	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment	1	3	Low	Overall Risk level is low, highly unlikely event, no further assessment
1.5	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	2	23	Low	Overall Risk level is low, <u>highly</u> -unlikely event, no further assessment
1.6	Fuel storage and transfer fire and explosion	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Personal protection equipment Fire safety plan and firefighting system	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.7	Vehicle and construction equipment accident	Co / Op / De	Occupational major injuries	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage)	4	2	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment
1.8	Vehicle and construction equipment accident	Co / Op / De	Occupational fatalities	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control	2	5	ALARP, High	Best practice in worker health and safety program resulting in high but ALARP, no further assessment
1.9	Vehicle accident	Co / Op / De	Hazardous materials spill	Occupational health and safety plan Personnel training and orientation Preventive and routine maintenance Onsite traffic control (speed limits, signage) Spill management and response	4	2	Low	Overall Risk level is low, minor consequence <u>events</u> , no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



- EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Per FIRT IR 214 updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply
- EcoMetrix

Updated severity to 3 (from 2) to reflect occupational injury. This change does not change the overall risk ranking of ALARP, moderate.

@mention or reply

Wellfield - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-2: Hazard Identification Evaluation – Drilling

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
2.1	Drilling mud spill	Co / Op	Material spill to ground, including contaminated drill muds	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Primary and secondary containment for drilling mud	4	2	Low	Overall risk level is low, <u>low-minor</u> consequence event (assumes containment and clean up), no further assessment
2.2	Piping failure in the well field	Co / Op	Loss of lixiviant, UBS, and/or regents to ground	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to ground where clean up is possible prior to groundwater contamination), no further assessment
2.3	Surface flood	Co / Op	Potential for groundwater contamination	Lined collection points Site grading to collection areas Collection pond sized to accommodate PMP	2	2	Low	Overall risk level is low, <u>low-minor</u> consequence event, no further assessment
2.4	Well casing yield and/or damage	Co / Op	Loss of lixiviant into the groundwater within freeze wall containment	Occupational health and safety plan Personnel training and orientation Personal protection equipment Spill management and response Secondary containment via freeze wall	2	3	Low	Overall risk level is low, moderate consequence event (assume localized event to groundwater where cleanup is possible), no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking


**EcoMetrix**

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

Note: Table includes new scenario 2,4 FIRT IR 213.

August 16, 2023, 8:23 AM

Access Road / Land Transportation - Summary – Eight potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios carried forward for quantitative assessment.

Table 3-3: Hazard Identification Evaluation – Access Road / Land Transportation (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequences	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
3.1	Vehicle accident including rollover, collision, run off road	Op	Aquatic release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.2	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of radioactivity	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.3	Vehicle accident including rollover, collision, run off road	Co / Op / De	Aquatic release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	5	High	Further Assessment Recommended
3.4	Vehicle accident including rollover, collision, run off road	Co / Op / De	Terrestrial release of fuel, hazardous chemicals and reagents	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan Spill management and emergency response plan	3	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP; Further Assessment Recommended to address interested party concerns (includes consideration of radioactivity)
3.5	Vehicle fire	Co / Op / De	Terrestrial release of hydrocarbons and fuel	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	Best practice in terrestrial spill containment and cleanup resulting in ALARP, no further assessment
3.6	Vehicle fire	Co / Op / De	Release of radioactivity to air	Occupational health and safety plan Personnel training and orientation Travel management plan Spill and emergency response plan Spill management and emergency response plan	1	4	ALARP, moderate	<u>Overall moderate (ALARP) low-risk, low-probability</u> highly unlikely event. Reversible and transient effect. No further assessment
3.7	Vehicle fire	Co / Op / De	Atmospheric release of particulate and combustion by-products	Occupational health and safety plan Personnel training and orientation Travel management plan Spill management and emergency response plan Fire safety plan and firefighting systems Ambient air monitoring	1	3	Low	<u>Overall low-low risk, highly unlikely-low-probability</u> event. Reversible and transient effect. No further assessment
3.8	Vehicle – Wildlife collision	Co / Op / De	Wildlife fatality	Occupational health and safety plan Personnel training and orientation Traffic control measures Travel management plan	4	2	Low	<u>Overall low risk</u> . Individual (not population) level <u>minor</u> effect, reversible and nonsignificant effect, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



Airstrip - Summary – Four potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios carried forward for quantitative assessment.

Table 3-4: Hazard Identification Evaluation – Airstrip

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
4.1	Fuel storage failure	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	1	3	Low	<del>Overall r</del> Risk level is low, highly unlikely event, no further assessment
4.2	Refuelling accident	Co / Op / De	Hydrocarbon release	Occupational health and safety plan Personnel training and orientation Secondary containment Spill and emergency response plan	4	2	Low	<del>Overall Risk</del> risk level is low, <del>low-minor</del> consequence event, no further assessment
4.3	Plane de-icing chemical release	Co / Op / De	Terrestrial release of reagent; possible aquatic release of reagent	Personnel training Containment Spill and emergency response plan	3	2	Low	<del>Overall r</del> Risk level is low, <del>low-minor</del> consequence event, no further assessment
4.4	<u>Air plane</u> crash	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-likelihood</del> Highly unlikely event, best practice in air traffic control resulting in ALARP, no further assessment
4.5	Ground vehicle – <u>air plane</u> collision	Co / Op / De	Occupational major injuries / fatality Atmospheric release of particulate and combustion by-products Release of hydrocarbons and fuel Damage to mine infrastructure structure	Travel management plan Air traffic control Ground traffic control Spill and emergency response plan Fire safety plan and firefighting systems Personnel training	1	5	ALARP, moderate	<del>Low-Highly unlikely</del> likelihood event, best practice in air / ground traffic control resulting in ALARP, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze plant - Summary – Five potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.

Table 3-5: Hazard Identification Evaluation – Freeze plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
5.1	Ammonia storage and piping failure	Co / Op	Material spill	Occupational health and safety plan Personnel training and orientation Storage inspection, maintenance Secondary containment Spill and emergency response plan	3	2	Low	<del>Overall risk</del> Risk level is low, <del>low-minor</del> consequence event, no further assessment
5.2	Loss of freeze capacity	Op	Loss of freeze wall and secondary underground containment	Freeze wall monitoring Monitoring wells outside of the freeze wall – temp, pressure Back up gensets	1	5	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended. Denison does not believe a leak would occur however public perception of a loss of containment is of high concern and should assessed. In practice, the mechanical failure of refrigeration system can be addressed and mitigated well before the thawing of the freeze wall which would take months.
5.3	Cooling line break	Co / Op	Release of brine below ground and potential for groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Spill and emergency response plan	2	4	ALARP, moderate	<del>Low likelihood</del> Unlikely event, best practice resulting in ALARP, no further assessment
5.4	Cooling line break	Co / Op	Release of brine on surface – potential for ground and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system Pipes in trenches and secondary containment Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low-minor</del> consequence event with appropriate response and mitigation, no further assessment
5.5	Pumps failure	Co / Op	Release of brine on surface - potential for surface and groundwater contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Remote monitoring system No open drain from pumphouse Spill and emergency response plan	2	2	Low	<del>Overall Risk-risk</del> level is low, <del>low-minor</del> consequence event with appropriate response and mitigation, no further assessment

Notes: “Co” is construction  
“Op” is operations  
“De” is Decommissioning  
“L” is likelihood  
“S” is severity  
“RR” is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Freeze wall - Summary – One potential scenario has been identified. Risks have been characterized as high as it concerns environmental risks. One scenario is carried forward for quantitative assessment.								
Table 3-6: Hazard Identification Evaluation – Freeze wall								
ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
6.1	Failure of freeze wall due to seismic event / geotechnical instability	Op	Loss secondary underground containment and groundwater contamination	Freeze wall monitoring Redundancy in design Control of pump and injection wells	2	4	Moderate	Loss of containment of lixiviant outside mining chamber - Further Assessment Recommended

Notes: “Co” is construction  
“Op” is [operations](#)  
“De” is Decommissioning  
“L” is [likelihood](#)  
“S” is [severity](#)  
“RR” is risk [ranking](#)

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No changes needed.

@mention or reply



Production Plant - Summary – Seven potential scenarios have been identified. Risks have been characterized as low to high as it concerns environmental risks. Two scenarios are carried forward for quantitative assessment.

Table 3-7: Hazard Identification Evaluation – Production Plant (shaded rows are those recommended for further assessment)

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
7.1	Process vessel and piping system failure	Op	Release of sulphuric acid	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate risk, low-minor consequence event, no further assessment
7.2	Process vessel and piping system failure	Op	Release of hydrogen peroxide and potential for fire	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate risk, low-minor consequence event, no further assessment
7.3	Process vessel and piping system failure	Op	Release of magnesium hydroxide	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained	3	2	Low	Overall low Moderate risk, low-minor consequence event, no further assessment
7.4	Process vessel and piping system failure, Thickener overflow	Op	Release of aqueous solution	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment Process sumps Production building is contained Detectable signs of exposure e.g., irritation	3	2	Low	Overall low Moderate risk, low-minor consequence event, no further assessment. ALARP
7.5	Process vessel and piping system failure	Op	Release of acidic fume from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Availability of respirators Emergency response plan will implement medical response to acute exposure to acidic fumes. Ambient monitoring Building ventilation	3	2	Low	Overall low Moderate risk, low-minor consequence event, no further assessment
7.6	Process vessel and piping system failure	Op	Release of radon from storage tank	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Emergency response plan Ambient monitoring Building ventilation	3	3	Moderate	Overall moderate risk, moderate consequence event - Further Assessment Recommended
7.7	Facility fire / explosion	Op	Release of radioactivity and yellowcake powder to atmosphere	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan Ambient air monitoring	2	5	High	Further Assessment Recommended. It is also noted that this scenario could be an outcome of many initiating events – the specific details associated with the event will be determined based on the most current inventory of combustible and flammable materials associated with the production plant when the analysis is completed.
7.8	Process containment and gas cleaning and filtration system failure	Op	Release of yellowcake powder to atmosphere	Inspection, testing, and maintenance program Ambient air monitoring	3	4	ALARP, moderate	The consequence is bounded by scenario 7.7.

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply

Clean Waste Rock Pads - Summary – Four potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-8: Hazard Identification Evaluation – Clean Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
8.1	Stockpile slope failure	Co / Op / De	Release of material into surrounding environment	Personnel training and orientation Inspection and maintenance	2	2	Low	Overall low risk, unlikely event due to small extent of stockpiles, no further assessment
8.2	Stockpile erosion	Co / Op / De	Release of materials into the environment	Personnel training and orientation Inspection and maintenance Single-lined pad Inspection and maintenance	2	3	Low	Overall low risk, highly unlikely event, no further assessment
8.3	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of materials into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Ambient monitoring Surface water management Spill management	1	2	Low	Overall low risk, highly unlikely event, no further assessment
8.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of materials into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill response plan	2	3	Low	Overall low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
August 16, 2023, 9:11 AM  
@mention or reply

EcoMetrix  
Though not captured by the FIRT IR the Likelihood rating of Scenarios 8.1 and 8.2 were inadvertently reversed. That's has been corrected and the revised Likelihood rating for Scenario 8.1 is "highly unlikely", score 1 and the revised Likelihood rating for Scenario 8.2 is "unlikely", score 2.  
With Specific reference FIRT IR 214(IV) it is believed that that the revised scoring "unlikely" better reflects the event likelihood. Stockpile erosion may not be uncommon but stockpile erosion that would lead to an environmental release as envisioned by the scenario in consideration of the design basis is deemed unlikely.  
August 16, 2023, 9:12 AM  
@mention or reply

Special / Specialized Waste Containment - Summary – Two potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-9: Hazard Identification Evaluation –Special / Specialized Waste Rock Pads

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
9.1	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Ambient monitoring Surface water management Spill management	1	3	Low	<del>Overall low</del> low risk, <del>highly</del> unlikely event, no further assessment
9.2	Loss of containment from storage vessels (barrels) resulting in uncontrolled leachate release	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill response plan	1	4	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)



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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Gypsum (clean) Precipitates Disposal Area - Summary – Five potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-10: Hazard Identification Evaluation – Gypsum (clean) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
10.1	Precipitates erosion	Co / Op /De	Release of contaminants into surrounding environment	Personnel training and orientation Single-lined pad Inspection and maintenance	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.2	Uncontrolled leachate / seepage release through runoff	Co / Op /De	Release of contaminants into the environment	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.3	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the surface water	Personnel training and orientation Single-lined pad Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	2	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.4	Uncontrolled leachate / seepage release through lining failure	Co / Op /De	Release of contaminants into the groundwater	Personnel training and orientation Single-lined pad Inspection and maintenance Groundwater monitoring Spill management and response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment
10.5	Wind erosion	Co / Op /De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <a href="#">highly</a> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is [operations](#)  
"De" is Decommissioning  
"L" is [likelihood](#)  
"S" is [severity](#)  
"RR" is risk [ranking](#)

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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Iron (contaminated) Precipitates Disposal Area – Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-11: Hazard Identification Evaluation – Iron (contaminated) Precipitates Disposal Area

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
11.1	Precipitates erosion	Co / Op / De	Release of contaminants into surrounding environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment
11.2	Uncontrolled leachate / seepage release through runoff	Co / Op / De	Release of contaminants into the environment	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.3	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the surface water	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Surface water monitoring Surface water management Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.4	Uncontrolled leachate / seepage release through lining failure	Co / Op / De	Release of contaminants into the groundwater	Personnel training and orientation Double lined with leak detection/collection Inspection and maintenance Groundwater monitoring Spill management and response plan	1	5	ALARP, moderate	Best management practice results in ALARP, highly unlikely event, no further assessment
11.5	Wind erosion	Co / Op / De	Atmospheric release of contaminants	Personnel training and orientation Erosion control measures Inspection and maintenance Ambient air monitoring Response plan	1	3	Low	Overall <del>low</del> -low risk, <del>highly</del> unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Wastewater Treatment System - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-12: Hazard Identification Evaluation – Wastewater Treatment System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
12.1	Equipment / piping failure	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Piping design pressure higher than pumps shutoff pressure Inspection and maintenance Process monitoring Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, containment of the piping within the ditches indicates no further assessment
12.2	Effluent clarifier overflow	Op / De	Contaminant and radioactivity release	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Secondary containment Spill management and response	2	3	ALARP, <u>moderate/low</u>	Best management practice results in ALARP, no further assessment
12.3	Equipment and control system failure	Op / De	Release of reagents, Environmental contamination	Occupational health and safety plan Personnel training and orientation Inspection and maintenance Process monitoring Recirculation of off-spec water to the process Spill management and response	2	3	Low	Low risk, unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

EcoMetrix

Changes made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenarios 12.1 and 12.2 were "moderate" but should have been ranked "low" based on L=2 and S=3.  
August 16, 2023, 8:47 AM

@mention or reply



Ponds and Retention Berms - Summary – Five potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-13: Hazard Identification Evaluation – Ponds and Retention Berms

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
13.1	Pond overtopping	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	2	3	Low	Overall low risk, <del>low-probability</del> unlikely event, no further assessment
13.2	Ponds containment or embankment failure	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	5	ALARP, moderate	Best engineering practice in maintenance and inspection of the containment systems and berms. No further assessment
13.3	Ponds lining failure and leakage	Op / De	Contaminant and radioactivity release to groundwater	Personnel training and orientation Inspection and maintenance Groundwater monitoring Response plan	2	3	ALARP, moderate/low	Overall moderate/low risk, <del>low-probability</del> likely event with moderate consequence. Overall risk considered ALARP given engineering design and other safeguards. No further assessment recommended.
13.4	Surface flooding	Op / De	Contaminant and radioactivity release	Personnel training and orientation Inspection and maintenance Surface water management Ponds designed for PMP/PMF Spill and emergency response plan Monitoring	1	3	Low	Overall low risk, <del>low-probability</del> highly unlikely event, no further assessment
13.5	Wildlife entering pond	Op/De	Exposure to contaminants, drowning	Wildlife management plan Inspection Fencing	1	2	Low	Overall low/low risk, <del>low-probability</del> highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



**EcoMetrix**  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix.  
@mention or reply



**EcoMetrix**  
Per FIRT IR 214 the likelihood score has been revised from L=2 (unlikely) to L=3 (likely) and therefore overall risk has been updated to ALARP, moderate from Low.  
Based on information received from manufactures and the project team's own experience it is thought the L=3 (≤1 occurrence in 10 years and >1 occurrence in 100 years) may better reflect liner performance, assuming the liner is installed based on appropriate design criteria and used as intended.  
August 16, 2023, 10:34 AM  
@mention or reply

Electrical System and Power Plant - Summary – Three potential scenarios have been identified. Risks have been characterized as low to moderate as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-14: Hazard Identification Evaluation – Electrical System and Power Plant

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
14.1	Substation transformer leak	Co / Op / De	Release of mineral oil and potential for groundwater contamination	Personnel training and orientation Inspection and maintenance Spill and emergency response plan Secondary containment	3	2	Low	Overall low risk, low-minor consequence, no further assessment
14.2	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational major injuries	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	2	23	ALARP, moderate/low	Best practice in worker health and safety program resulting in ALARP, no further assessment
14.3	Transformer, turbine, generator fire / explosion	Co / Op / De	Occupational fatalities	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Emergency response plan Fire safety plan and firefighting systems	1	5	ALARP, moderate	Best practice in worker health and safety program resulting in ALARP, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking

**EcoMetrix** ...  
Per FIRT IR 214, updated severity to 3 (from 2) to reflect occupational injury.  
Also, originally the overall risk ranking was ALARP, moderate - this has been revised to ALARP, low consistent with the hazard analysis risk matrix.  
August 16, 2023, 9:18 AM  
@mention or reply

**EcoMetrix** ...  
Editorial changes made to make terminology consistent with the hazard risk analysis matrix. Also, change made to make overall risk ranking consistent with the hazard risk analysis matrix. Originally, scenario 14.2 was "moderate" but should have been ranked "low" based on L=2 and S=2.  
August 16, 2023, 8:52 AM  
@mention or reply

Fire Protection System - Summary – Two potential scenarios have been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-15: Hazard Identification Evaluation – Fire Protection System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
15.1	Failure of fire pump	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Redundancy Fire safety plan and firefighting systems (including and elevated fire water tank, and a gas-powered pump for at a groundwater well) Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment
15.2	Loss or lack of fire water	Co / Op / De	Loss of firefighting capacity	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Fire safety plan and firefighting systems Emergency response plan	1	3	Low	<u>Overall</u> Low risk, highly unlikely event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix
...

Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

Hazardous Waste Management System - Summary – One potential scenario has been identified. Risks have been characterized as low as it concerns environmental risks. No scenarios are carried forward for quantitative assessment.

Table 3-16: Hazard Identification Evaluation – Hazardous Waste Management System

ID#	Accident / Malfunction	Phase	Consequence	Existing Safeguards / Design Features	L	S	RR / Significance	Screening Decision / Rationale
16.1	Hazardous waste spill	Co / Op / De	Potential for surface water and soil contamination	Personnel training and orientation Occupational health and safety program Personal protection equipment Inspection and maintenance Waste management plan Emergency response plan Onsite monitoring	2	2	Low	Overall low risk, low-minor consequence event, no further assessment

Notes: "Co" is construction  
"Op" is operations  
"De" is Decommissioning  
"L" is likelihood  
"S" is severity  
"RR" is risk ranking



EcoMetrix

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Editorial changes made to make terminology consistent with the hazard risk analysis matrix.

@mention or reply

## Attachment: IR-217


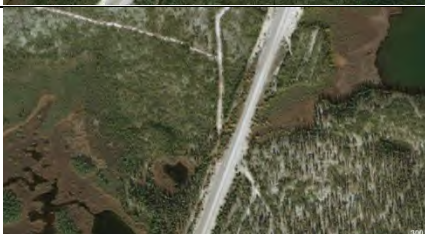


Number	IR-217
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1 and 14.6.2
Context and Rationale	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>
Information Requirement	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.

### Response:

As recommended by the reviewer a review of water crossings associated with the transportation route have been identified. For reference, the analysis considers Hwy 914 south from the project site to its junction with Hwy 165. Hwy 165 was further considered east to Hwy 2 and west to Hwy 155. A total of 66 water crossings were identified as shown in Table IR-217-1, below. Coordinates (lat., long.; are provided for each of the crossings along with a basic description of each and a corresponding satellite image. For reference, in the table the designation “Highway 165W” means the location of the crossing is on Hwy 165 west of Hwy 914, beginning at the Hwy 165/155 and travelling east and the designation “Highway 165E” means the crossing is east of Hwy 914, travelling east toward Hwy 2. It is noted that most crossings are not identifiable by a specific name and are thus identified as “Unnamed creek”.





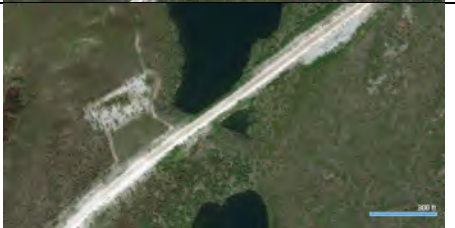

As noted by the reviewer, the potential aquatic environment release scenarios focused on the Wheeler River crossing location. This location was chosen as it represents an important location to resource users in the study area. The scenarios provide examples of the consequences of such releases to local receptors. That is, the results of the assessment of the releases at this location would be expected to be representative of crossings along the transport route since the key endpoint in the assessment is overall risk, as defined for the assessment process as probability multiplied by consequence. For reference, the crossing analysis reference above and presented in the technical memorandum has identified in excess of 100 water crossings along the transportation route as described. It is not practical to assess each of these crossings. While the specific conditions at these crossings may differ in size or nature, the results of the analysis presented can generally be applied more broadly as indicated above. The approach used is consistent with past practice for comparable assessments for uranium projects in the province.

**Table IR-217-1 – Water Crossings on the Wheeler River Project Transport Route**

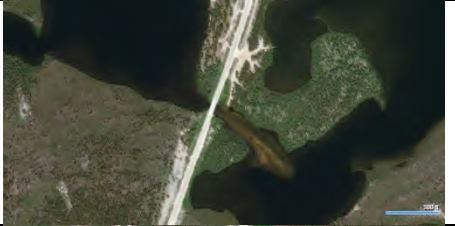


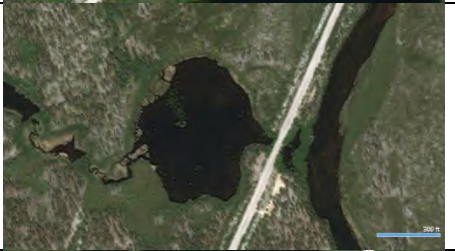


Crossing #	Hwy	Coordinates	Name	Feature	Feature Width (m)	Image
1	914	<a href="#">57.439217, -105.399002</a>	Unnamed creek	Water crossing	10	
2	914	<a href="#">57.378448, -105.464859</a>	Unnamed creek	Water crossing	<2	
3	914	<a href="#">57.354164, -105.485123</a>	Russell Lake	Lake crossing	900	
4	914	<a href="#">57.285332, -105.570038</a>	Unnamed creek	Water crossing	<2	









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5	914	<a href="#">57.273514, -105.591202</a>	Unnamed creek	Wetland complex	100	
6	914	<a href="#">57.220776, -105.685287</a>	Unnamed creek	Water crossing	13	
7	914	<a href="#">57.053490, -105.983330</a>	Unnamed creek	Wetland complex	35	
8	914	<a href="#">56.898136, -106.130302</a>	Unnamed creek	Water crossing	50	
9	914	<a href="#">56.882645, -106.152107</a>	Unnamed creek	Water crossing	60	
10	914	<a href="#">56.850391, -106.159187</a>	Unnamed creek	Water crossing	10	

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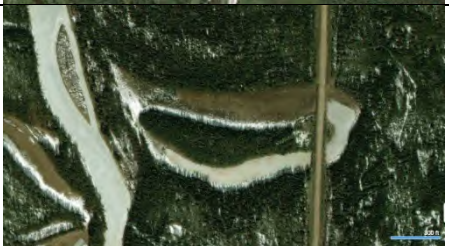
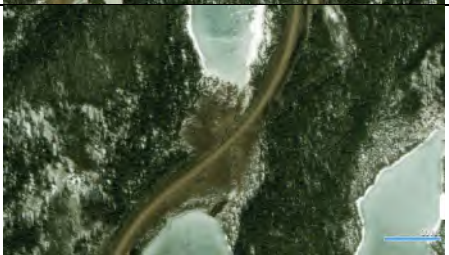
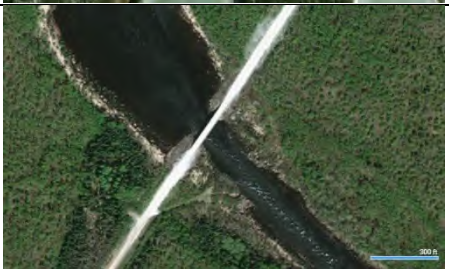
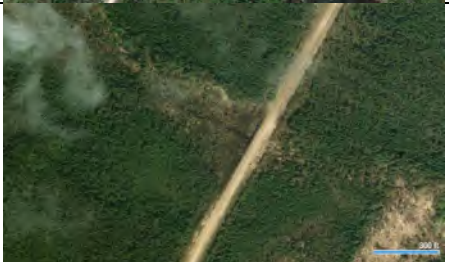
11	914	<a href="#">56.793152, -106.146248</a>	Unnamed creek	Water crossing	15	
12	914	<a href="#">56.787197, -106.149460</a>	Unnamed creek	Water crossing	<2	
13	914	<a href="#">56.722340, -106.165710</a>	Unnamed creek	Water crossing	<2	
14	914	<a href="#">56.669765, -106.201149</a>	Unnamed creek	Water crossing	10	
15	914	<a href="#">56.600300, -106.252251</a>	Unnamed creek	Water crossing	<2	
16	914	<a href="#">56.572754, -106.281494</a>	Unnamed creek	Water crossing	<2	

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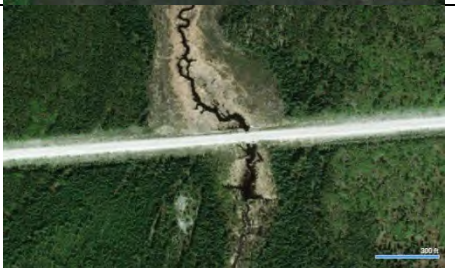


17	914	<a href="#">56.554306, -106.306236</a>	Unnamed creek	Water crossing	<2	
18	914	<a href="#">56.539055, -106.330338</a>	Unnamed creek	Water crossing	5	
19	914	<a href="#">56.444473, -106.401733</a>	Unnamed creek	Water crossing	10	
20	914	<a href="#">56.388561, -106.512726</a>	Unnamed creek	Water crossing	20	
21	914	<a href="#">56.353569, -106.565643</a>	Unnamed creek	Water crossing	<2	
22	914	<a href="#">56.329689, -106.562004</a>	Unnamed creek	Water crossing	10	








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23	914	<a href="#">56.147633, -106.613579</a>	Unnamed creek	Water crossing	35	
24	914	<a href="#">55.994797, -106.521835</a>	Unnamed creek	Water crossing	10	
25	914	<a href="#">55.967976, -106.532318</a>	Unnamed creek	Water crossing	30	
26	914	<a href="#">55.867905, -106.503120</a>	Unnamed creek	Water crossing	<2	
27	914	<a href="#">55.733261, -106.565331</a>	Churchill River	Water crossing	40	
28	914	<a href="#">55.660831, -106.585144</a>	Unnamed creek	Water crossing	<2	

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29	914	<a href="#">55.656418, -106.588326</a>	Unnamed creek	Water crossing	<2	
30	914	<a href="#">55.568588, -106.603722</a>	Unnamed creek	Water crossing	10	
31	914	<a href="#">55.494350, -106.646774</a>	Unnamed creek	Water crossing	<2	
32	914	<a href="#">55.504215, -106.714218</a>	Unnamed creek	Water crossing	7	
33	914	<a href="#">55.500674, -106.768551</a>	Unnamed creek	Water crossing	5	
34	914	<a href="#">55.474350, -106.836800</a>	Unnamed creek	Water crossing	20	

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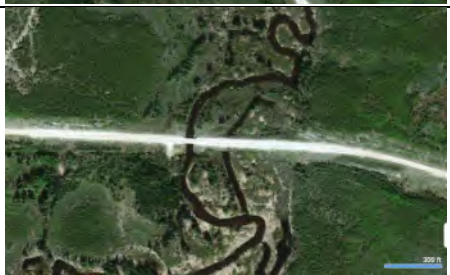



35	914	<a href="#">55.465046, -106.865280</a>	Unnamed creek	Water crossing	<2	
36	914	<a href="#">55.434074, -106.842552</a>	Unnamed creek	Water crossing	<2	
37	914	<a href="#">55.378868, -106.833595</a>	Unnamed creek	Water crossing	10	
38	914	<a href="#">55.358044, -106.839149</a>	Unnamed creek	Water crossing	<2	
39	914	<a href="#">55.282467, -106.815933</a>	Unnamed creek	Water crossing (2x)	40	








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40	165W	<a href="#">55.124847, -107.681786</a>	Unnamed creek	Water crossing	15	
41	165W	<a href="#">55.153086, -107.597933</a>	Beaver River	Crossing complex	750	
42	165W	<a href="#">55.219022, -107.403364</a>	Unnamed creek	Water crossing (minor)	3	
43	165W	<a href="#">55.222092, -107.214650</a>	Unnamed creek	Water crossing	18	
44	165W	<a href="#">55.240179, -106.869717</a>	Unnamed creek	Water crossing (minor)	3	
45	165E	<a href="#">55.229849, -106.789293</a>	Unnamed creek	Wetland complex	100	

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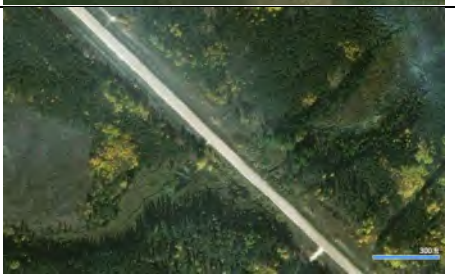

46	165E	<a href="#">55.210766, -106.789518</a>	Unnamed creek	Water crossing	6	
47	165E	<a href="#">55.190045, -106.755394</a>	Unnamed creek	Water crossing (one side ponded)	60	
48	165E	<a href="#">55.178462, -106.686886</a>	Unnamed creek	Crossing complex	13	
49	165E	<a href="#">55.164998, -106.635760</a>	Unnamed creek	Water crossing (one side ponded)	25	
50	165E	<a href="#">55.147328, -106.569588</a>	Unnamed creek	Water crossing (minor)	5	
51	165E	<a href="#">55.145846, -106.480813</a>	Unnamed creek	Water crossing	10	

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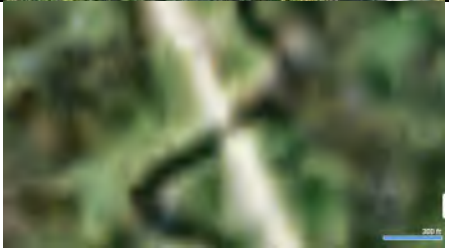

52	165E	<a href="#">55.148323, -106.465283</a>	Unnamed creek	Water crossing (minor)	3	
53	165E	<a href="#">55.155644, -106.419692</a>	Unnamed creek	Water crossing (minor)	3	
54	165E	<a href="#">55.160151, -106.391546</a>	Unnamed creek	Wetland complex	25	
55	165E	<a href="#">55.156452, -106.340823</a>	Unnamed creek	Water crossing	10	
56	165E	<a href="#">55.159666, -106.317084</a>	Unnamed creek	Water crossing	5	
57	165E	<a href="#">55.166328, -106.259241</a>	Unnamed creek	Water crossing (minor)	2	



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58	165E	<a href="#">55.163412, -106.206745</a>	Smoothstone River	Water crossing (major)	50	
59	165E	<a href="#">55.122788, -106.016421</a>	Unnamed creek	Water crossing (minor)	5	
60	165E	<a href="#">55.103940, -105.963149</a>	Unnamed creek	Water crossing (minor)	3	
61	165E	<a href="#">55.104002, -105.949567</a>	Unnamed creek	Water crossing (ponded)	70	
62	165E	<a href="#">55.076830, -105.859303</a>	Unnamed creek	Water crossing (minor)	3	
63	165E	<a href="#">55.059849, -105.821333</a>	Unnamed creek	Water crossing (minor)	5	

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64	165E	<a href="#">55.056275, -105.810201</a>	Unnamed creek	Water crossing (minor)	3	
65	165E	<a href="#">54.884914, -105.748054</a>	Montreal River	Water crossing (major)	20	
66	165E	<a href="#">54.811663, -105.671518</a>	Unnamed creek	Water crossing (ponded)	38	

## Attachment: IR-218

Number	IR-218
Dept.	CNSC
Project effects link	Accidents and Malfunctions
Reference to EIS, appendices, or supporting documentation	Sections 14.6.1.1 and 14.6.1.4
Context and Rationale	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m<sup>3</sup>/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m<sup>3</sup>/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>
Information Requirement	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.

Updated EIS tables to support response:



Table 14.6-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	3,309 <del>2,535</del>	129
Maximum	47	2,535 <del>3,309</del>	912

Table 8-5 to be revised as shown below:

Flow	Affected Distance (m)	Average Sediment Concentration (µg/g)	Porewater Concentration (µg/L)
Minimum	21	3,461	12
Average	33	<u>3,309</u> <del>2,535</del>	<u>129</u>
Maximum	47	<u>2,535</u> <del>3,309</del>	<u>912</u>

## Attachment: IR-236

Number	IR-236
Dept.	ECCC
Project effects link	Fish and fish habitat
Reference to EIS, appendices, or supporting documentation	Section 15.5.2, Expected Environmental Conditions
Context and Rationale	<p>Context: It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p>Rationale: In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics.</p> <p>Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>
Information Requirement	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p>Technical Discussion Required: Yes</p>

### Response:

During the EIS review by the FIRT, there were information requirements (IRs; mainly IR-235 and IR-236, and to a lesser extent IR-103 and IR-104) related to current and future climate precipitation, as well as the probable maximum precipitation. The information in Attachment IR-236 will be added as *Appendix D Summary of Precipitation Values Presented in the EIS* to Appendix 6-C in the final EIS. The Project design and site drainage plan are more closely linked to detailed design to support the licensing process and the precipitation information provided in the draft EIS to support an EA decision is adequate. This new appendix to Appendix 6-C serves to provide clarifications only.

The probable maximum precipitation (PMP) event used for feasibility engineering designs is 493 mm. The PMP value has been extrapolated from Key Lake data presented in the Canadian Climate Program

(1994). Denison reviewed the update to the Canadian Climate Program (1994) report provided in Atmospheric Environment Branch (1999) which shows PMP at the approximate Wheeler River Project location at 489.3 mm. Denison retained the higher of the two PMP values, i.e., 493 mm, for design purposes. As an example, during a PMP, water requiring management will report to the wellfield runoff pond which will be sized to accommodate a PMP event at the site. This pond has been sized to 38,200 m<sup>3</sup> (*excluding a freeboard of 1 meter*). From the wellfield runoff pond, water will then be sent to the process water pond for treatment if required. In EIS Section 2.8 Project Design Features, Denison notes that “Ponds will be designed to maintain a minimum freeboard of at least 1.0 m to allow for continued functioning during a probable maximum precipitation (PMP) event.”

Tables 1 to 4 below provide a summary of precipitation information for both current / existing climate and future climate under different emissions scenarios, in order to 1) summarize precipitation data from various sections of the EIS (Section 6 including Appendix 6-C, Section 8, and Section 15) and 2) provide context on the PMP of 493 mm in comparison to precipitation values (annual precipitation, maximum 1-day precipitation, and 1:100 year, 24 hour return).

Table 1: Precipitation - Existing Climate – Comparisons of Observed Annual Average Precipitation and Maximum 24-hour Precipitation to PMP

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
Annual average precipitation	456 mm	Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Annual average precipitation	483 mm	Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>PMP is similar to annual precipitation</i></b>
Maximum 24-hour precipitation	45.9 mm	Occurred on August 8, 2020.  Recorded from Key Lake in the period from 2011-2020, ECCC station 4063753 Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 10.7 x lower than PMP</i></b>
Maximum 24-hour precipitation	72 mm	Occurred July 12, 1998. Canadian Climate Normals 1981-2010 Station Data, Key Lake, Saskatchewan. Available at: <a href="http://climate.weather.gc.ca">climate.weather.gc.ca</a>	Presented in 6.1.3.1.2 Precipitation and Appendix 6-C. Provides point of comparison for selected Project PMP.	<b><i>24-hr event is 6.8 x lower than PMP</i></b>

Precipitation-related metric	Value	Notes on Source of Data	Location in EIS and comment on how this information was used in the EIS	Commentary on metric compared to PMP (493 mm)
1 in 100 year, 24 hour return	79.9 mm	Calculated using IDF_CC Tool for the Wheeler River Project. Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 6.2 x lower than PMP</b>
1 in 100 year, 24 hour return	56.4 mm	Return Period Estimate based on data from the Key Lake Mine using the IDF_CC Tool (~32 km away from Wheeler River Project). Available at: <a href="http://www.idf-cc-uwo.ca">www.idf-cc-uwo.ca</a>	8.1.3.4 Climate Change Influenced Extreme Events and Appendix 8-B. Provides point of comparison for water management design and understanding rainfall associated with 1:100-year storms.	<b>1:100 is 8.7 x lower than PMP</b>

Table 2: Precipitation – Future Climate - Existing and Predicted Precipitation Data for Key Lake (provided in EIS, Appendix 6-C, Table 10)

Year	Total Annual (mm)				Maximum 1-day (mm)			
	Measured	RCP 2.6	RCP 4.5	RCP 8.5	Measured	RCP 2.6	RCP 4.5	RCP 8.5
<b>2011-2020</b>	455	518	509	508	48	29	27	27
<b>2030</b>		528	503	537		27	24	26
<b>2040</b>		487	498	514		28	29	24
<b>2050</b>		504	524	520		26	29	33
<b>2060</b>		513	515	523		26	33	26
<b>2070</b>		527	534	568		29	31	28
<b>2080</b>		539	551	547		30	33	28
<b>2090</b>		543	545	548		31	32	35
<b>2100</b>		546	535	559		23	25	28
<b>Overall Increase:</b>		28	26	51		-6	-2	1



Table 3: Precipitation – Future Climate - Historical and Future Precipitation Data (Total Annual and Maximum 1-day) for Tomblin Lake, Climate Atlas (provided in EIS, Section 15, Table 15.5-1 and 15.5-2)

Period	Total Annual (mm)			Maximum 1-day (mm)		
	Historical	RCP 4.5	RCP 8.5	Measured	RCP 4.5	RCP 8.5
<b>Historical mean (1976-2005)</b>	456			24.1		
<b>Near Term (2021-2050)</b>		484	487		25.9	25.9
<b>Far Term (2051-2080)</b>		500	509		26.7	27.5

Table 4: Precipitation – Future Climate - Predicted Precipitation (1:100 year, 24-hour return) for Key Lake and Wheeler River Project, 2020 to 2050 using IDF\_CC Tool (provided in EIS Section 8)

Location	1:100 year, 24-hour return
<b>Key Lake Mine</b>	62.0
<b>Wheeler River Project</b>	88.6

References:

Canadian Climate Program. 1994. Point Probable Maximum Precipitation in Northern Saskatchewan. R.F. Hopkinson. Scientific Services Regina Operations Building, Regina Airport. Regina, Saskatchewan. Report No. CSS – R94 – 01.

Atmospheric Environment Branch. 1999. Environment Canada Prairie and Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Atmospheric Environment Branch, Atmospheric and Hydrologic Sciences Division. Regina, Saskatchewan. Report No. AHSD – R99 – 01.

## Attachment: IR-237

Number	IR-237
Dept.	CNSC
Project effects link	EA follow-up and monitoring program
Reference to EIS, appendices, or supporting documentation	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)
Context and Rationale	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"> <li>objectives and structure of the follow-up program and the VCs targeted by the program</li> <li>tabular summary and explanatory text of the main components of the program including: <ul style="list-style-type: none"> <li>a description of each monitoring activity under that component</li> <li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li> <li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li> <li>the specific monitoring objective for that activity</li> <li>planned schedule</li> </ul> </li> <li><u>roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li> <li><u>possible involvement of independent researchers</u></li> <li><u>program funding sources</u></li> <li>information management and reporting (reporting frequency, methods and format)</li> <li><u>possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li> </ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>

Information Requirement	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>
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Response:

Denison concurs that follow-up program documentation will evolve over the planning process and is committed to providing complete and up to date documentation as the EIS is finalized and prior to the EA Decision. Per the March 20, 2023 letter from the CNSC to Denison (Subject: Results of the Federal-Indigenous Review Team technical review of the October 21st, 2022 Draft Environmental Impact Statement Submission for the proposed Wheeler River Project), the company will be providing, as part of the final EIS documentation, a Commitments Report in order to capture all the mitigation measures, follow-up program measures and commitments that have been referenced in the EA documentation in a single location for completeness and traceability. The Commitments Report will be scoped so that it also fulfils the obligations of the commitments registry required by the Saskatchewan Ministry of Environment.

Notwithstanding the above, Denison believes that section 16-C, Summary of Monitoring and Follow-up Programs, in the draft EIS generally meets the requirements outlined in the EIS guidelines but agrees that some additional information can be provided to clarify select aspects. Specific notes per the EIS Guidelines are provided below to provide context the remainder of the response. For reference text in *italics* is taken from the EIS Guidelines; whereas text in **bold** is commentary provide by Denison. Additionally, bold text that is underlined indicates where Denison commits to revising or adding information into the EIS.

*The EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.* **Note from Denison – Table 1-5.1 in Appendix 16-C identifies a framework or preliminary program upon which EA follow-up actions will be managed, as well as all phases of the Project in which the proposed individual follow up programs will be executed.**

*The EIS should provide discussion on the follow-up program's requirements, and include:*

- *objectives and structure of the follow-up program and the VCs targeted by the program* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs, provides an overall program structure and identifies the VCs targeted by the program.**
- *tabular summary and explanatory text of the main components of the program including:*
  - o *a description of each monitoring activity under that component* - **Note from Denison - Table 1-5.1 in Appendix 16-C identifies each proposed monitoring activity for the various technical disciplines within which the environment assessment has been organized.**
  - o *which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)* - **Note from**

**Denison - Table 1-5.1 in Appendix 16-C generally identifies whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures (see column “Monitoring Program Objective(s)”); however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further column will be added to indicate specifically whether the proposed follow up activities are related to verifying EA predictions and/or determine effectiveness of mitigation measures with rational.**

- o *the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects) – Note from Denison - Table 1-5.1 in Appendix 16-C identifies the relevant section of the EIS to which each proposed follow up activity refers. however, it is agreed that further clarity can be provided in this regard. In the updated version of Table 1-5.1 a further, more specific reference to the section / subsection / statement (as appropriate) will be added to the “EIS Reference” column for greater traceability between the assessment section of the EIS for each of the technical disciplines and the proposed follow activities.*
- o *the specific monitoring objective for that activity- Note from Denison - Table 1-5.1 in Appendix 16-C identifies the objectives of the proposed individual follow up programs.*
- o *planned schedule - Note from Denison -Table 1-5.1 in Appendix 16-C identifies the phases of the Project in which the proposed individual follow up programs will be executed. It is premature in Denison’s view to develop specific “schedule” associated with all follow-up activities that are proposed. As noted in draft EIS Section 1.7.5, Licensing and Permitting, as well as in other responses to FIRT IRs, the Project is proceeding through sequential EA and licensing process. Given the sequential process to which Denison has committed it is planned that further detail will be developed to align with detailed engineering design through licensing and permitting and that this information will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.*

*roles and responsibilities to be played by the proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results - Note from Denison – At this time and commensurate with the level of detail (i.e. concept) at which the follow up activities have been defined the proponent assumes responsibility for execution of all proposed activities. This may change as the program details are developed, and Denison presumes this is likely as it continues to work with the key Indigenous groups. It is noted however that provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners and therefore it is inappropriate (and may remain so) that specific details regarding follow up activities be shared without the expressed consent of the agreement signatories. Regulatory agencies at the provincial and federal levels are expected to largely play a review/approval role consistent with their responsibilities under various laws/acts/licenses/permits under which the Project, and follow up activities, will be executed. At this time there are no specific plans with local and regional organizations as it pertains to the design, implementation and evaluation of the program results; but this may change in the future. Per the above, Denison will add additional detail into Table 1-5.1 in Appendix 16-C with respect to roles and responsibilities consistent with the information provided in this IR response. As noted full disclosure of such information may not be possible as it would be*

**subject to non-disclosure covenants between Denison and its key Indigenous partners; nevertheless more specific information will be provided as is available.**

- *possible involvement of independent researchers* – **Note from Denison** – Involvement of independent researchers in follow up activities has not been identified at this time, nor has need for such been specifically flagged. This does not preclude possible involvement of independent researchers in the future; however, need for such has not been specifically flagged. As noted above, provisions for follow up activities and monitoring are expected to be included in agreements developed between Denison and its key Indigenous partners, and such follow up activities and monitoring could include independent research. The sharing of information related to this type of independent research can and would only be shared with the expressed consent of the agreement signatories. **Per the above, Denison will add narrative to the text of Appendix 16-C clarifying the role of independent research that is consistent with the understanding of such at the time the final EIS is published.**
- *program funding sources* – **Note from Denison** – As noted above, the proponent assumes responsibility for execution of all proposed follow up activities that have been identified and therefore the funding of such. Also as noted above, provisions for follow up activities and monitoring that may be included in agreements developed between Denison and its key Indigenous partners will be subject to non-disclosure covenants in those agreements. This would include information concerning any funding that may be associated with these programs. It would be inappropriate (and may remain so) that specific details regarding any funding that may be provided for follow up activities be shared without the expressed consent of the agreement signatories.
- *information management and reporting (reporting frequency, methods and format)* – **Note from Denison** – A framework for information management and reporting is provided in Section 1.2 of Appendix 16-C. As described in Section 1.2 of Appendix 16-C specific information management and reporting structures associated with follow up activities are proposed to be developed as part of the development of the Project Environmental Management System (EMS). The Project EMS will be developed during licensing and permitting and that this information, including more detailed information regarding information management and reporting (e.g., reporting frequency, methods and format) will be available for review at that time. Denison understands that the Project cannot move forward until the appropriate Program / Plan / Procedure documentation is in place and has received approval through the regulatory process.
- *possible opportunities for the proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program* – **Note from Denison** – As noted above, Denison is committed to continuing the ongoing process of identifying opportunities the participation of the public and Indigenous groups as follow up activity programs evolve. There is nothing specific to share at this time but it is expected that further clarity in this respect will be provided in the near to medium terms. It is also understood that any information that can be shared only represents a snapshot in time. Since follow up activities will span the full lifecycle of the Project identification of potential opportunities for involvement is an ongoing process that will also span the full lifecycle of the Project.

Denison anticipates that the lengthy and evolving EIS review process, and consideration of the public comments received by Denison on June 27<sup>th</sup>, 2023, will bring forward additional mitigation and follow up activities. Denison will update Section 16-C, Summary of Monitoring and Follow-up Programs, per the commentary provided in response to IR-237 and will also include changes resulting from the FIRT review process and the Saskatchewan Ministry of Environment review process. This section will align with the Project's Commitment Report which will be provided as part of the final EIS documentation.



Responses to Advice to Proponent

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-01	Canadian Nuclear Safety Commission (CNSC)	Glossary sections	<p>There are terms used throughout the EIS that may either need defining, or inclusion in the glossary.</p> <ul style="list-style-type: none"><li>· “Bounding”, “bounding case” and “bound” are used frequently throughout the EIS to describe the scope of the assessment. For example, p. 2-6 the EIS States: “Denison has bound the environmental assessment above the deposit...”</li><li>· “Laydown”. P. 2-54 states: “During Construction, Denison plans to create a laydown area next to the future domestic landfill to temporarily store construction waste. Examples of materials include clean wood, plastics, metal, and concrete. The construction laydown area will not be lined, but it will have a berm surrounding the area to minimize run-on and runoff.”</li><li>· “Deflagration” (p. 2-22)</li><li>· “Speed of sound” The EIS states: “Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds...” (p. 2-22) - Explain briefly what is meant by “speed of sound”</li><li>· “Dries” (p. 2-65): “the main dries will be located in the processing plant”</li><li>· “Scarified” 2-84 Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species.</li><li>· “Furblock” (p. 4-29)</li><li>· “Cutlines” (p. 4-101)</li></ul>	<p>Add this terminology to either one of the early glossaries, or when describing the methodology, in order to help readers understand these terms (particularly non-technical readers, such as Indigenous peoples and members of the public).</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-02	CNSC	General	<p>Mining solution and lixiviant are used interchangeably throughout the EIS. When both are used periodically, may be difficult for a member of the public to recognize that these are one in the same (mining fluid seems more often used).</p>	<p>Be consistent in how this is referred to, in order to ensure it’s clear to readers that these are one and the same.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-03	CNSC	Throughout the Executive Summary (ES) and draft EIS	<p>Errors in formatting and grammar were identified throughout ES and EIS. Some examples are underlined below:</p>	<p>Please correct these and any other formatting, spelling or grammatical errors.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>
AD-04	CNSC	Section 2.2.1 Mining (p. 2-4 to 2-5)	<p>An arial view could be useful to help a reader understand the proposed freeze wall earlier in section 2 (e.g., The shape, whether it surrounds the deposit). This is unclear but there are good images further down in the EIS (i.e., Figure 2.3-1 on p. 2-78).</p>	<p>Consider adding image to Section 2.2.1, similar to or containing aspects of Figure 2.3-1.</p>	<p>Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-05	Transport Canada (TC)	Sections 2.2.3.2, 2.2.3.10, 2.2.5.1, 2.3.1.6, 8.3.4.2.2, 11.1.4.4.2,	The two water crossings over Kratchkowsky Creek and Hart Creek and the water intake and effluent discharge/intake pipeline and diffuser at Whitefish Lake may be subject to the <i>Canadian Navigable Waters Act</i> (CNWA). However, these works may be exempt from the CNWA, if they meet the requirements of the Minor Works Order.	<p>*This advice pertains to the regulatory phase.*</p> <p>It is recommended that the Proponent self-assess each work using TC’s Project Review Tool as follows: <a href="https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet">https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet</a></p> <p>If the works do not fit the Minor Works Order, the Proponent has the option to either submit an application for approval to the NPP, or use the public resolution process, as these are all unscheduled waterways. The full text of the Minor Works Order is available here: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html">https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html</a>.</p> <p>Background information on the NPP, the Minor Works Order, the application for approval process and the public resolution process are available here: <a href="https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp">https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp</a></p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.
AD-06	Environment and Climate Change Canada (ECCC)	Section 2.2.3.8, Project Description	<p>In this section it is stated that: “The third step of the Industrial Wastewater Treatment Plant (IWWTP) is anticipated to further neutralize and improve the remaining water quality proposed to be achieved with further pH adjustments through agitated tanks and a clarifier with negligible solids generation expected at this stage. Several additional technologies including ion exchange are being evaluated as part of an ongoing Best Available Technology Study to be complete as part of future permitting.” ECCC would be interested in reviewing this study when it becomes available.</p> <p>Considering that the third step of the effluent treatment process in the IWWTP is still undergoing development, ECCC cannot make final conclusions regarding the efficacy of the treatment process. When final treatment technologies have been evaluated and selected, ECCC would like to review this information to allow for release to the environment.</p>	ECCC requests the opportunity to review the Best Available Technology Study and selected treatment technologies for the IWWTP when the report becomes available.	The BATEA information for the IWWTP will be included in Denison’s application to the CNSC for a license to operate. As such, ECCC can direct their review request for review to the CNSC.
AD-07	TC	Section 2.2.5.3	With respect to the proposed airstrip, under the <i>Aeronautics Act</i> , the proposed airstrip would be considered an “aerodrome”, which is defined as: “aerodrome means any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.” Aerodromes, including the one proposed by Denison, are subject to the <i>Aeronautics Act</i> and the Canadian Aviation Regulations (CARs).	<p>*This advice pertains to the regulatory phase.*</p> <p>The proponent must notify the Minister of Transport of the proposed airstrip (aerodrome). This notification, being a summary report to the Minister of Transport, is required by section 307 of the CARs (CARs 307). CARs 307 also requires Denison to undertake consultation in the prescribed manner before it constructs the proposed aerodrome at the mine site. Details of the consultation are to be included in the above-mentioned summary report to the Minister of Transport.</p> <p>CARs 307 identifies the requirement to consult to include anyone seeking to undertake a prescribed aerodrome work at a certified or non-certified aerodrome, whether it is the creation of a new aerodrome or, at an existing aerodrome, lengthening an existing runway or making a</p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				<p>new one. The Regulation also provides minimum expectations for how the consultation should be conducted, including timelines, who to notify and under what circumstances. The intent of the Regulation is to compel consultation in advance of an aerodrome work that will result in sustained and regular impact on interested parties as identified in the Regulation. As the proposed aerodrome will not be within 4 kilometres of a city or built-up area, under CARs 307, the proponent is required to consult the following interested parties:</p> <ul style="list-style-type: none"><li>(i) the Minister of Transport,</li><li>(ii) the providers of air navigation services,</li><li>(iii) the operator of a certified or registered aerodrome located within a radius of 30 nautical miles from the location of the proposed aerodrome work,</li><li>(iv) the authority responsible for a protected area located within a radius of 4 000 m from the location of the proposed aerodrome work,</li><li>(v) any local land use authority where the proposed aerodrome work is to be carried out, and</li><li>(vi) the owner of any land bordering the land on which the proposed aerodrome work is to be carried out.</li></ul> <p>Proponents are encouraged to share their plans with the local land use authority before the consultation period. The local land use authority may have information about other nearby projects or developments that could impact on the proponent's plans.</p> <p>In summary, regarding the airstrip (aerodrome), the proponent must complete the consultation and file the summary report with the Minister of Transport, prior to commencing construction of the aerodrome.</p> <p>Further details can be found at: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01">https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01</a>.</p> <p>TC recommends that the proponent contact TC's Aerodromes Group at CASPNR- SACRPN@tc.gc.ca before starting the consultation, to ensure it is completed in accordance with CARs 307.</p>	
AD-08	CNSC	Figs. 3.4-1, 4.3. 1, and where applicable throughout the EIS	Some maps in the EIS do not contain highway numbers.	Please consider including the highway numbers on the maps early in the Draft EIS when laying out the project location so the reader can become familiar with road network within northern Saskatchewan when discussions take place.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.

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AD-09	CNSC	Section 4, including Figures 4.3.1 and/or 4.3.2 and where applicable throughout the EIS.	The maps included in the EIS in sections do not have any Treaty boundaries. First Nation Treaties should be included on the map. Not all First Nations reserves, and boundaries are included on the map such as Cree Lake and Slush Lake, please include on map and consider adding others from the NAD.	It is recommended that Denison update the maps in these sections to include Treaty Boundaries and community locations are included on the Project location map in Figure 4.3.2 and other maps throughout the entire EIS where applicable.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-10	CNSC	Section 4	Overall, CNSC believes that Denison is abiding by the communications strategies and products identified in their PIDP, but would be interested in additional information that is available.	While CNSC staff are satisfied that the proponent meets the requirements with this EIS, further clarity and detail on the strategic planning behind these communications activities would be beneficial and would further support the overall goals of the Project’s engagement activities.	Acknowledged. Further details on the Public Information Program and Public Disclosure will form part of the documentation submitted in support of the CNSC licensing for the Project.
AD-11	CNSC	Section 4 Indigenous Engagement Report (IER)	There is a summary of what engagement activities will occur moving forward. However, it is not clear which engagement activities/meetings will occur during the different stages of the EA/ project life cycle. Please provide additional details upon submission of the Final EIS.	Denison should consider clarifying in the updated IER which engagement activities will occur during each stage of the project moving forward as per Reg Doc 3.2.2 before submitting the Final EIS.	<p>The engagement activities as outlined in the draft EIS are reflective of the iterative nature of engagement with respect to the Project.</p> <p>At the time of the filing of the final EIS, Denison will describe the status of engagement and future expected engagement activities to occur, which will continue to be aligned with the requirements of Reg Doc 3.2.2.</p>
AD-12	CNSC	Section 4 IER	Information included in the EIS Section 4 and IER regarding engagement activities, communication and issues and concerns raised will need to be updated when the next version of the EIS is submitted. The EIS and IER will need to be updated to include information from Fall of 2022 until approximately two months prior to the submission date of the next EIS.	When re-submitting the EIS, ensure that the engagement log, issues and concerns tables and information about engagement activities done to date have been updated. No action needed only advice to update this section before submission with most up to date engagement activities including any that take place with other Indigenous Nations and communities not included in the Draft EIS.	Acknowledged.
AD-13	CNSC	Section 4 IER	Denison states that validation of VC selection was completed with ERFN, the Northern Village of Beauval, the Northern Village of Pinehouse Lake, and the Northern Hamlet of Patuanak (hereafter Beauval, Pinehouse, and Hamlet of Patuanak, respectively). The EIS states that this was completed through a shared online survey. The EIS also indicates that YNLR was also included in this process.	How has Denison validated VC selection with the other Indigenous Nations and communities that have showed interest and if so, by what methods (survey’s, engagement, meetings, review of Draft sections etc.?) Did Indigenous Nations and communities select any VC’s that were not included in the EIS and if so why not? Please elaborate and provide more details in the EIS on any other methods used including engagement sessions that were completed with Indigenous Nations and communities, through in-person community workshops, VC selection approval through early review of Draft EIS sections.	<p>Section 4 of the draft EIS describes the approach taken related to the Indigenous and non-Indigenous Communities of Interest in relation to the Wheeler River Project. Denison has engaged with these entities regarding the validation of the VC selection.</p> <p>Denison has not undertaken VC validation activities with other Indigenous Nations or communities that have shown interest in the Project, owing to the systematic approach to engagement Denison has been following. This approach is consistent with the methodology presented to the CNSC by Denison in early 2020, for which confirmation was received in mid-2020 and reflected in the draft EIS.</p> <p>All activities undertaken in relation to engagement on VCs are currently described in the EIS; there are no additional details to add.</p> <p>Denison can confirm that it is unaware of additional or new VCs brought forward by other Indigenous Nations or communities that are not suitably captured within the current draft EA approach.</p>

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AD-14	CNSC	Section 4.3.1, Pg 246	On this page, Denison states that MN-S is “currently structured with a President, an Executive, a Provincial Metis Council, Regional Presidents, and Local Presidents. The wording of ‘Regional President’ is incorrect and should be changed to say, ‘Regional Director’.	Please update all wording of “Regional President” to “Regional Director” when referring to MN-S.	Thank you for the advice comment. This will be corrected in the final EIS.
AD-15	ECCC	Sections 5.3.4 (Table 5.3-3); 8.1.3.3 Climate Change; 8.1.3.4 Climate Change Influenced Extreme Events; Table 15.4-1: Summary of Potential Effects of Short-term Extreme Weather  Events on the Project and Associated Mitigation; Section 15.5 Climate Change.	<p>The Proponent indicates that the Project’s full lifetime is roughly 40 years (including the post- decommissioning phase) and that climate conditions are important design considerations for a number of sensitive aspects of the Project. Potential future climate changes and their potential effects on the Project and Valued Components (VCs) are described in various sections of the draft EIS. Notably, in Section 15.5.2, ensemble mean projections are provided for several climate variables for two future time periods and emissions scenarios (RCP 4.5 and 8.5). In Section 8.1.3.4, the Proponent describes possible future changes in short-duration precipitation extremes (based on Intensity Duration Frequency or IDF curves from the IDF_CC tool) and indicates that an increase in their frequency and magnitude may occur over the Project lifetime “... and may require consideration for greater storage and conveyance capacity for Project water management infrastructure” (p.8-41).</p> <p>The Proponent indicates that aspects of the Project are being designed to meet standards based on design values that appear to be derived from observed (i.e. historical) climate conditions (e.g. water management infrastructure; see Table 15.4-1). In Section 15.5.3, they indicate that an adaptive management approach will be used to address some aspects of future climate change as necessary. For example, page 15-19 of the draft EIS states that: “Denison will develop an Emergency Preparedness and Response Program for the Project to address forest fires and extreme weather that may occur. If unforeseen effects on the Project occur from longer and more severe forest fire seasons associated with climate change, or increased frequency or severity of extreme weather (e.g., ice storms, snowstorms, flooding), Denison will apply adaptive management that includes monitoring climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.” (Emphasis added).</p>	<p>ECCC recommends that when considering potential future climate change and relevant effects on the Project, the Proponent consider the range of variability from the ensemble of models (not just the ensemble mean). ECCC also recommends that the Proponent consult the 2019 Canadian Standards Association Guidance on Intensity Duration Frequency for Canadian Water Resources practitioners , which provides examples of alternative methodologies to estimate future return values for design as needed.</p> <p>In terms of adaptive management, ECCC recommends that the Proponent clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p>	<p>Please see response to IR-15, IR-103, IR-104, IR-235, and IR-236.</p> <p>The probable maximum precipitation (PMP) value of 493 mm selected for design of water management infrastructure, such as ponds, is similar to total annual precipitation (456 mm from Key Lake station, and 483 mm from 1981-2020 climate normals).</p> <p>The selected PMP is well above (&gt;5 times higher): 1) current/measured 24-hour maximum precipitation, 2) modelled 1 in 100 year 24-hour return for current conditions, 3) modelled 1:100 year 24 hour return for a future (2020-2050) period, 4) the predicted maximum 1-day precipitation under different emissions scenarios for the future (including RCP8.5 in the 2021-2050 period).</p> <p>For comparison to the <b>design PMP of 493 mm</b>:</p> <ul style="list-style-type: none"><li>- the measured maximum 24-hour precipitation from Key Lake station was <b>42.9 mm</b> and <b>72 mm</b> from 1981-2020 climate normals.</li><li>- the modelled existing/current 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>79.9 mm</b> and at the Key Lake area was <b>56.4 mm</b>.</li><li>- the modelled future (2020-2050) climate 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>88.6 mm</b> and at the Key Lake area was <b>62.0 mm</b>.</li><li>- the predicted future climate (2021-2050) under the highest CO2e emissions scenario (RCP 8.5) shows maximum 1-day precipitation of <b>25.9 mm</b>.</li></ul> <p>The PMP is much higher (&gt; 5 times higher) than the observed and predicted 24-hour maximum precipitation and the 1:100 year 24 hour return. Completing the design using a large PMP provides confidence that the water management infrastructure will be sufficient and function under future climates as it relates to potential changes in precipitation.</p>
AD-16	CNSC	Section 5.10 (p.70) and throughout the EIS	<p>In section 5.10 of the ES, where the seven scenarios are listed, formatting is inconsistent. Likelihood is in quotes in some places, but not in all.</p> <p><b>Not significant</b> is bolded inconsistently throughout the EIS. As well, in many cases noted as “not significant”, where others note “are not expected to have a significant effect”.</p>	<p>Suggest making formatting consistent if going to use quotes and bolding to highlight sections of the text. Also, validate that use of “not significant” and “are not expected to have a significant effect” are consistently used (where appropriate).</p>	<p>Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.</p>



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AD-17	ECCC	Appendix 6-A Air Quality Technical Supporting Document A.10	Some of the off-road vehicles have an emission rating of Tier 2 but in Appendix 6-A Section A.10 the Proponent claims that “for non-road diesel combustion, Tier 4 emission factors were assumed”. Choosing an engine with a lower Tier will increase emissions in NOx significantly and the Proponent should be using the best available technologies to minimize environmental impacts.	ECCC recommends that the Proponent choose engines that meet the most stringent emission standards to the extent possible, which are Tier 4 for the compression-ignition engines, during all phases of the Project.	Please see response to IR-139.
AD-18	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	Understanding Project emissions is important to inform analysis of a Project’s potential impact on Canada’s emissions targets and climate change commitments. ECCC notes that Section 4.0 and Appendix C: Greenhouse Gas Emissions Calculations of Appendix 6-C identifies the source of emissions and quantifies them in the construction, operation, and decommissioning phases of the Project, in accordance with the Draft Technical Guide Related to the SACC (Draft Technical Guide). While ECCC recognizes that the emissions will be relatively small in the post-decommissioning phase, the identification and quantification of the emissions in this phase is not found in the draft Environmental Impact Statement (EIS). The post- decommissioning phase is expected to last 15 years, likely going past 2050. The draft EIS does not discuss emission intensities of the Project, only the grid electricity. The draft EIS also does not discuss the Project’s potential impacts on Canada’s climate targets.	ECCC recommends that the identification of the sources of Greenhouse Gas (GHG) emissions and quantification of these emissions be described for the post-decommissioning phase, as done for the other phases. ECCC recommends the Proponent include discussion on the emission intensities of the mining of the product, following the guidance of the SACC and the Draft Technical Guide. ECCC recommends that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the SACC and the Draft Technical Guide.	The Post-Decommissioning phase only includes monitoring (physical, chemical, and biological) and regulatory site inspections. These activities are not expected to generate any significant GHG releases. Notwithstanding, the calculated GHG emissions estimates for Construction, Operation and Decommissioning are expected to be sufficiently conservative to capture any incidental GHG releases during monitoring and inspection activities.  The EIS anticipated an annual average production rate of approximately 4,082 metric tonnes of U <sub>3</sub> O <sub>8</sub> and an annual net GHG releases of 30,702 metric tonnes CO <sub>2</sub> e over the operations phase of the project. The annualized GHG intensity during operations is estimated at 7.5 tonnes of CO <sub>2</sub> e / tonnes of U <sub>3</sub> O <sub>8</sub> .  Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.  Also see response for AD-19 (second paragraph).
AD-19	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	The draft EIS lacks information related to estimates of impact on carbon sinks and emissions from land-use changes. As land use shifts from a vegetated site prior to development, to an industrialized site, removal of vegetation and peat will have impacts on carbon sinks and construction emissions. Section 6, Appendix 6-C, 4.1.2 Land Use Change states that site-specific information of above- ground mass of vegetation was not available and default data from Table 20 of the Draft Technical Guide were applied. The default data is contained in this table is not applicable in this case, as they represent aboveground woody vegetation in cropland systems. ECCC recognizes that the usage of the median value of 0.51 for the carbon content is reasonable. From the information given in the draft EIS, it does not seem that the soil carbon was taken into account. In the absence of detailed information, the Proponent assumed that the area cleared would also be excavated (and drained in the case of wetland areas) which would create significant additional emissions from soil disturbances and drainage. Section 4.1.2 also states the Project involves clearing an area of	Land Use Change Regarding the lack of site-specific information of above-ground mass of vegetation, an initial site survey on-site using basic information such as site class and species would assist in determining the above-ground biomass. More specific data, such as regional data from provinces, forest companies, or literature may be available, and generic national data is available (e.g., Fo148-1-2E.pdf (publications.gc.ca), 4775.pdf (nrcan.gc.ca)). ECCC recommends that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands. Carbon Sinks ECCC recommends that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the Draft Technical Guide.	Limited site-specific data were available to characterize land use change and impacts on carbon sinks. As such, the use of default values from the SACC/IPCC in conjunction with some limited habitat/vegetation data (extracted from Chapter 9.2 Terrestrial Environment – Vegetation and Ecosystems, Listed Plant Species and Wetlands) was employed and is considered reasonable at this stage of the assessment. Please note that additional information on the land use change GHG calculations can be found in Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report.  In accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data becomes available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks



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			approximately 169.6 hectares. There are no estimates on the impact on carbon sinks related to the Project.		and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.
AD-20	NRCan	Section 7.3.1, Physical Geography	Drumlins and eskers in the region trend Northeast to Southwest as opposed to northwest to southeast as written on page 7, line 18. Correct orientations are used on page 7, line 23.	NRCan recommends revising the text. Please refer to 250 000 scale Surficial Geology Lines from Quaternary mapping, CSRS NAD83 Zone 13, Saskatchewan Geological Survey 2017.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS. In Section 7.3.1. the text will be updated to say the following: “The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...” See also response to IR-54.
AD-21	NRCan	Section 7.3.2.3, Metacrystalline Basement Rock	Pegmatite missing from list of basement rock types.	NRCan suggests addition of pegmatite to the list of basement tock types as shown on Figure 7.3-6.	Denison will update the final EIS per NRCan’s suggestion.
AD-22	NRCan	Section 7.3.3.1, Aquifer Properties, Section 7.3.2.3, Metacrystalline Basement Rock, Appendix 7A, 2.0, 2.3.1, 2.3.2	The terms “metacrystalline” and “metagranitic gneiss” are not frequently used terms in scientific literature. Gneiss is, by definition, a metamorphic rock.	NRCan suggests revision to “Crystalline Basement rocks” or “Basement metamorphic rocks”, and “granitic gneiss” as used in Figure 7.3-6. Please refer to Oxford Dictionary of Earth Sciences.	Denison will update the final EIS per NRCan’s suggestion.
AD-23	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Orogeny is the process, orogen (or orogenic belt) is the feature produced by orogeny.	NRCan suggests replacing “Tran Hudson Orogeny” with Trans Hudson Orogen”.	Denison will update the final EIS per NRCan’s suggestion.
AD-24	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Quartzite is by definition a metamorphic rock, and the term is used later without the meta- prefix.	NRCan suggests replacement of the term “meta-quartzite” with “quartzite”.	Denison will update the final EIS per NRCan’s suggestion.
AD-25	NRCan	Appendix 7A, 2.3.4, Athabasca Group Sandstones and Conglomerates	Sands are unlithified, whereas you are referring to grain sizes in this case.	In Table 2-1, NRCan suggests replacing the term “sands” with “grain sizes” under MFc and MFb descriptions.	Denison will update the final EIS per NRCan’s suggestion.
AD-26	NRCan	Appendix 7A, 2.3.5, Overburden	Typo on page 2, line 7: “A grain size sample was collected in GWR-033 from approximately 9 m below ground surface, and the same consisted of 8.8% clay (less than 4 µm).	NRCan suggests revision of “same” to “sample” and clay to “clay-sized” grains.	Denison will update the final EIS per NRCan’s suggestion.

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AD-27	CNSC	Section 8.2.1.3 – Spatial and Temporal Boundaries	It is noted that McGowan Lake is an identified reference lake for the Key Lake Mill site. With the establishment of the Wheeler River mine, effluent would be flowing into McGowan Lake, which could potentially interfere with Key Lake’s environmental monitoring program by compromising McGowan Lake’s baseline conditions. Depending on the loading of COPC’s into McGowan Lake and resultant water concentrations, it may no longer be accepted as an acceptable reference lake for use by Key Lake. This would require Cameco to modify their monitoring program at the Key Lake Mill.	The CNSC advises Denison to communicate with Cameco to ensure they are aware of this situation. Coordination between the two companies may be necessary to ensure Key Lakes environmental monitoring program is not compromised. It is recommended to discuss this potential issue with Cameco ahead of time to determine the best path forward.	<p>Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating, since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.</p> <p>Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.</p>
AD-28	ECCC	Section 8.2.4.2.3 Appendix 10-A, Section 3.1.1.2	Tables 8.2-9 and 8.2-10 in Section 8.2.4.2.3 Part II_S8 Aquatic Environment and Table 3-1 in Appendix 10-A Section 3.1.1.2 demonstrate predicted maximum effluent concentrations of Constituents of Potential Concern (COPCs) and maximum predicted receiving environment concentrations. The final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short-term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guideline, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe. While uranium is not a Schedule 4 substance with prescribed concentration limits under the Metal and Diamond Mining Effluent Regulations (MDMER), the MDMER requires the characterization of uranium concentrations in effluent under Schedule 5, and requires that all mine effluent released from final discharge points be non-acutely lethal. Under Schedule 5 Section 9(d) of the MDMER, the Proponent will likely be required to conduct selenium fish tissue sampling if average annual concentrations of selenium in effluent equals or exceeds 5 ug/L.	Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.	Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria.
AD-29	CNSC	Section 8.3.3 Figures 8.3.5 etc. 8.5-4	It does not appear that aquatic baseline sampling maps for Russell Lake have LAB 1 and 2 locations showing the baseline sampling locations within Russell Lake. (Figures 8.3.5). Please update the Figures throughout aquatic environment section to include of the baseline sampling studies/ locations within Russell Lake.	Please update maps and sections in EIS to reflect aquatic baseline studies that were completed.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

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AD-30	CNSC	EIS sections 8.4.3.2.4 Benthic Invertebrate Community and 8.4.7.6 Climate Change Considerations	<p>ECCC EEM guidance recommends the use of multiple reference areas as it offers the greatest statistical power to detect a meaningful difference between a reference area and an exposure area and can also give an indication of variability among reference areas. It is also important to incorporate multiple reference locations into the study design to aid in designing against spatial confounding factors.</p> <p>Section 3 of the Aquatic Environment Baseline Study Report details the similarities between benthic invertebrate communities by using the mean Bray-Curtis index between sampling locations and the median reference condition for the lake group size. It's not clear in the EIS if there are any issues expected to be able to use this data to compare project effect locations to references sites into the future, as some sampling locations are currently not very similar to the reference sites. In addition, climate change could affect the sediment and benthic communities in the future. The EIS states “the frequency and magnitude of extreme precipitation events have the potential to change water levels and flows in the RSA, which may affect sediment transport, deposition, and therefore benthic invertebrate habitat. Changes to average and upper and lower bounds of ambient temperatures may also affect aquatic habitat, which in turn may affect benthic invertebrate communities. Climate change over the life of the Project (i.e., 35 to 40 years) will be monitored as part of the Project’s environmental monitoring programs, and influences on water quality, sediment quality, and benthic invertebrates will require adaptive management to mitigate any potential effects of the Project that may be exacerbated by climate-related changes on the aquatic environment”. It is recommended to ensure that appropriate number/location of reference sites are sampled to enable any changes to sediment or benthic invertebrate communities that may be due to climate changes, and not project effects, are able to be assessed.</p>	<p>Considering climate change may change the lake conditions from baseline conditions, and that there is already natural variability between lakes that will be used as reference lakes and exposure lakes, it could become difficult to show changes to sediment/benthic invertebrates are not due to project activities, therefore there is a recommendation to ensure the current baseline data is adequate, and to consider if additional data, and addition of additional reference stations, will be needed moving forward.</p>	<p>Changes in landscape influence and lake conditions are not limited to those brought about by climate change. The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls prior to project development. A preliminary EEM study can be completed that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.</p>
AD-31	CNSC	Section 8.4.6.1, Residual Effects Characterization	<p>The EIS states “Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment.” Based off concerns from Indigenous communities, and the fact that phosphate is a COPC in the effluent, and elevated concentrations of mercury were measured near the</p>	<p>Please consider adding methylmercury to the environment sampling plans (such as fish dorsal muscle) in order to confirm there are no unexpected effects of the project on levels, and to satisfy stakeholder concerns.</p>	<p>Refer to response to IR-100.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
			Kratchkowsky Lake bottom, adding methylmercury to the environment sampling plans may be beneficial.		
AD-32	CNSC	Section 9.1.8.3, Appendix 10-A (ERA) section 3.2.1.5	<p>It appears there is no consistency between the assessment of soil quality in the ERA and the baseline soil sampling program presented in the EIS. The baseline program includes 10 soil permanent sampling locations (Appendix 9-B, section 2.5). Sampling at these locations is proposed to be continued during the Operation Phase, and monitoring data will be compiled and reported annually/periodically (EIS section 9.1.8.3). Conversely, the ERA estimates and predicts concentrations of COPC in soil based on atmospheric deposition. Furthermore, the location of ecological receptors in the ERA (Figure 5-2) is different from the permanent soil sampling plot locations (Appendix 9-B, Figure 2.5-1). It is unclear why measured baseline soil quality data were not discussed in the ERA and whether future monitoring data will be considered in the ERA to verify accuracy of predicted COPC concentrations</p>	<p>Please clarify how baseline measured data on COPC concentrations in soil is considered in the current and future iterations of the ERA.</p>	<p>Baseline measured soil data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. The baseline soil concentrations used in the model are provided in Section 3.5.1 and Table 3-8 of Appendix A in Appendix 10-A (ERA).</p> <p>The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.</p>
AD-33	CNSC	Section 9.3.3.1.2	<p>Indigenous knowledge is summarized with regard to moose, including:</p> <ul style="list-style-type: none"><li>· Calving sites close to the Wheeler River, with lots of muskeg in the area. A moose calving area is located in the Terrestrial RSA, southwest of the Project Area.</li><li>· A wildlife corridor is used by moose, running between Cree Lake (outside and to the west of the Terrestrial RSA) and Russel Lake (in the southern portion of the Terrestrial RSA).</li></ul> <p>It is unclear how this information is incorporated into the residual effects assessment.</p>	<p>Please clarify how Indigenous knowledge on moose calving sites and corridors in the RSA is incorporated into the residual effects assessment for the key indicator “moose”.</p>	<p>The sites identified by IK were explicitly considered in the impact assessment as indicated by their identification as overlapping with the Terrestrial RSA as noted in the question. However, the areas were not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects.</p> <p>The Indigenous Knowledge provided by ERFN and SVS (2022) identifies a moose calving site (Feature 1001-08) ~ 2 km southwest, and a wildlife corridor ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022). Both areas are within the Terrestrial RSA but outside the Wildlife LSA. The reference to “Calving sites close to the Wheeler River...” refers to a broad area that is 45 km east of the Project Area, well beyond interactions with the Project Area.</p> <p>The presence of the areas identified through IK was acknowledged in Section 9.3.3.1.2 (Information from Indigenous Knowledge, Local Knowledge, and Engagement) in Part II, Sec. 9 of the Draft EIS. The assessment (Sec. 9.3.4.2) considered alteration and/or habitat loss at the LSA and RSA scale. Section 9.3.4.2.1 (pg. 9-210) summarizes the effects on moose habitat as follows: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA....”</p> <p>Further, Sec. 9.3.6.2.1 (Alteration and/or Loss of Habitat, pg. 9-230) identifies that an area within a 500 m radius of the Project Area will be influenced by the Project and likely make the habitat within that area less suitable for use by moose. Therefore, the effects of the Project on moose calving have been appropriately assessed and are expected to be contained within the Wildlife</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
					LSA. That affected area does not overlap with the moose calving site or the wildlife corridor identified by IK.
AD-34	CNSC	Appendix 9-B	Baseline studies for birds are restricted to short time frames in one year only, for example: <ul style="list-style-type: none"><li>· Breeding Songbird Point Count Call Survey (June 7 and 17, 2017)</li><li>· Aerial Waterfowl and Raptor Stick Nest Survey (June 15 and 16, 2017)</li></ul> The Canadian Wildlife Service (2022) recommends: <ul style="list-style-type: none"><li>· Consider the potential effects of projects on birds throughout the year and document the distribution and abundance of birds in all seasons. Some species may be under-represented in existing data bases due to temporally restricted periods of detectability.</li><li>· Explicitly target species at risk and other focal species.</li><li>· Conduct at least two years of field surveys as a national standard for major projects, so that temporal variability can be considered in future comparisons to baseline data.</li></ul> <b>Reference:</b> Canadian Wildlife Service. 2022. Guidance Regarding Data Needed to Support Assessment of Project Effects on Birds. Environment and Climate Change Canada, Gatineau, Quebec. 80 p.	Please consider conducting surveys following CWS’s recommendations or provide an explanation as to how current baseline data for birds is sufficient to characterize the existing environment.	The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site. However, to supplement the species data that were collected as part of the baseline field program, Denison is willing to acquire additional information on species presence in the RSA from existing sources, specifically from the Saskatchewan Breeding Bird Atlas (Birds Canada). However, collection and consideration of this information is not expected to affect the findings and/or conclusions stated in the draft EIS as the assessment was habitat-based to address all species.
AD-35	CNSC	Section 10, IMPACT MODEL	Denison discusses details of the IMPACT model but has not provided scenario(s) used to facilitate review.	Please consider providing CNSC with the IMPACT model scenario file(s) in the spirit of regulatory cooperation.	The intent of Appendix A to Appendix 10-A is to provide the inputs used for the IMPACT model as well as all of the characteristics for human and ecological receptors. Where site-specific data were not used in the model it can be assumed that default values from CSA N288.1-20 were used in the IMPACT model. As such, Denison does not intend to provide the scenario files.
AD-36	English River First Nation (ERFN)	Section 10.1.3.2, Traditional Foods Diet (p. 10-15)	The EIS States: "The ERFN is comprised of seven reserve lands across Saskatchewan" (p. 10-15). While this is accurately reflecting a source document, the source document is incorrect.	Please update to "The ERFN is comprised of seven historical settlements that have now grown into 19 different reserves across Saskatchewan"	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-37	CNSC	Section 10.1.9, Human Health Summary and Appendix 10-A – 4.4.1 Risk Estimation	The Human Health section of the EIS, as well as the ERA, indicates that there is an exceedance for selenium for the fisher/trapper receptor, with the Project estimated to contribute to the majority of this exceedance (0.93 of the HQ). While the assessment is conservative by assuming an increase intake rate of fish solely sourced from Russel Lake, the precautionary principle should be considered to ensure in reality the HQ for selenium remains below 1, even under conservative assumptions.	Please conduct of effluent, water, and aquatic organism monitoring (as already suggested in EIS) to confirm HQ's are highly conservative in the EIS modelling and receptors remain protected. Should it be determined Se concentrations are increasing in the environment at such a rate as there may be in impact to the environment or human health, installation of a selenium removal circuit into the effluent treatment process should be considered. The proponent should ensure that the proposed wastewater treatment system design incorporates the capability for expansion or upgrades in alignment with the precautionary approach, pollution prevention, and continuous improvement.	Denison acknowledges that a robust effluent and environmental monitoring program will be developed to confirm all EIS modelling predictions. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-38	CNSC	Appendix 10-A (ERA)	It is unclear if measured or modelled COPC concentrations in blueberry were used in the calculations of human receptor dose. Similarly, it is unclear if measured or modelled COPC concentrations in lichen and blueberry were used in the calculations of ecological receptor dose. CSA N288.6-22, Clause 7.3.6 states that "Measured concentrations of COPCs should be used, where possible, in the exposure assessment." Please see the Clause for further information.	Please clarify if measured or modelled COPC concentrations in blueberry / lichen were used in the calculations of human and ecological receptor dose.	Measured baseline lichen data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. Measured baseline blueberry data were used for model calibration to determine if there was good agreement between measured data and modelled data. The IMPACT model was used to predict both baseline and Project contributions for blueberries. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-39	CNSC	Appendix 10-A (ERA), Table 2-2	Table 2-2: Estimated Home Ranges of Selected Terrestrial Ecological Receptors Based on the reference McLoughlin et al. (2016), the Home Range for Woodland Caribou is indicated as "Expected = 80 km2" which represents the mean range sizes pooled over the two study years for calving/post-calving. The indicated Minimum (67 km2) and Maximum (267 km2), however, do not relate to the calving/post-calving stage, which is not clearly stated in Table 2-2. In contrast, these values are actually mean range size values for autumn/rut and early winter, respectively, as described in the source document on Page 83 (McLoughlin et al., 2016). It should be noted that in terms of true minimum and maximum, the source document states that individual home ranges, based on up to two years of GPS locations, varied in size from 16.2 km2 to 1363.9 km2 (Page 82 of McLoughlin et al., 2016). Reference: McLoughlin et al. 2016. Population dynamics and critical habitat of woodland caribou in the Saskatchewan Boreal Shield. Interim Project Report, 2013–2016. Department of Biology, University of Saskatchewan, Saskatoon. 162 pp. Available online at <a href="http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf">http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf</a>	Please provide clear details on the source of the home range values listed in Table 2-2.	Denison acknowledges the comment and will add clarification in Table 2-2 of Appendix A in Appendix 10-A that the minimum represents the autumn/rut and the maximum represents the early winter.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-40	CNSC	Appendix 10-A (ERA) section 3.2.1.5	Although the soil type selected in the ERA for modeling of atmospheric deposition to soil is sandy soil, organic soils have been delineated and characterized (section 9.1.3.3 of the EIS) as valued component (i.e., “Organic Matter/Peat”). It is unclear if the soil quality modeling performed in the ERA is protective for soil types other than sandy soil.	Please clarify if COPC modeling based on sandy soil is protective of organic/peaty soil and provide justification.	The majority of the soil in the Project Area and LSA is considered sandy soil. Section 9.1.3.2 of the EIS states "Mineral soils are associated with upland sites and (in all likelihood) anthropogenically disturbed land that, together, correspond with >99% of the Project Area and 91.5% of the LSA (Figure 9.1-8). The predominate mineral soils within the RSA have been classified as Sandy Dystric Brunisols (Smith et al. 2011)." Organic matter/peat was included as a VC in the EIS because of the concern regarding drying and losing biological function through groundwater interactions, and not in terms of assessment of soil quality. Additionally, Section 9.1.3.3 of the EIS acknowledges that organic soils is limited in the Project Area. As such, this comment is considered not applicable.
AD-41	CNSC	Appendix 10-A (ERA), Table 5-5	Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model The exposure pathway for phytoplankton is stated as “direct contact in sediment”, however, phytoplankton live suspended in the water column. It is acknowledged that in the IMPACT modelling report, phytoplankton is described with an occupancy factor of 1 in water (Table 2-5).	Please add the pathway “direct contact in water” to Table 5-5 and revise all calculations accordingly.	Table 5-5 will be revised to state “direct contact in water” for phytoplankton. No calculation changes are needed.
AD-42	CNSC	Appendix 10-A (ERA), Table B.12	Table B.12: Sample Calculation – Adult Recreational Fisher/Hunter (McGowan Lake) Dose and Risk Calculations for Selenium  The source for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry is stated as “Table C.5”, however, this table could not be located.	Please provide the referred-to Table C.5 or an alternate source of information for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-43	CNSC	Appendix 10-A (ERA), Environmental Risk Assessment for Wheeler River Technical Support Document	The ERA is prepared by Ecometrix and submitted to Denison Mines. It is unclear if the ERA submitted has been reviewed and accepted by the proponent (Denison Mines).  CSA N286-12 clause 9.5.5 specifies that “the selected supplier’s technical documents that are required to be submitted shall be reviewed and accepted”.  Meeting these CSA N286-12 requirements will ensure that the proponent has control of the purchased services as a future licensee applicant.	Provide clarifications if ERA documents have been reviewed and accepted by the proponent.	See response to IR-202 which indicates that Denison reviewed and accepted the ERA. This text will be added to Appendix 10-A.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-44	CNSC	Section 11	It is not clear whether all of the interested Indigenous Nations and communities were engaged on the results and findings of the Heritage Resources Impact Assessments (HHRIA) or just ERFN?	CNSC staff would appreciate an update on any engagement activities that have taken place with regards to any of the HHRIAs for the Project, or any site or thing that is of historical, archaeological, paleontological or architectural significance as requested by other Indigenous Nations and communities to date.	<p>Denison confirms that the results of the Project-related HRIAs were discussed with ERFN, as they expressed interest in further understanding the nature of the work undertaken.</p> <p>The Saskatchewan Ministry of Parks, Culture and Sport, Heritage Conservation Branch (HCB) administers The Heritage Property Act. Regulatory approval as per section 63 of The Heritage Property Act (GS 80) was granted for the Project for the two separate HRIAs (HCB File No. 16-2102, December 14, 2017 and HCB File No. 19-933 February 12th, 2020).</p> <p>The results of the HRIAs were included and formed part of the draft EIS. Comments made by Indigenous communities on this section of the EIS will therefore be responded to accordingly by Denison, where appropriate.</p> <p>Additionally, as noted in Section 11.3.2, “The Heritage Resource Management Plan (HRMP) was informed by engagement with ERFN, who recommended that the HRMP should include a mechanism to involve Indigenous communities where appropriate (21-EN-ERFN-591.1; 21-EN-ERFN-591.2) (see Appendix 11-B).”</p> <p>The mechanism to involve Indigenous communities has been included in the HRMP and allows for general notification to Indigenous communities should an artefact be found, which provides flexibility to engage all appropriate Indigenous nations accordingly.</p>
AD-45	CNSC	Section 11.1.4.5.2. Perceived Suitability/Safe Use of Resources (p. 11-59)	The EIS States: “Section 2.6.1 in Section 2 describes the extensive review of mining methods that led to the decision to adopt the ISR mining method.” (p. 11-59). This reference is not correct, as this section does not contain a review of the mining methods.	Please update this to reflect the appropriate section.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-46	TC	Section 14.6.7.2	<p>Transport Canada would like to clarify that although the proponent may use a third party to assist in developing emergency response assistance plans (ERAPs), it is the proponent’s responsibility to submit the ERAP application(s) to Transport Canada, per Section 7(1) of the <i>Transportation of Dangerous Goods Act, 1992</i> as follows:</p> <p>Emergency response assistance plan</p> <p>7 (1) No person shall import, offer for transport, handle or transport dangerous goods in a quantity or concentration that is specified by regulation — or that is within a range of quantities or concentrations that is specified by regulation — unless the person has an emergency response assistance plan that is approved under this section before</p> <p>(a) importing the dangerous goods;</p> <p>(b) offering the dangerous goods for transport; or</p> <p>(c) handling or transporting the dangerous goods, in the case where no other person is required to have an emergency response assistance plan under paragraph (a) or (b) in respect of that handling or transporting.</p>	<p>*This advice pertains to the regulatory phase.*</p> <p>Transport Canada notes that the sentence highlighted in yellow below is incorrect and should be revised or removed. While a contractor could assist the proponent to develop the ERAP(s), it is the responsibility of the proponent to apply to Transport Canada for approval of the plan(s).</p> <p>14.6.7.2 Design and Mitigation Considerations Principal traffic risk mitigation measures include:</p> <ul style="list-style-type: none"><li>• traffic control measures such as speed limits;</li><li>• travel management plans;</li><li>• spill and emergency response planning; and</li><li>• driver training.</li></ul> <p>Additionally, Denison considered several provisions to make sure that the effects of a terrestrial release of hazardous materials are as low as practicable. In addition to transportation mitigations listed for Scenarios 1 and 2, the following provisions were considered.</p> <ul style="list-style-type: none"><li>• The Transportation of Dangerous Goods Act, 1992 (Government of Canada 2019) outlines the requirements for entities that transport dangerous goods to establish emergency response assistance plans. These plans list specialized personnel and equipment that are required for responding to an incident. <b><i>It is expected that a contractor responsible for the transportation of uranium concentrate, fuel, and hazardous chemicals would develop these plans.</i></b></li></ul>	<p>Acknowledged. Section 14 will be updated in the final EIS to clearly state that while a contractor could assist Denison to develop the ERAP(s), it is Denison’s responsibility to apply to Transport Canada for approval of the plan(s).</p>
AD-47	Health Canada (HC)	Appendix 14-A (p. 8-9)	<p><b>Context:</b> No emergency response plan has been provided within the draft EIS, which states that emergency response plans will be developed in the future (Section 14 Appendix 14-A, p.8-9).</p> <p><b>Rationale:</b> For any emergency event, Health Canada considers the protection of human health as a primary consideration in the development of emergency preparedness and response plans.</p> <p>This includes monitoring for human health impacts and the provision of health-related guidance. Further, this will be a requirement of the licensing process.</p> <p>The proponent should ensure that the emergency response plans consider the protection of all relevant potential human receptors that could be impacted by an onsite or project-related off- site accident involving the release of chemical and/or radiological substances.</p>	<p>It is recommended that Denison develop an emergency response plan in consultation with potentially affected communities and stakeholders that includes, but is not limited to, the following:</p> <ol style="list-style-type: none"><li>1. All relevant contact information of the communities, especially related to km 160 of Hwy 914, which is the location of a cultural camp that has been established by the English River First Nation and km 67 of Hwy 914 that is a gathering location for the Kineepik Metis Local associated with the Northern Village of Pinehouse.</li><li>2. Description of the mechanisms for communication with communities in case of an emergency.</li><li>3. Description of the partnership with and the training of local communities and local responders (see Section 14 Appendix 14-B, p.1).</li><li>4. Description of mutual aid agreements with neighboring industries/municipalities, where appropriate.</li></ol>	<p>Denison acknowledges the comment and thanks Health Canada for the recommendations as to the development of its Emergency Response Plan.</p> <p>As noted in the draft EIS, Denison has committed to the development of an Emergency Preparedness and Response Program as a component of its Environmental Management System (EMS). The objectives of the program are generically consistent with the recommendations that have been provided and Denison, as it has demonstrated to date, is committed to meaningful engagement with communities of interest and will solicit input and advice during all aspects of program development.</p> <p>For reference it is noted that as it concerns its EMS framework documentation hierarchy it is expected that three levels of documentation will be developed – Programs, Plans and Procedures. The emergency preparedness and response documentation will follow this hierarchy and input from interested parties will be solicited during all phase of program/plan/procedure development. Denison intends to develop this documentation as it advances through the licensing phase of Project realization.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-48	ECCC	Appendix 16-C, Summary of Monitoring and Follow-up Programs	Appendix 16-C does not include consideration of any monitoring and follow-up programs regarding GHGs.	ECCC recommends that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the draft EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Denison anticipates being subject to ECCC’s reporting requirements for emitters over 10,000 tonnes CO2e and the information is collected under section 26 of the Canadian Environmental Protection Act. This was noted in the draft EIS, Section 2.5 Greenhouse Gas Emissions.
AD-49	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	ECCC notes that GHG mitigation measures have not been considered for the Project. Furthermore, the Project’s lifetime is expected to extend into 2050 and beyond. Consistent with the information requirements of the SACC, and aligning with Canada’s commitment to achieve net-zero GHG emissions by 2050, the Proponent should provide a credible plan that describes how the Project will achieve net-zero emissions by 2050.	ECCC recommends that the draft EIS include an assessment of potential GHG mitigation measures throughout all phases of the Project. This could include a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the Draft Technical Guide. ECCC also recommends that the Proponent provide a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the Draft Technical Guide.	<p>GHGs were not included as a VC or KI in the draft EIS and as such, there are no specific GHG-related mitigation measures in Appendix 16. However, many of the mitigation measures for the VC Air Quality related to combustion products would also be associated with a reduction in the Project’s Scope 1 emissions. As noted in the draft EIS, Section 2.5, at this stage in the Project Denison will look for opportunities to optimize energy management and improve the energy intensity of the Project where practical. Also see response for AD-19 (second paragraph).</p> <p>Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances. Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.</p>



e-Doc: 7106577

August 11, 2023

Ms. Janna Switzer  
Director - HSE Regulatory Compliance  
Denison Mines Corp.  
jswitzer@denisonmines.com

**Subject: Outcome of CNSC Staff Completeness Check of the July 14, 2023, Responses to Federal-Indigenous Review Team Information Requests for the Wheeler River Project**

Dear Ms. Switzer,

On July 14, 2023, Denison Mines Corp. (Denison) submitted responses to Information Requests (IRs) for the proposed Wheeler River Project [1]. Canadian Nuclear safety Commission (CNSC) staff have conducted a completeness check of this submission to form a conclusion on whether the required information has been provided in order to proceed with the technical review of the Environmental Impact Statement (EIS) submission. CNSC staff have deemed the submission incomplete.

CNSC staff reviewed the responses to the 238 IRs, along with any relevant proposed revisions to the EIS and supporting technical documents, as provided in Denison's list of attachments. There are 9 responses to IRs that remain outstanding.

**Overall Review**

During the completeness check, CNSC staff reviewed each IR response for consistency with CNSC staff's expectations for Denison's submission as outlined in our [March 20, 2023, letter](#) [2], including submitting:

- a revised EIS along with document revision history, in order for reviewers to locate the changes that have been made to the revised documents
- complete responses to all IRs and advice to proponent comments, while clearly indicating how responses to IRs and any subsequent changes were incorporated into the revised EIS

CNSC staff acknowledge that since the provision of this guidance, it was agreed that a revised EIS was not required for this submission, as long as Denison provided the proposed revisions to the EIS and revisions to other supporting documents for review.

Detailed feedback is provided in the attached table, appended as appendix A.

## **Information Requests (IRs)**

The main reasons for determining incompleteness of 9 IR responses included:

- response does not fully address each sub-question of the IR (4)
- information provided is insufficient to allow a technical review (4)
- the supplementary material or changes to EIS documents or Technical Support Documents provided as part of the response is/are insufficient to adequately meet the request (1)

Overall, these responses did not include sufficient information to address the original IR.

CNSC staff found that 5 of the incomplete IR responses referenced detailed information to be provided at licencing. CNSC staff previously reinforced in separate correspondence our expectation that responses to IRs must include sufficient details for subject matter experts to complete their technical assessment. Responses that additional information will be provided during the licensing phase are not adequate [3]. Summaries of detailed program information that will be provided at licencing are expected to be provided as part of the EIS and supporting documents, if required in order for subject matter experts to determine that significant adverse environmental impacts will be avoided, limited or mitigated.

### *Additional Guidance*

There are also IRs that note additional information will be updated in the final EIS (e.g., IRs# 02, 31, 71, 73, 100). The final EIS is our review step to verify that accepted responses to IRs and proposed revisions to the EIS and any supporting documentation have been properly completed. The Federal-Indigenous Review Team (FIRT) must review this information before IRs can be resolved, which is required prior to a final EIS submission. Although these IRs passed completeness, it is expected that any additional information be provided in advance of a final EIS.

No new information that hasn't been reviewed by the FIRT is to be included in the final EIS, or other supporting documents.

Of the IRs that passed completeness, please note that 7 IRs in the completeness table contain additional *Advice to the Proponent*, which relate to corrections required in the response text, guidance for the revised responses to IRs, or guidance for a future submission of responses to IRs.

## **Indigenous engagement**

CNSC staff recognize that Denison has continued to put effort into engagement with identified Indigenous Nations and communities since the October 2022 submission. As per the requirements of REGDOC 3.2.2, the Indigenous Engagement Report (IER) is an evergreen document to be updated and submitted to the CNSC as Denison's engagement activities progress. The CNSC has not received an updated version of the IER since October 2022, which contains information up to Spring 2022.

As has been communicated to Denison both verbally and in written correspondence, CNSC staff expect Denison to provide any supplementary information along with the fulsome responses to IRs, and any supporting evidence [4][5]. Further, REGDOC 3.2.2 states: "It is essential that



licensees submit all necessary and relevant information gathered pursuant to the engagement report, as this helps the CNSC to ensure an adequate Indigenous consultation process, to determine the appropriate level of Indigenous consultation activities, and to carry out an effective and efficient EA and/or licensing review” (section 4.2).

The engagement information that has occurred between spring 2022 and the summer of 2023 is information that underpins CNSC staff technical review of Denison’s engagement activities. Therefore, CNSC staff expect Denison to submit an update on engagement activities as part of Denison’s next submission. This can be provided in the form of a fully revised IER, or whatever format Denison chooses. This should include updated information on Denison’s engagement activities from Spring 2022 until the new submission date, as appropriate.

### **Commitments Report**

As noted in the email from CNSC staff to Denison on November 28<sup>th</sup>, 2022 [6] and the March 20, 2023, letter submitted along with the conclusion of the EIS technical Review [2], CNSC staff have requested that Denison submit a draft Commitments Report as part of its revised EIS documentation. This report would capture all the mitigation measures, follow-up program measures and commitments that are referenced in the Environmental Assessment (EA) documentation, in a single location for completeness and traceability. This report would remain an evergreen document that would continue to be updated during the remainder of the regulatory review process, as well as if the project is approved, after the public hearings and Commission decisions, in order to capture any additional commitments made by Denison staff during public hearings and any actions directed by the Commission to Denison.

This report has not been included along with the first round of responses to IRs. CNSC staff expect that Denison will provide a draft commitments report along with the next submission, as the FIRT must review this information before IR-2 can be resolved.

### **Expectations and Next Steps**

CNSC staff expect Denison to perform any additional work, make revisions to the submission and re-submit responses to IRs, along with any supporting documents that may have changed as a result of the revisions. Further, it is expected that the aforementioned information on Indigenous engagement be submitted along with this next submission. CNSC staff are available to hold a meeting with Denison to further elaborate on the outcome of this completeness check, and the expectations for resubmission.

Upon resubmission of a complete EA package, CNSC staff will perform a subsequent completeness check of the remaining 9 IRs and any additional supporting information. Should the next submission be deemed complete, the technical review will commence.

Should you have any questions, please do not hesitate to contact me, directly by phone at 343-540-6213 or by email at [Jessica.Way@cnsccsn.gc.ca](mailto:Jessica.Way@cnsccsn.gc.ca).

Sincerely,

Jessica Way  
Environmental Review Officer  
Environmental Review Division

**c.c.:** CNSC: N. Kwamena, P. Burton, C. Cattrysse, J. Way, W. Yen, K. Gorzkowski, R. Froess  
Denison: K. Himbeault, C. Inglis-McQuay, R. Nagel

**Attachment:** Appendix A: Wheeler River Project Completeness Check: Review of Denison Responses to Information Requests (IRs) and Supporting Documents Received July 14, 2023 (e-Doc 7102957)

## References:

- [1] Letter, J. Switzer (Denison) to J. Way (CNSC), *Submission of responses to the FIRT information requests for the Wheeler River Project*, July 14, 2023 (e-Doc 7099807)
- [2] Letter, J. Way (CNSC) to J. Switzer (Denison), *Results of the Federal-Indigenous Review Team technical review of the October 21st, 2022 Draft Environmental Impact Statement Submission for the proposed Wheeler River Project*, March 20, 2023 (e-Doc 7103212)
- [3] Email, J. Way (CNSC) to J. Switzer (Denison), *Follow-up to June 16th Presentation*, June 16, 2023 (e-Doc 7103206)
- [4] Email, J. Way (CNSC) to J. Switzer (Denison), *RE: [\*\*]RE: Engagement issues and concerns table*, May 31, 2023 (e-Doc 7103213)
- [5] Email, N. Kwamena (CNSC) to J. Switzer (Denison), *Clarity regarding expectations for submission to IRs - Denison Wheeler*, June 5, 2023 (e-Doc 7060779)
- [6] Email, J. Way (CNSC) to J. Switzer (Denison), *Future Submission of a Commitments Table for Wheeler River EIS*, November 28, 2022 (e-Doc 6943639)

Appendix A

Wheeler River Project Completeness Check: Review of Denison Responses to Information Requests (IRs)  
and Supporting Documents Received July 14, 2023

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-1	Complete: Yes		
Reference #: IR-2	Complete: Yes		<p><b>Advice to the proponent:</b></p> <p>The response notes that: “A list of commitments, including specific commitment or mitigation measures related to Project effects as an outcome of engagement, made in the draft EIS, throughout the Federal information request period and the Provincial comment response period, will be included with the submission of the final EIS. For clarity, this would not include any private, confidential accommodations made under contractual agreements.”</p> <p>CNSC staff expect that a draft commitments report be provided in a submission for staff to review during the technical review process. It is not sufficient to provide this at the final EIS step. CNSC staff recommend that Denison provide a draft commitments report along with the next submission. If this is not provided along with the revised responses to incomplete IRs, it will be expected at a later phase of the technical review process, as this IR cannot be resolved until the draft report has been received.</p>
Reference #: IR-3	Complete: Yes		
Reference #: IR-4	Complete: Yes		
Reference #: IR-5	Complete: Yes		
Reference #: IR-6	Complete: Yes		
Reference #: IR-7	Complete: Yes		
Reference #: IR-8	Complete: Yes		
Reference #: IR-9	Complete: Yes		
Reference #: IR-10	Complete: Yes		
Reference #: IR-11	Complete: Yes		
Reference #: IR-12	Complete: Yes		
Reference #: IR-13	Complete: Yes		<p><b>Advice to the proponent:</b></p> <p>The Final EIS Updates column highlights the following change to EIS text: “Based on the current wellfield and freeze wall design, approximately <del>150</del> 2,000 m3 of special waste rock will be generated.” This change appears unrelated to the IR response, and it is unclear why the size has increased from 150 to 2000 m3.</p> <p>CNSC staff expect that none of the information that has been previously provided in the draft EIS, currently under technical review, will change unless the revisions are the result of an IR. Further, any revisions to draft EIS text must be reviewed before a final EIS can be provided. No new information can be provided in the Final EIS.</p>
Reference #: IR-14	Complete: Yes		
Reference #: IR-15	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-16	Complete: Yes		<b>Advice to the proponent:</b> The meeting held with CNSC staff and Denison on December 7 <sup>th</sup> , 2022 was with a specialist from the Health Sciences and Environmental Compliance Division (HSECD) and not the ERA lead. Please edit this for clarity.
Reference #: IR-17	Complete: Yes		<b>Advice to the proponent:</b> The fourth paragraph of the response appears to be missing an end quote. Please add this for clarity.
Reference #: IR-18	Complete: Yes		
Reference #: IR-19	Complete: Yes		
Reference #: IR-20	Complete: Yes		
Reference #: IR-21	Complete: Yes		
Reference #: IR-22	Complete: Yes		
Reference #: IR-23	Complete: Yes		
Reference #: IR-24	Complete: Yes		
Reference #: IR-25	Complete: Yes		
Reference #: IR-26	Complete: Yes		
Reference #: IR-27	Complete: Yes		
Reference #: IR-28	Complete: Yes		
Reference #: IR-29	Complete: Yes		
Reference #: IR-30	Complete: Yes		
Reference #: IR-31	Complete: Yes		
Reference #: IR-32	Complete: Yes		
Reference #: IR-33	Complete: Yes		
Reference #: IR-34	Complete: Yes		
Reference #: IR-35	Complete: Yes		
Reference #: IR-36	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-37	Complete: Yes		
Reference #: IR-38	Complete: Yes		
Reference #: IR-39	Complete: Yes		
Reference #: IR-40	Complete: Yes		
Reference #: IR-41	Complete: Yes		
Reference #: IR-42	Complete: Yes		
Reference #: IR-43	Complete: Yes		
Reference #: IR-44	Complete: No	<b>Rationale:</b> The information provided is insufficient to allow a technical review.	<b>Context and Information Required for a Complete Response:</b> The response does not provide details of the noise complaints resolution and response procedure as per <a href="#">Health Canada</a> (2017).  As noted in section 9.3 of the CNSC’s Generic EIS Guidelines, the EIS will “describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address”.  A response that the requested information will be provided as part of the licensing efforts is not a sufficient response. Although a fully detailed monitoring and follow-up plan is not required at this stage, the information in the draft EIS lacked the level of detail required in order for the reviewer to complete their technical review.  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-45	Complete: Yes		
Reference #: IR-46	Complete: Yes		
Reference #: IR-47	Complete: Yes		
Reference #: IR-48	Complete: Yes		
Reference #: IR-49	Complete: Yes		
Reference #: IR-50	Complete: Yes		
Reference #: IR-51	Complete: Yes		
Reference #: IR-52	Complete: Yes		
Reference #: IR-53	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-54	Complete: Yes		
Reference #: IR-55	Complete: Yes		
Reference #: IR-56	Complete: Yes		
Reference #: IR-57	Complete: Yes		
Reference #: IR-58	Complete: Yes		
Reference #: IR-59	Complete: Yes		
Reference #: IR-60	Complete: Yes		
Reference #: IR-61	Complete: Yes		
Reference #: IR-62	Complete: Yes		
Reference #: IR-63	Complete: Yes		
Reference #: IR-64	Complete: Yes		
Reference #: IR-65	Complete: Yes		
Reference #: IR-66	Complete: Yes		
Reference #: IR-67	Complete: Yes		
Reference #: IR-68	Complete: Yes		
Reference #: IR-69	Complete: Yes		
Reference #: IR-70	Complete: Yes		
Reference #: IR-71	Complete: Yes		
Reference #: IR-72	Complete: Yes		
Reference #: IR-73	Complete: Yes		
Reference #: IR-74	Complete: Yes		



Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-75	Complete: Yes		
Reference #: IR-76	Complete: Yes		
Reference #: IR-77	Complete: Yes		
Reference #: IR-78	Complete: Yes		
Reference #: IR-79	Complete: Yes		
Reference #: IR-80	Complete: Yes		
Reference #: IR-81	Complete: Yes		
Reference #: IR-82	Complete: Yes		
Reference #: IR-83	Complete: Yes		
Reference #: IR-84	Complete: Yes		
Reference #: IR-85	Complete: Yes		
Reference #: IR-86	Complete: Yes		
Reference #: IR-87	Complete: Yes		
Reference #: IR-88	Complete: Yes		
Reference #: IR-89	Complete: Yes		
Reference #: IR-90	Complete: Yes		
Reference #: IR-91	Complete: Yes		
Reference #: IR-92	Complete: Yes		
Reference #: IR-93	Complete: Yes		
Reference #: IR-94	Complete: Yes		
Reference #: IR-95	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-96	Complete: Yes		
Reference #: IR-97	Complete: Yes		
Reference #: IR-98	Complete: Yes		
Reference #: IR-99	Complete: Yes		
Reference #: IR-100	Complete: Yes		
Reference #: IR-101	Complete: No	<b>Rationale:</b> The response does not fully address each sub-question of the IR.	<b>Context and Information Required for a Complete Response:</b> The response to this IR does not provide the requested baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.  A response that the requested information has not been collected to date is not a sufficient response. If information cannot be provided at this time, please justify in the response why this information is lacking, the path forward to resolving this gap, etc. As noted in section 8.4 of CNSC’s Generic EIS Guidelines, “The applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-102	Complete: Yes		
Reference #: IR-103	Complete: Yes		
Reference #: IR-104	Complete: Yes		
Reference #: IR-105	Complete: Yes		
Reference #: IR-106	Complete: Yes		
Reference #: IR-107	Complete: Yes		
Reference #: IR-108	Complete: No	<b>Rationale:</b> The information provided is insufficient to allow a technical review.	<b>Context and Information Required for a Complete Response:</b> Although these tables have been updated in the submission, they appear incomplete and it is not clear what the highlighted cells mean, nor why there are blank cells. This should be clear to the reviewer, and a reader of the EIS.  Please update the tables appropriately, and where information is not provided, please provide a legend or explanation that helps a reader understand why certain information may have been omitted.
Reference #: IR-109	Complete: Yes		
Reference #: IR-110	Complete: Yes		
Reference #: IR-111	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-112	Complete: Yes		
Reference #: IR-113	Complete: Yes		
Reference #: IR-114	Complete: Yes		
Reference #: IR-115	Complete: Yes		
Reference #: IR-116	Complete: Yes		
Reference #: IR-117	Complete: Yes		
Reference #: IR-118	Complete: Yes		
Reference #: IR-119	Complete: Yes		
Reference #: IR-120	Complete: Yes		
Reference #: IR-121	Complete: Yes		
Reference #: IR-122	Complete: Yes		
Reference #: IR-123	Complete: No	<b>Rationale:</b> The information provided is insufficient to allow a technical review.	<b>Context and Information Required for a Complete Response:</b> The response to this IR does not provide the baseline concentrations of mercury in sediment.  A response that the requested information has not been collected to date is not a sufficient response. If information cannot be provided at this time, please justify in the response why this information is lacking, the path forward to resolving this gap, etc. As noted in section 8.4 of CNSC’s Generic EIS Guidelines, “The applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-124	Complete: Yes		
Reference #: IR-125	Complete: Yes		
Reference #: IR-126	Complete: Yes		
Reference #: IR-127	Complete: Yes		
Reference #: IR-128	Complete: Yes		
Reference #: IR-129	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-130	Complete: Yes		
Reference #: IR-131	Complete: Yes		
Reference #: IR-132	Complete: Yes		
Reference #: IR-133	Complete: Yes		
Reference #: IR-134	Complete: Yes		
Reference #: IR-135	Complete: No	<b>Rationale:</b> The response does not fully address each sub-question of the IR.	<b>Context and Information Required for a Complete Response:</b> The response does not provide details on noise and other sensory disturbance monitoring and mitigations if noise levels surpass thresholds. The response also makes reference to Section 6.2.5 and 6.2.8, which Denison considers an appropriate level of supplemental information to support the IR.  While the draft EIS broadly discusses mitigation measures and monitoring and follow-up activities, the information in section 9 lacked the level of detail required in order for the reviewer to complete their technical review. Further, it is expected that responses to IRs be self-contained, which means that the response itself should summarize the key elements of this information and demonstrate how the information fully address the IR, as opposed to reviewers having to look and identify which information is relevant to their question.  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-136	Complete: Yes		
Reference #: IR-137	Complete: Yes		
Reference #: IR-138	Complete: Yes		
Reference #: IR-139	Complete: Yes		
Reference #: IR-140	Complete: Yes		
Reference #: IR-141	Complete: Yes		
Reference #: IR-142	Complete: Yes		
Reference #: IR-143	Complete: Yes		
Reference #: IR-144	Complete: Yes		
Reference #: IR-145	Complete: Yes		
Reference #: IR-146	Complete: Yes		
Reference #: IR-147	Complete: No	<b>Rationale:</b> The response does not fully address each sub-question of the IR.	<b>Context and Information Required for a Complete Response:</b> The response lacks sufficient details regarding reclamation activities and measures. As noted in the original IR, the information currently provided in the EIS (the conceptual decommissioning plan) is insufficient for the Federal-Indigenous Review Team to assess project impacts.

Reference #	Status	Rationale	Context and Information Required for a Complete Response
			Please provide a complete response with sufficient detail for reviewers to complete their review, and any supporting documentation to support this request.
Reference #: IR-148	Complete: Yes		
Reference #: IR-149	Complete: Yes		
Reference #: IR-150	Complete: Yes		<b>Advice to the Proponent:</b> Although this response is complete for the purposes of moving to the next phase of technical review, it would be valuable reviewers to have the original reference that underpins this response. If available, please provide the 2021/2022 Caribou Trail study along with the submission of updated responses to the outstanding IRs.
Reference #: IR-151	Complete: Yes		
Reference #: IR-152	Complete: Yes		
Reference #: IR-153	Complete: Yes		
Reference #: IR-154	Complete: Yes		
Reference #: IR-155	Complete: Yes		
Reference #: IR-156	Complete: Yes		
Reference #: IR-157	Complete: Yes		
Reference #: IR-158	Complete: Yes		
Reference #: IR-159	Complete: Yes		
Reference #: IR-160	Complete: Yes		
Reference #: IR-161	Complete: Yes		
Reference #: IR-162	Complete: Yes		
Reference #: IR-163	Complete: Yes		
Reference #: IR-164	Complete: Yes		
Reference #: IR-165	Complete: Yes		
Reference #: IR-166	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-167	Complete: Yes		
Reference #: IR-168	Complete: Yes		
Reference #: IR-169	Complete: Yes		
Reference #: IR-170	Complete: Yes		
Reference #: IR-171	Complete: Yes		
Reference #: IR-172	Complete: Yes		
Reference #: IR-173	Complete: No	<b>Rationale:</b> The response does not fully address each sub-question of the IR.	<b>Context and Information Required for a Complete Response:</b> The response does not provide any details on monitoring and follow-up programs for avian mortality.  While the draft EIS broadly discusses mitigation measures and monitoring and follow-up activities, the information in section 9 lacked the level of detail required in order for the reviewer to complete their technical review.  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-174	Complete: Yes		
Reference #: IR-175	Complete: Yes		
Reference #: IR-176	Complete: Yes		
Reference #: IR-177	Complete: Yes		
Reference #: IR-178	Complete: Yes		
Reference #: IR-179	Complete: Yes		
Reference #: IR-180	Complete: Yes		
Reference #: IR-181	Complete: Yes		
Reference #: IR-182	Complete: Yes		
Reference #: IR-183	Complete: Yes		
Reference #: IR-184	Complete: Yes		
Reference #: IR-185	Complete: Yes		



Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-186	Complete: Yes		
Reference #: IR-187	Complete: Yes		
Reference #: IR-188	Complete: Yes		
Reference #: IR-189	Complete: Yes		
Reference #: IR-190	Complete: Yes		
Reference #: IR-191	Complete: Yes		
Reference #: IR-192	Complete: Yes		
Reference #: IR-193	Complete: Yes		
Reference #: IR-194	Complete: Yes		
Reference #: IR-195	Complete: Yes		
Reference #: IR-196	Complete: Yes		
Reference #: IR-197	Complete: Yes		
Reference #: IR-198	Complete: Yes		
Reference #: IR-199	Complete: Yes		
Reference #: IR-200	Complete: Yes		
Reference #: IR-201	Complete: Yes		
Reference #: IR-202	Complete: Yes		
Reference #: IR-203	Complete: Yes		
Reference #: IR-204	Complete: Yes		
Reference #: IR-205	Complete: Yes		
Reference #: IR-206	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-207	Complete: Yes		
Reference #: IR-208	Complete: Yes		
Reference #: IR-209	Complete: Yes		
Reference #: IR-210	Complete: Yes		
Reference #: IR-211	Complete: Yes		
Reference #: IR-212	Complete: Yes		
Reference #: IR-213	Complete: Yes		
Reference #: IR-214	Complete: No	<b>Rationale:</b> The supplementary material or changes to EIS documents or TSDs provided as part of the response is/are insufficient to adequately meet the request.	<b>Context and Information Required for a Complete Response:</b> The response acknowledges that changes are required but does not provide proposed revisions to the draft text. The final EIS is our review step to verify that accepted responses to IRs and proposed revisions to the EIS and any supporting documentation have been accepted. The reviewer must review this information before IRs can be resolved, which is required prior to a final EIS submission.  Please provide the proposed changes to the draft text for review by the FIRT in the appropriate sections.
Reference #: IR-215	Complete: Yes		
Reference #: IR-216	Complete: Yes		
Reference #: IR-217	Complete: Yes		
Reference #: IR-218	Complete: Yes		
Reference #: IR-219	Complete: Yes		
Reference #: IR-220	Complete: Yes		
Reference #: IR-221	Complete: Yes		
Reference #: IR-222	Complete: Yes		
Reference #: IR-223	Complete: Yes		
Reference #: IR-224	Complete: Yes		
Reference #: IR-225	Complete: Yes		

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-226	Complete: Yes		
Reference #: IR-227	Complete: Yes		
Reference #: IR-228	Complete: No	<b>Rationale:</b> The information provided is insufficient to allow a technical review.	<b>Context and Information Required for a Complete Response:</b> The response does not provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 6.  As noted in Section 9.4.1 of CNSC’s Generic EIS Guidelines, “Malfunctions and accidents are reviewed in depth under the NSCA for licensing purposes (for example, under REGDOC-2.4.1, Deterministic Safety Analysis; REGDOC-2.4.2, Probabilistic Safety Assessments for Nuclear Power Plants and REGDOC-1.1.1, Site Evaluation and Site Preparation for New Reactor Facilities. These scenarios should be taken into consideration by the applicant when designing environmental protection measures.”  Please provide a complete response with sufficient detail for reviewers to complete their review.
Reference #: IR-229	Complete: Yes		
Reference #: IR-230	Complete: Yes		
Reference #: IR-231	Complete: Yes		
Reference #: IR-232	Complete: Yes		
Reference #: IR-233	Complete: Yes		
Reference #: IR-234	Complete: Yes		
Reference #: IR-235	Complete: Yes		<b>Advice to the Proponent:</b> The response to sub-question #2 is not specified in the response. The response contains #1, 3 and 4. Although it appears that some of this text responds to #2, revise response in the submission of updated responses to the outstanding IRs.
Reference #: IR-236	Complete: Yes		
Reference #: IR-237	Complete: Yes		
Reference #: IR-238	Complete: Yes		

Appendix A

Wheeler River Project Completeness Check: Review of Denison Responses to Information Requests (IRs)  
and Supporting Documents Received October 18, 2024

Reference #	Status	Rationale	Context and Information Required for a Complete Response
Reference #: IR-12	Complete: Yes		
Reference #: IR-101	Complete: Yes		
Reference #: IR-107	Complete: Yes		
Reference #: IR-114	Complete: Yes		
Reference #: IR-126	Complete: Yes		
Reference #: IR-142-159-167-R1	Complete: Yes		
Reference #: IR-170	Complete: Yes		
Reference #: IR-174	Complete: Yes		

Appendix A to Denison's Response to FIRT Round 4 Wheeler  
River Project EIS Comments

October 18, 2024



IR-12

- Department: ECCC
- Project Effects Link: Change to an environmental component due to hazardous contaminants
- Reference to EIS, appendices, or supporting documentation: Section 2.2.3, Project Description

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 9, 2024)	IR (ROUND 4, Sept.6, 2024)	Denison Response (ROUND 4, Sept. 16, 2024)
IR-12	-	Context: There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and noncontact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans. In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2- 16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events. Rationale: In order to be able to understand	1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment. 2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment. 3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event. 4. Provide additional information on culvert designs and conveyance capacity for PMP events.	1. and 2. Denison's approach to site water management is keep non-contact water “clean” – that is, the management approach provides that non-contact water does not come into contact with site aspects that may impart constituents/contaminants of concern and that non-contact water mingles with contact water. Contact water is water expected at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17), and also includes leachate collected from landfills. As such, runoff from the airstrip and site roads is considered non-contact water and will not be actively managed. However, should a spill occur, the spill response plan will be followed. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. By following best practice and mitigation measures outlined in the EIS, Denison does not anticipate a need to continually manage water at the airstrip or along site roads as the water here will be clean, non-contact runoff. Examples of relevant mitigation measures include: <ul style="list-style-type: none"><li>• Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li><li>• Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li><li>• Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li><li>• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li></ul> Refer to Section 14 of the draft EIS for the screening and evaluation of various accident and malfunction scenarios. Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Additionally, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed and the areas would be re-graded to minimize water accumulation. 3. As indicated in the response to IR-12, points 1 and 2 above, Denison expects contact water requiring management is at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17). For this area, the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m3. The wellfield runoff pond has been sized appropriately (38,200 m3 with 1 m of freeboard) to contain this volume of water. 4. Details related to culvert design and conveyance capacity are being developed as part of ongoing	This response has not been accepted, for the following reasons (numbers correspond with original IR): 1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed. 3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999 study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value. CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP. Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment. Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR. Reference: [A.1] Atmospheric & Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie & Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.	1-2. The water management design information presented in the draft EIS is considered appropriate at the EA stage and for this stage of the Project and fit-for-purpose to support the assessment of potential effects. The detailed design information on site water management infrastructure and runoff management requested in this IR and related IRs (i.e., IR-12-R1A and IR-12-R1B) will be provided to the CNSC and province as part of licensing and permitting. Nevertheless, and building on information provided previously, additional information and context regarding site water management and design concepts is provided as follows: <ul style="list-style-type: none"><li>• Conceptual site drainage maps spanning the full Project Area scale has been provided in Attachment IR-12 to this IR response table as context for the reviewer.</li><li>• Design for the access roads and airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road or airstrip.</li><li>• The overall vision for non-contact water along the access roads and airstrip is to use shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems.</li><li>• The condition of the airstrip and roads would be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.</li><li>• Infrastructure features that are within 50 to 100 m (depending on grade) of waterbodies and that are associated with cleared land where there is no vegetated buffer may require additional erosion management / controls to ensure protection of the waterbodies from unmitigated suspended solids inputs. A map showing the distance of Project components to waterbodies is available in Attachment IR-12 as context for the reviewer. The map shows for example, that four waterbodies (waterbody numbers 1, 16, 23, and 86) are within 100 m of the Project footprint where potential erosion protection measures may be employed. The details of erosion control measures at these locations will be outlined in the Environmental Management System to support licensing.</li><li>• Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water along roads and at the airstrip would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred.</li><li>• As described in the draft EIS, the proposed crossings at Kratchkowsky Creek and Hart Creek are not culverts, but clear span bridges. Clear span bridges are designed to completely span</li></ul>	Item one of the IR has been accepted, but a follow-up item of advice can be found within the Advice to the Proponent table [reference to come].  There is outstanding information required to resolve item two. The Proponent did provide the requested proposed water management structures in Attachment IR-12; however, for the road to airstrip and the airstrip, the water management strategy does not include any containment structures or information about runoff quality.  Contaminants may be contained in non-contact water from all site infrastructure, including the airstrip, roads, and the camp area. This information is required in order to make a determination on significant adverse effects, as it relates to potential impacts to water quality and fish, which are assessed as part of the EA process.  The Proponent should confirm that the proposed water management structures, for the roads, camp pad, operation, substation and airstrip, will be included in the Final EIS. The Proponent should also describe how quality of runoff from infrastructure will be monitored, and what proposed mitigation and management measures will be taken if necessary.  <i>With regards to items three and four, these have been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a license.</i>  Denison is expected to address the following: <ol style="list-style-type: none"><li>3. From FIRT's Information Request Rationale (2023-12-05): CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.</li><li>4. From Denison submission of responses to IRs (2023-08-18): Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.</li></ol>	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B (Round 3) below.	In a supplementary submission provided by Denison on July 9 <sup>th</sup> , 2024, much of the information requested has been provided.  Table 1 of round 3 attachment IR-12 is a screening of constituents of potential concern (COPCs) in water catchments. For the “Camp” catchment, risks to the aquatic environment from nutrients is described as “None expected.” However, sewage spills occur occasionally at camps and would release nutrients which could reach the aquatic environment.  Also in Table 1, a management/mitigation often referred to is, “A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.” No further details were found on how wash bay water will be handled such that it does not pose a risk to the aquatic environment.  The Proponent is relying on its spill response plan to handle any spills from the freeze plant and substation as well as the camp. Section 14 of the EIS, Accidents and Malfunctions, does not discuss these hazards. Given the stated reliance on the spill response plan for brine and sewage spills on site, it will be important that the plan explicitly address brine and sewage spills.  <i>In order to resolve this IR, Denison are expected to:</i> <ul style="list-style-type: none"><li>• Include nutrients from sewage as a contaminant of potential concern for the Camp Watershed in Table 1 of round 3 attachment IR-12 or provide justification why there are no risks to the aquatic environment from nutrients from the camp.</li><li>• Clarify how wash bay water will be handled, given that it may potentially contain contaminants.</li></ul> The following will be assessed during licensing: Denison will be expected to incorporate information provided in this supplementary submission in the Spill Response Plan.	In response to this IR, the Site Water Management Plan has been updated using track changes; see Attachment IR-12, IR-12-R1A, and IR-112-R1B (Round 3) below. Briefly for context, nutrients as a COPC related to sewage in the Camp Watershed have been incorporated into Table 1, and clarification with respect to the wash bay water management has been provided.  In addition, responses to the CNSC's round 4 comment related to nutrients, the wash bay, and commitments for the Spill Response Plan are also provided here.  <b>Nutrients:</b>  The domestic wastewater treatment plant pond stores treated domestic wastewater prior to conveyance to the process water pond that reports to the industrial wastewater treatment plant (IWWTP). To clarify, the accidents and malfunctions assessment (EIS Section 14) considered four scenarios that could introduce COPCs to the environment from site “ponds and retention berms” (see Table 3-13, Appendix A or EIS Appendix 14-A), including overtopping, flooding and containment failure – the domestic wastewater treatment plant pond would fall into this generic “ponds and retention berms” category. The “ponds and retention berms” scenarios were deemed low risk or risks were deemed to be as low as reasonably practical (ALARP), given design and other mitigations.  <b>Wash Bay:</b>  Described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP where it will be treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.  For the purpose of the site water management strategy, water derived



Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 9, 2024)	IR (ROUND 4, Sept.6, 2024)	Denison Response (ROUND 4, Sept. 16, 2024)
		site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.		engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.		<p>a watercourse without interfering with the channel bed and banks.</p> <ul style="list-style-type: none"><li>As a reminder to ECCC that the road to the Project’s proposed airstrip follows an existing, decommissioned road, the Fox Lake Road.</li><li>The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence and the well-drained characteristics of the region support the plans to divert non-contact water to ground, and as noted made surfaces would be graded to promote drainage and discourage pooling.</li><li>Please refer to our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419) for additional context on best practice and mitigation measures related to water management and also the scoping and evaluation of accident and malfunction scenarios in the draft EIS.</li><li>Importantly, the conceptual management scheme outlined above for non-contact water runoff is consistent with other roads and airstrips in the region – that is, runoff is not currently captured from other roads and airstrips in the region as envisioned by the review comment. This includes infrastructure associated with Saskatchewan Ministry of Highways and Infrastructure, existing uranium mines and mills, and communities including First Nation communities. It is not practical to do so and collection of non-contact water is not needed based on risk and moreover as noted above is to be avoided so as not to necessarily affect water quantity in local drainages and sub-drainages.</li></ul> <p>3. The reviewer is referred to the response to IR-103 for a discussion regarding the PMP and its suitability and relevance given available data and different methods of calculation included that provided by CSA guidance. Notwithstanding the information provided in response to IR-103 Denison is committed to revisiting this issued as per CNSC’s recommendations, as applicable, for the licensing phase of the Project.</p> <p>To reiterate, Denison believes it has fulfilled its information requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process. Notwithstanding that, Denison recognizes that further information will be required as the Project moves past the EA and into the licensing and permitting phases. It is Denison’s opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by the Denison as part of the licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.</p>			from the wash bay is by definition “contact water”.	
n/a	IR-12-R1A	Context: Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern	n/a	n/a	<p>1. Update site water management plans to include management of potentially deleterious substances contained in non-contact water from all site infrastructure.</p> <p>2. Provide updated estimates of water volumes to be drained and managed from overall site infrastructure (including runoff</p>	<p>1 and 2. Denison understands the prohibition related to deleterious substances under Section 36 of the Fisheries Act and Denison affirms its commitment to ensuring no such events occur. However, in the context of this IR, we interpret ECCC is connecting the concept of deleterious substances under MDMER (those constituents identified in Part 1(3) i.e., arsenic; copper; cyanide;</p>	<p>The Proponent has not adequately answered either part of the IR.</p> <p>An updated site water management plan that includes the management of all water that has been in contact with project infrastructure and updated estimates of water volumes to</p>	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B below.		

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 9, 2024)	IR (ROUND 4, Sept.6, 2024)	Denison Response (ROUND 4, Sept. 16, 2024)
		<p>(COPCs) directly from mining operations infrastructure. However, it still has the potential to contain deleterious substances from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills, fire management practices, and snow removal practices. The Metal and Diamond Mining Effluent Regulations (MDMER) pursuant to the Fisheries Act requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. This includes deleterious substances in non-contact water from all site infrastructure including the airstrip, roads, and camp area.</p> <p>Rationale: All mine effluent and seepage that contains deleterious substances must be discharged through a final discharge point. This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices. The Proponent has not included how non-contact water runoff from site infrastructure will be captured within site water management planning. To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the capture of non-contact water.</p>			<p>from roads, airstrip, camp area, etc.) during the different Project phases. Include updated information on water treatment flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.</p>	<p>lead; nickel; zinc; suspended solids; radium 226; and un-ionized ammonia.) with the general concept of deleterious substance per the Fisheries Act. Mine effluent associated with MDMER defined deleterious substances will be discharged through a final discharge point to Whitefish Lake, and this has been reflected in the water management information presented in the draft EIS, including Section 2.2.3. The IR is suggesting Denison collects runoff water from the airstrip and roads with the rationale that this is needed in order to collect potential contact water associated with hydrocarbons spills (the text in rationale notes: This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices). As indicated in the draft EIS and in our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419), should a spill occur, the spill response plan will be followed. The details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Importantly, hydrocarbons are not mine waste-related deleterious substances perm MDMER definition. Collecting and treating non-contact runoff throughout the life of the Project would mean Denison collects an extremely large volume of clean water to protect against infrequent hydrocarbon spills which will be cleaned up in the appropriately scaled process (spill response), in terms of cost and risk to the environment. No other roads or airstrips in the region (including those associated with uranium mine and mill operations) requires the collection and treatment of runoff water from infrastructure such as roads and airstrips. It is not practical to do so and based on risk, the collection of non-contact water is not required. The road or trail to the airstrip is currently an unmaintained road: the decommissioned Fox Lake Road. For road upgrades and airstrip construction, Denison will be using material from the borrow area. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to upgrade roads and construct the airstrip will not be a source of metals or ARD. Denison will implement erosion control measures at infrastructure locations within 50 to 100 m of a waterbody (refer to response to IR-12 above and to Attachment IR-12, Figure IR-12-5: Distance from Project Footprint to Waterbodies) where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). In consideration of the above, Denison maintains that the runoff at the airstrip and roads are non-contact water. The water management mandate for the Wheeler River Project is to keep clean water clean and minimize the total volume of water requiring management, treatment, and discharge. In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p>	<p>be drained and managed from overall site infrastructure (including runoff from roads, airstrip, camp area, etc.) are required to understand the potential effects of contaminants on the surrounding environment. The Proponent should include updated information on water treatment, flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.</p>			

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 9, 2024)	IR (ROUND 4, Sept.6, 2024)	Denison Response (ROUND 4, Sept. 16, 2024)
	IR-12-R1B	<p>Context: The Proponent has clarified that there is no infrastructure in place for management of non-contact water from site infrastructure that may contain COPCs, including but not limited to roads, the airstrip, and the campground.</p> <p>Rationale: To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the type of infrastructure and its location for the capture of non-contact water</p>	n/a	n/a	Provide a map marking the locations of proposed surface drainage structures for runoff collection including collection ditches, culverts, diversion ditches, perimeter berms, collection ponds and other similar structures.	<p>It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by Denison as part of the permitting and licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.</p> <p>In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.</p> <p>Notwithstanding the above, Denson has provided the reviewer with additional, conceptual site drainage maps in Attachment IR-12, Figures IR-12-1, IR-12-2, IR-12-3, and IR-12-4; these are supplemental to the site drainage map provided in the draft EIS Figure 2.2-17.</p>	n/a (accepted)	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B below.		



ATTACHMENT IR-12 (included in Round 2 submission)

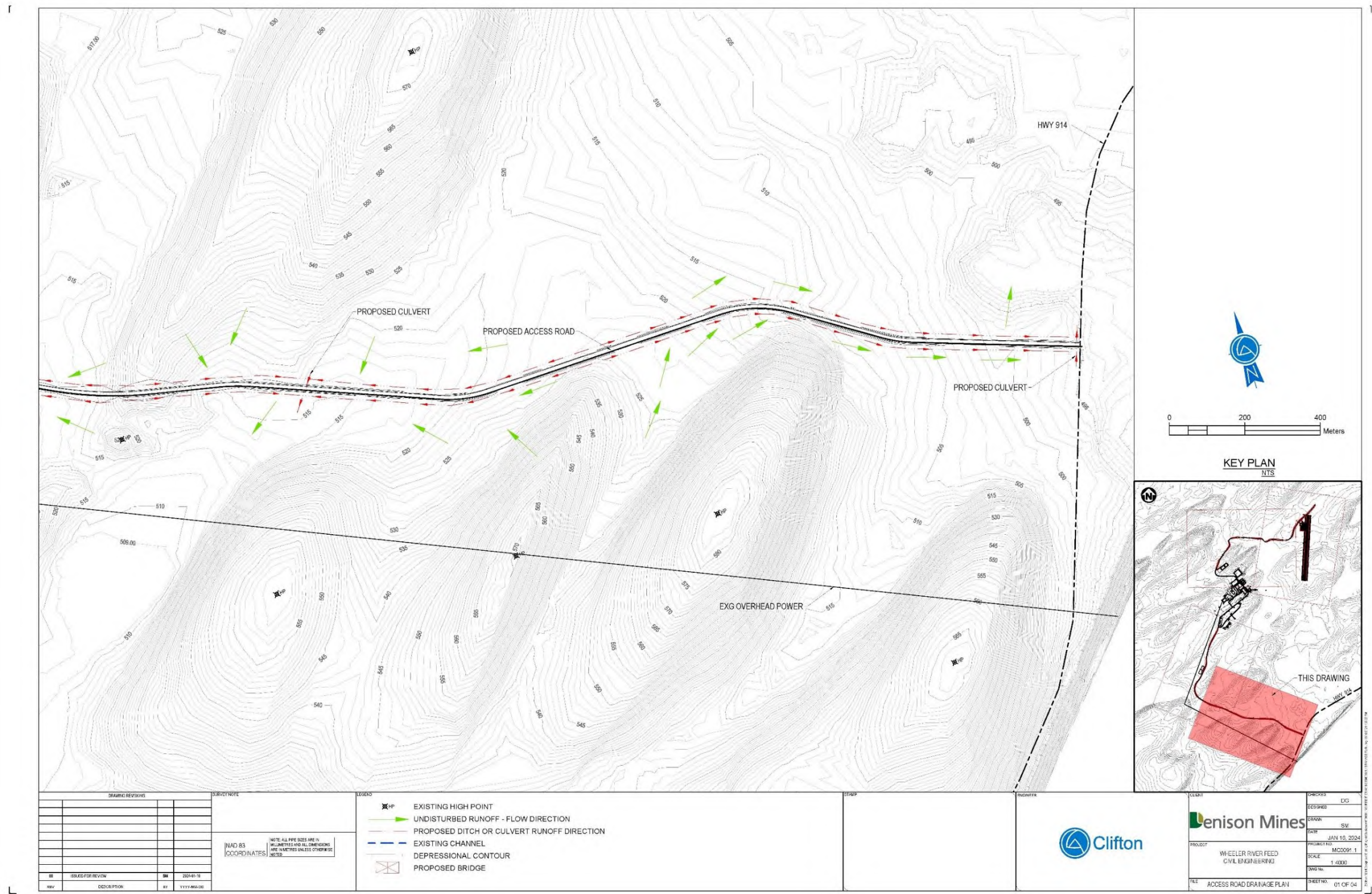


Figure IR-12- 1: Conceptual Site Drainage – Access Road (segment 1 of 2)



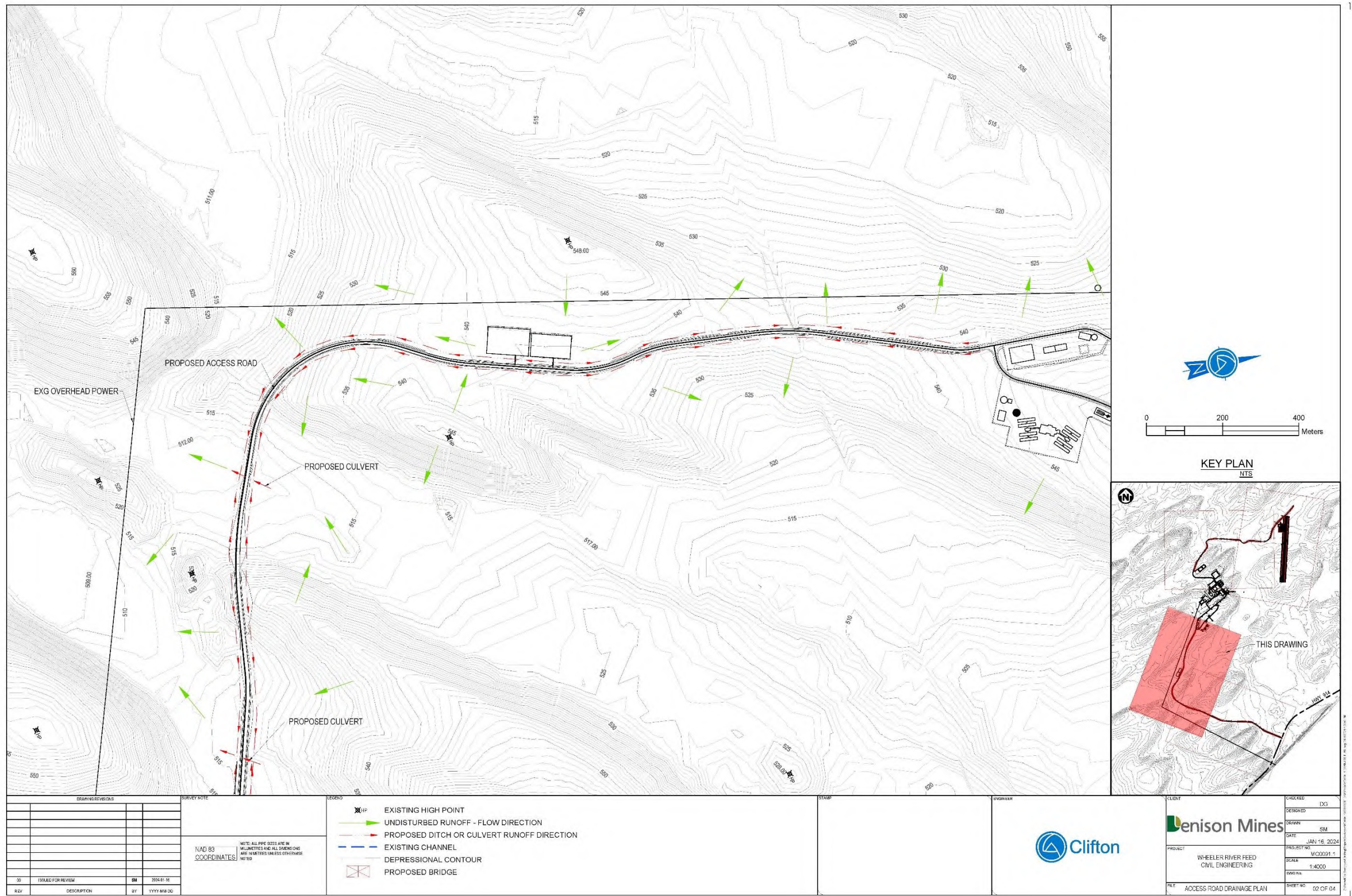


Figure IR-12- 2: Conceptual Site Drainage – Access Road (segment 2 of 2)



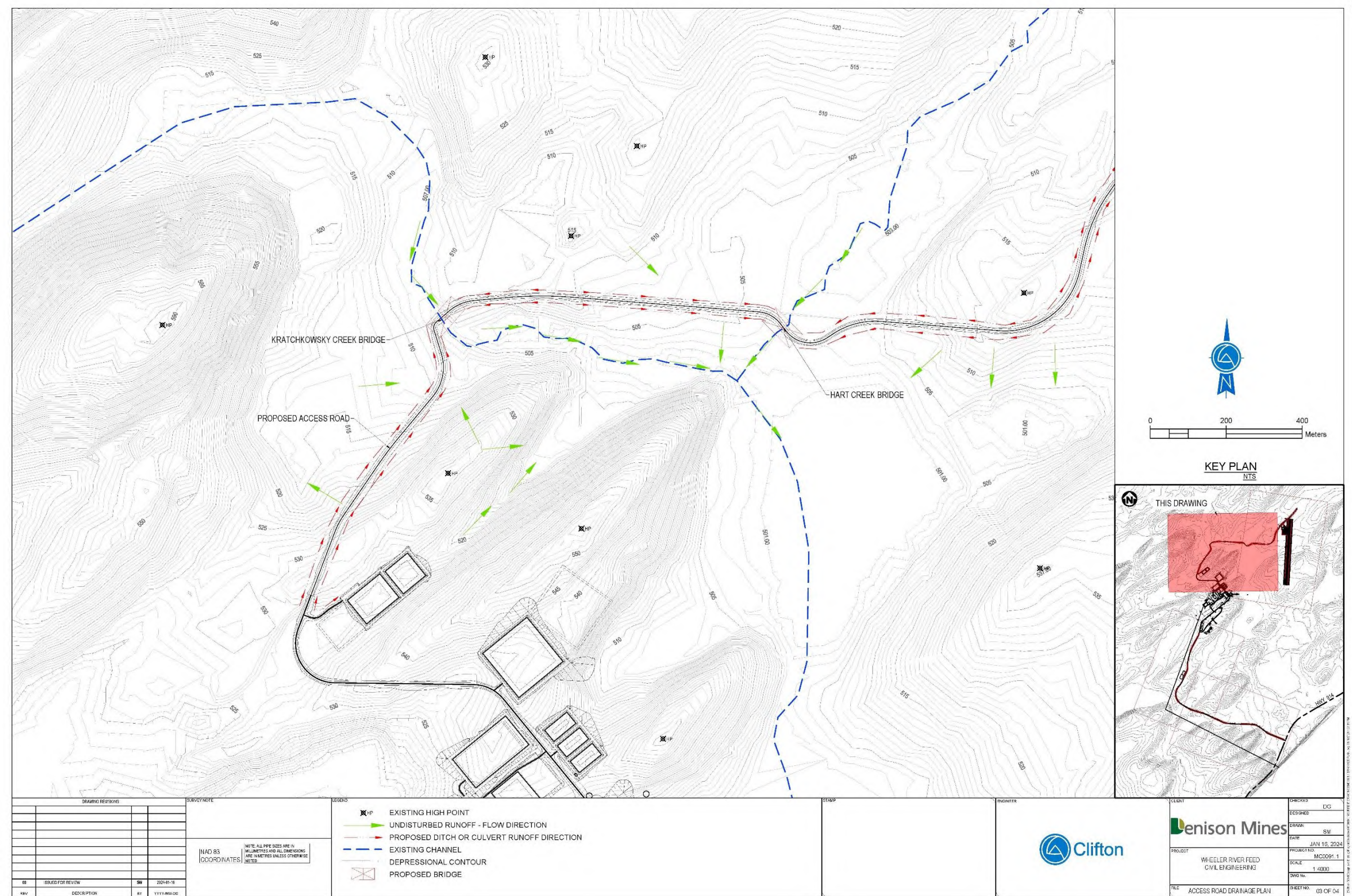


Figure IR-12- 3: Conceptual Site Drainage – Road to Airstrip



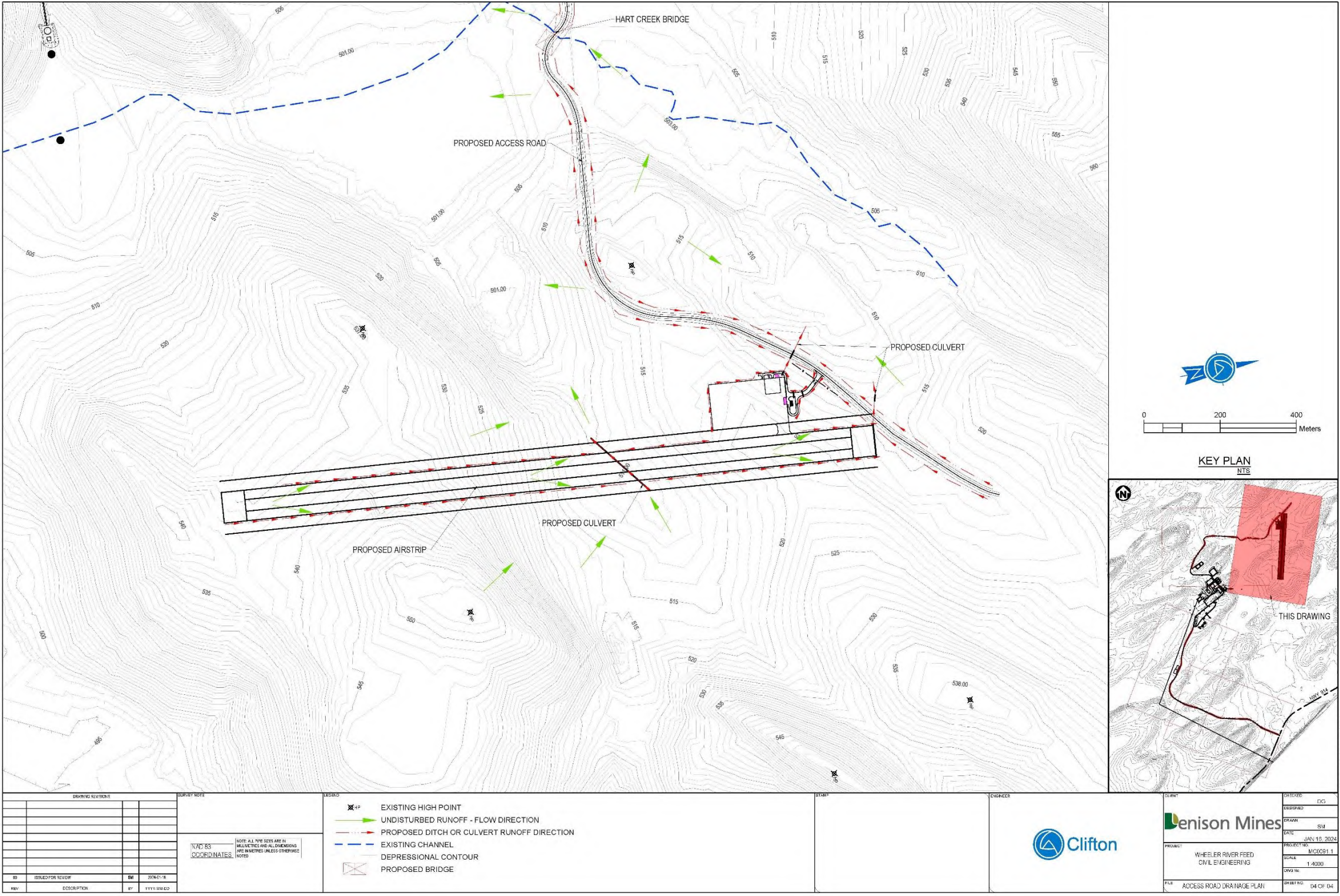


Figure IR-12- 4: Conceptual Site Drainage – Near Airstrip



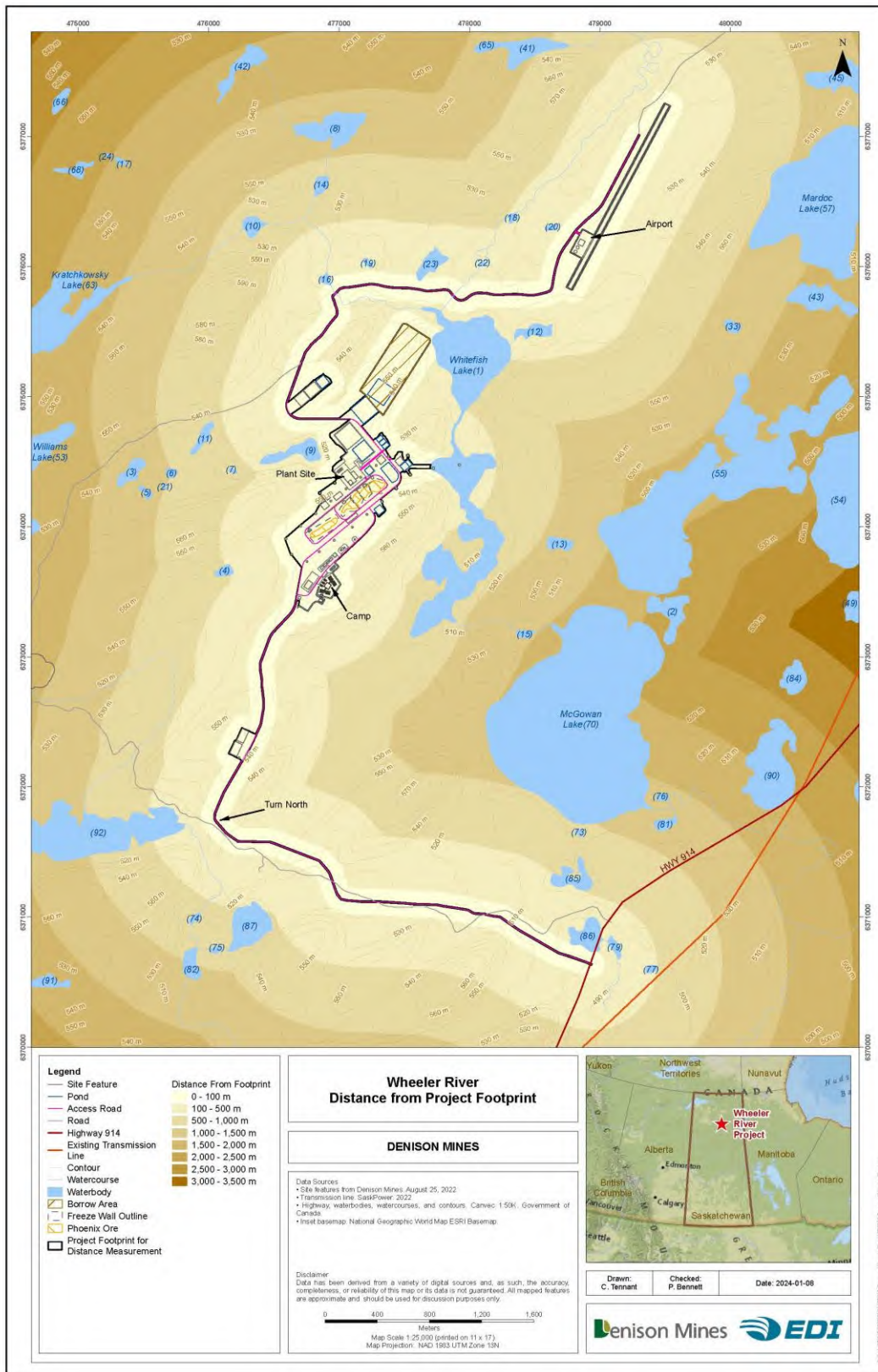


Figure IR-12-5: Distance from Project Footprint to Waterbodies



Figure 2.2-17: Site Drainage Plan with Flow Direction and Culvert Locations

For reference: Figure 2.2-17 from revised draft EIS

## **Attachment IR-12, IR-12-R1A, IR-12-R1B (Round 3 [with updates from Round 4 in track changes](#))**

In response to IR-12 and related IRs 12-R1A and 12-R1B Denison offers the following that has been divided into two parts.

In **Part 1**, an updated site water management plan is presented commensurate with the stage of the EA process for Wheeler River Project (or Project). That is, the site water management plan is largely conceptual at this time; however, Denison is able to provide additional information that builds on information presented previously in the EIS and supporting documentation including Round 1 and Round 2 IR responses as the Project-related engineering design process is advancing in parallel with the EA.

In **Part 2**, Denison has prepared specific responses to specific questions raised in IRs 12, 12-R1A and 12-R1B that are not necessary fully described by Part 1 of the response.

### **Part 1 – Wheeler River Project Site Water Management Plan**

#### **Introduction**

The following conceptual Site Water Management Plan (SWMP, or Plan) has been prepared in response to the third round (May 2024) of Federal Indigenous Review Team (FIRT) information requirements (IRs) regarding the Wheeler River Project (Project) Environmental Impact Statement (EIS) submission, [as well as the comments provided by CNSC on the Round 3 comment/disposition submission](#). The information offered herein builds on information provided previously by Denison Mines (Denison) in the EIS, its supporting documents, and responses to [Round 1 \(March 2023\) and Round 2 \(November 2023\)](#) FIRT IRs.

As noted, the Plan builds on information provided previously by Denison; but further seeks to consolidate this information into once place for ease of reference, as well as provide additional water management related detail that has been developed as Project-related engineering design has been advancing in parallel with the environmental assessment process. The Plan describes the SWMP design concept, its design basis, the delineation of so-called “contact” versus “non-contact” water management areas on the Project site, water management structures / infrastructure, the quantities of water that would be expected to be managed within the water management areas under normal and event-related conditions and monitoring.

The SWMP is provided with a conceptual level of detail and information commensurate with the stage of development of the Project and advancement of engineering design. Further detail and documentation, including engineering design to support construction, regarding site water management will be developed as the Project moves from the environmental assessment (EA) process into permitting and licensing, initially for site preparation and construction, subsequently for operations and ultimately for decommissioning.

#### **Design Concept**



The Project's design concept related to site water management is to keep clean water clean and minimize the total volume of water requiring more active management, treatment, and discharge. Denison will achieve this by 1) diverting clean, non-contact runoff around Project components and 2) collecting contact water for treatment in the Industrial Wastewater treatment Plant (IWWTP), and eventual release to Whitefish Lake. In general terms and within the context of this Plan, the following definitions are provided for contact and non-contact waters:

- Contact water is potentially contaminated as the result of interaction with Project process/structures/infrastructure and therefore requires management through site water infrastructure and conveyance to the IWWTP prior to controlled release to the environment.
- Non-contact water is suitable for direct release to the environment with appropriate, conventional best management practices and mitigation measures.

The rationale for the distinction of the two water types and management strategies is primarily associated with the desire to affect local hydrology as little as possible by only diverting runoff from natural catchments and sub-catchments where it is deemed necessary to protect water quality. Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred.

### **Design Basis**

For the purpose of contact and non-contact water management, the following design bases have been assumed.

For the contact water portion of the system, all water management structures/infrastructure would be designed to contain an event equivalent to 493 mm of precipitation over a 24-hour period (herein referred to as the 24-hour probable maximum precipitation (PMP) event). By definition, events exceeding this magnitude would be conveyed to the environment through purposely built emergency spillways so that the structural integrity of the structures/infrastructure would be maintained and not result in further event related consequences. For context, this volume of water is greater than the average annual precipitation recorded at nearby Key Lake (refer to Appendix D to Appendix 6-C) for the period 2011 through 2020 that was 456 mm. [Additionally, as described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. For the purpose of the site water management strategy, water derived from the wash bay is by definition "contact water" \(i.e., fits the definition of contact water above\), despite the fact that the wash bay is associated with the "camp" area and is not considered in the screening of non-contact water sources below for that reason. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP and treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.](#)

For the non-contact water portion of the system, all water management structures/infrastructure would be designed to withstand an event equivalent to 89 mm of precipitation over a 24-hour period (herein referred to as the 24-hour intensity-duration frequency (IDF) event). This event is the 1 in 100 year return event and was calculated utilizing the publicly available web-based intensity-duration-frequency tool that is pre-loaded with [data from](#) 898 Environment and Climate Change Canada rain stations. This number was derived based on the projection of conditions for the period 2020 - 2050 for the Wheeler River Project site coordinates and therefore considers the time period that overlaps with the time period when water is likely to be actively managed on the site (i.e., construction, operation, initial phase of decommissioning).

### **Delineation of Catchments Areas**

For the purpose of defining water management areas / nodes within and adjacent to the Project site, a series of maps delineating catchments areas based on local topography and drainage patterns have been developed. The delineation of key catchments at the Project site is shown in Figures 1 to 5 below.



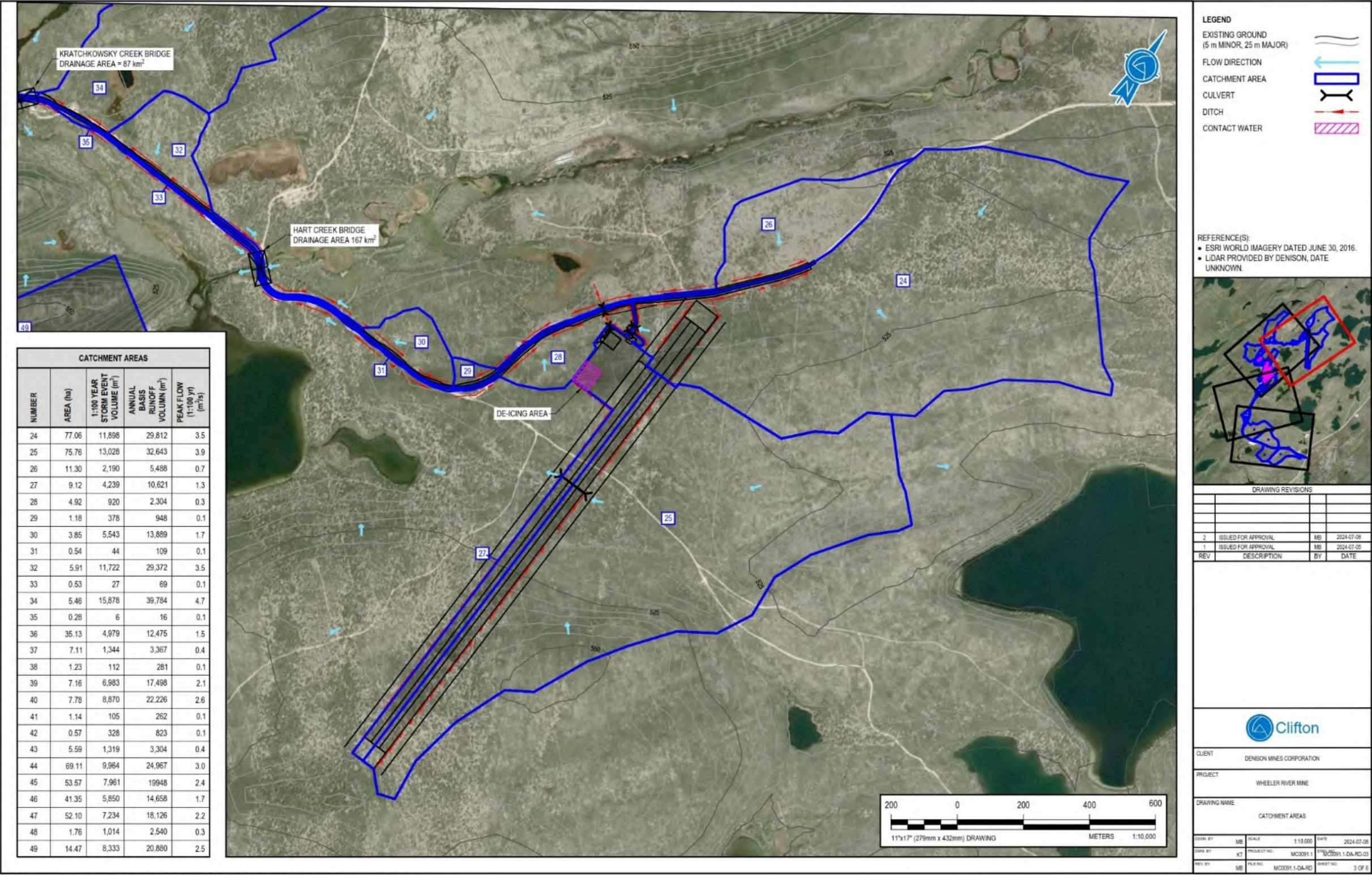


Figure 1: Site water management catchment areas – layout 1 of 5: Airstrip and portion of airstrip access road



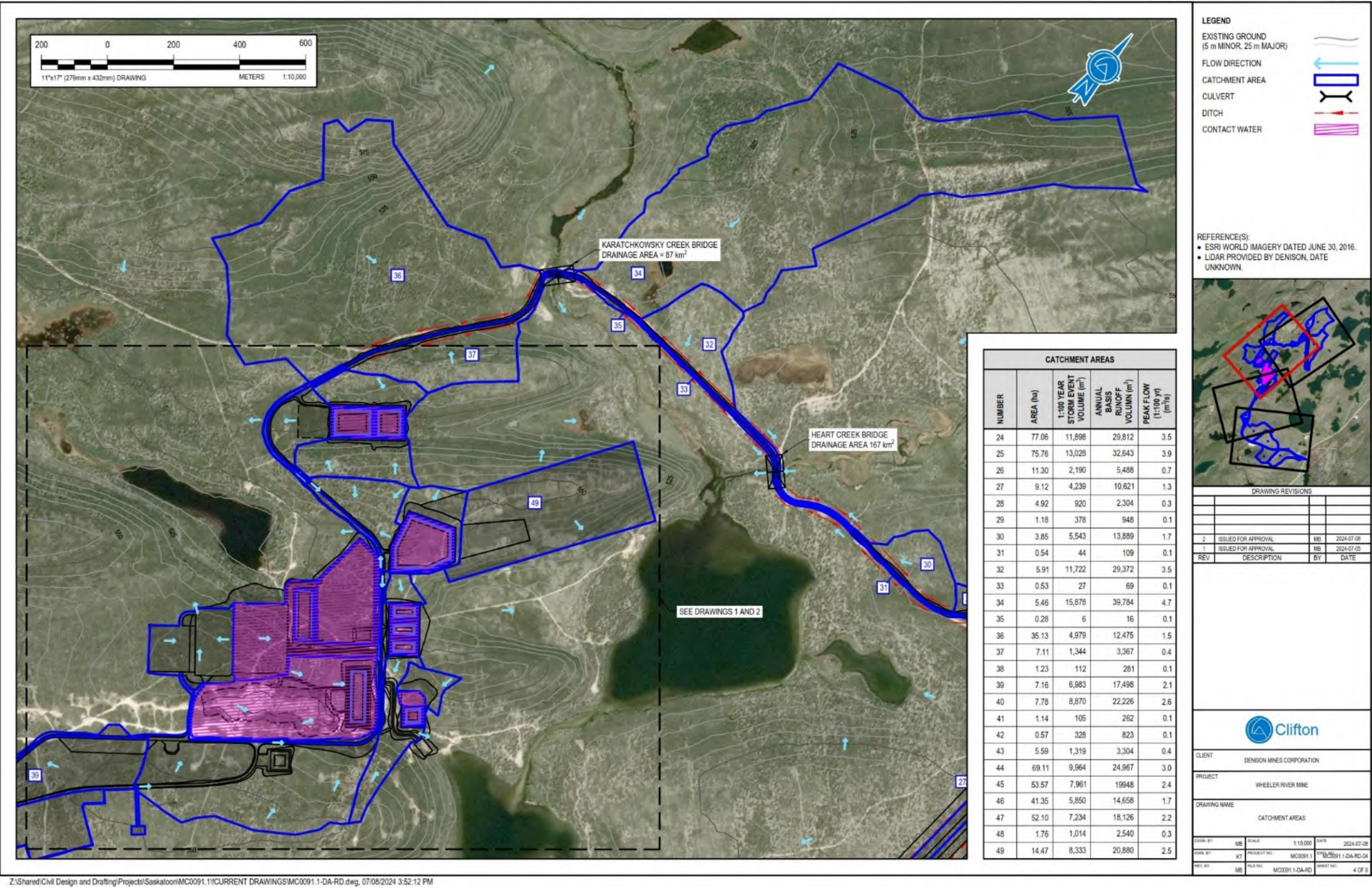
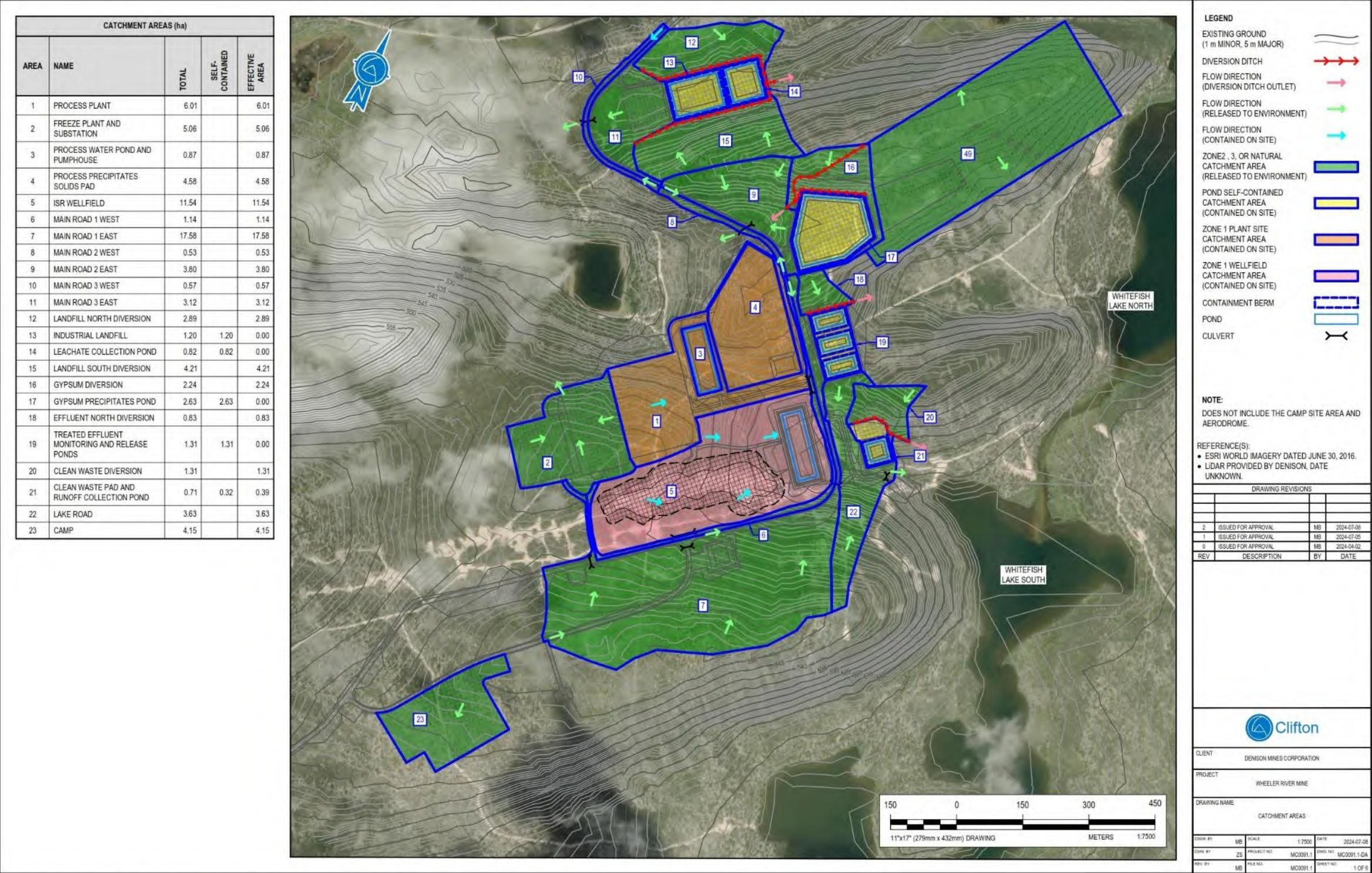


Figure 2: Site water management catchment areas – layout 2 of 5: Airstrip access road





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Figure 3: Site water management catchment areas – layout 3 of 5: main Project area



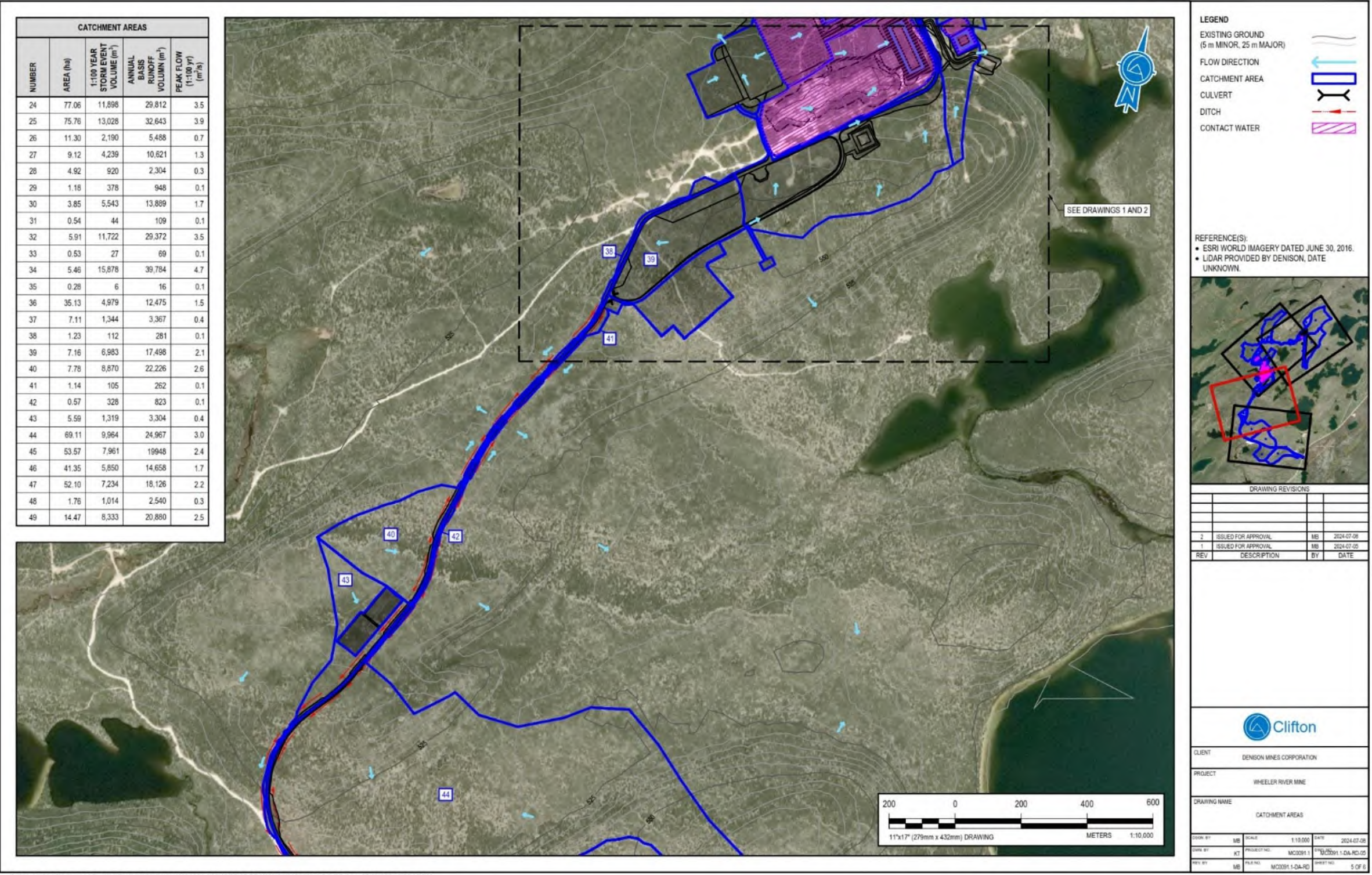


Figure 4: Site water management catchment areas – layout 4 of 5: Access road south of main Project area



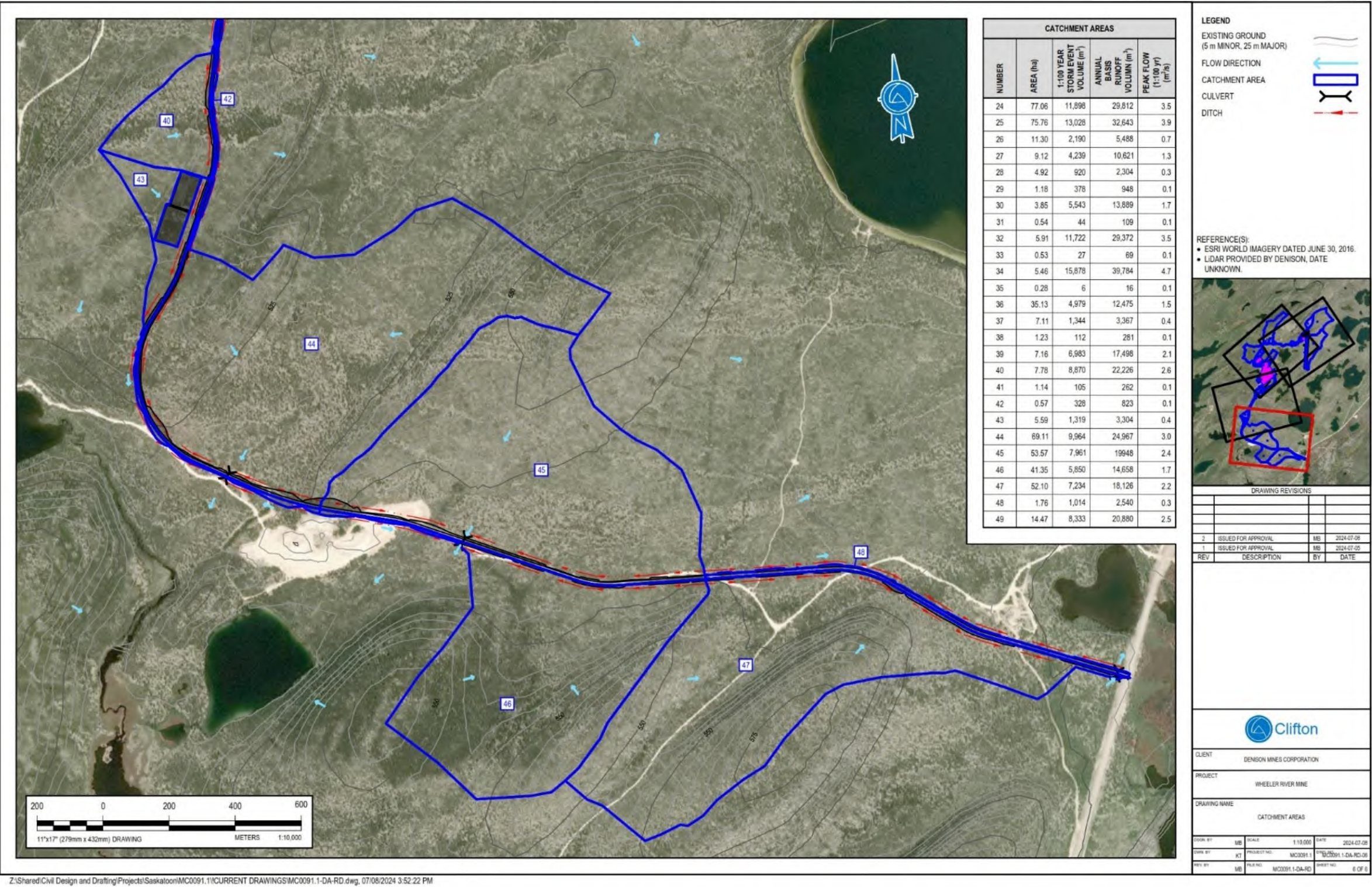


Figure 5: Site water management catchment areas – layout 5 of 5: Access road connection to Highway 914



## **Screening of Constituents of Potential Concern (COPCs) and Non-contact Water Source Areas**

The screening of constituents of potential concern (COPCs) in non-contact water is provided in Table 1 and is organized in terms of catchment characteristics / land use and Project components within or adjacent to the catchments. A screening was not completed here for contact water, as Denison has previously outlined the need to collect and treat this water (refer to Section 2.3.3 of the EIS).

A description of the Project's landscape, key Project components and activities, and management system plans are included here to facilitate the screening exercise.

### **Setting**

The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence.

Ground surface topography regionally has been shaped by glacial and fluvial processes active for over tens of thousands of years. The terrain is characterized by northeast to southwest trending drumlins and eskers, with small variations in elevation (ranging 480 to 590 m above sea level) resulting in a gently sloping terrain. Most of the Project Area consists of upland forest ecosite. Refer to Figure 1-6 in the EIS for a summary of landscape features and current site conditions.

### **Airstrip**

The airstrip will be constructed and maintained using locally-sourced granular material. Denison will be using material from the borrow area (overburden material). Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to construct and maintain the airstrip will not be a source of metals or ARD.

Design for airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the airstrip. The condition of the airstrip will be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.

All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids. Collected waters will be characterized and brought to the Project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows.

### **Roads**

Mainland access to the site will be from Highway 914. A 7-km section of road will be constructed from the highway to the Project site and a 5-km long road will also be constructed from the Project site to the airstrip; the total road length is 12 km. The road or trail to the airstrip is currently an



unmaintained road: the decommissioned Fox Lake Road. Additional site roads will include, for instance, a service loop to the camp.

Roads will be constructed of locally-source granular subbase and base. For road upgrades and maintenance, Denison will be using material from the borrow area (overburden material). Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to construct, upgrade, and maintain roads will not be a source of metals or ARD. Design for roads will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road. The condition of site roads will be inspected and maintained routinely. For example, should unexpected water pooling be observed during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.

In terms of material being transported on the site roads, the final product (yellowcake) will be transported in sealed drums from the processing plant south to the public highway network. With the selection of the in-situ recovery method the Project does not involve transporting large volumes of mine waste rock around the site.

#### Stream Crossings

Two water crossings (Kratchkowsky Creek and Hart Creek) will be installed along the road from the Project site to the airstrip. Both stream crossings occur along the section of the road which is an existing, unmaintained road (the decommissioning Fox Lake Road). The crossings will be designed, constructed, and maintained to avoid causing harm to fish and fish habitat and will be clear span bridges. Clear span bridges are designed to completely span a watercourse without interfering with the channel bed and banks.

#### Miscellaneous Project Components

In the SWMP, specific consideration is given to other areas of the Project including the diversion ditches at the main Project area, borrow area, camp, freeze plant and substation based on the delineation of catchments / land uses. Infrastructure in these areas will be constructed using locally-source material from the borrow area and are subject to Project-wide management system and best management practices. Any specifics of relevance to water quality are provided in Table 1.

#### Management System

We note that accident and malfunctions screening and assessment was completed in Section 14 of the EIS. The SWMP and screening of COPCs contained herein focuses on more routine events within the Project design basis, for example discrete leaks or spills of hydrocarbons from equipment. Events outside of the design basis were appropriately considered in Section 14 of the EIS. For instance, through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the release of fuel (diesel) was carried forward for more detailed analysis.

While details of Denison's management system programs and plans will be developed to support licensing, for context on the SWMP a description of key topics is provided here.

*Erosion and Sediment Control (ESC):*

Soil erosion is a natural process, but erosion is increased when land is disturbed. Erosion can result in sedimentation. The main concern is erosion caused by precipitation and run off. Erosion control is any measure undertaken to reduce the potential for erosion to occur (SK MHI 2012). Sediment control is any measure implemented to reduce the potential for sediment to be transported and/or deposited beyond the limits of the site (SK MHI 2012). Erosion control will be viewed as a first defense when protecting downstream aquatic habitats, while sediment control will be implemented as a contingency plan. Denison will focus on preventing soil erosion in order to reduce sedimentation and potential effects to the aquatic environment. In selecting the appropriate ESC treatment for areas of the Project, Denison will consider both temporary and permanent measures. Selection of ESC measures are dependent on site slopes, drainage patterns, existing vegetation and other site-specific conditions. Erosion control measures may include preventing or minimizing ground disturbance when working near water, maintaining/retaining as much vegetation as possible, erosion control blankets, and rip rap. Sediment control measures may include wattles and silt fencing.

*Spill Response Plan:*

Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Denison will identify and reduce the potential for accidents and emergency situations, and implement emergency response plans that will protect the health and safety of its workers, contractors, the public and the environment. Spill response plans would include procedures for worker and environment protection, details about personnel protection equipment, and procedures to evaluate exposures during a spill.

*Radiation Protection Program:*

The Radiation Protection Program has been designed, and will be implemented, such that Denison complies with, or exceeds, the level of radiation safety that is required by the applicable regulations and Denison's Environment, Health, Safety and Sustainability Policy. Areas within the Operation are designated according to potential radiological hazards and contamination control requirements. The movement and accumulation of all forms of radioactive contamination will be monitored via dosimetry and area monitoring. Contamination control measures will be in place to minimize the spread of radioactive materials into unintended locations.

*Waste Management Program:*

The Waste Management Program provides the framework that confirms Denison's licensed activities involving the processing, storage, and disposal of wastes are performed in a manner that complies with applicable regulatory and licence requirements and protects workers, the public, and the environment. The Waste Management Program includes identification of waste inventory and the characteristics of the waste (radiological and hazardous non-radiological). The program also includes waste segregation, waste packaging, and transfer requirements,

and the plan for storage or disposal of wastes. The Waste Management Program outlines the principles of reduction/reuse/recycle/and recovery (4 Rs) applied at the Project.

*Personnel and Contractor Training and Performance Management Program:*

A Personnel and Contractor Training and Performance Management Program would be developed to ensure all Project related personnel are fully equipped to effectively implement their work functions, in particular consideration of how job function may affect the environment, including worker and public health, within the context of the Environment Management System (EMS). Measurement of performance provides the means to Denison to foster a culture of continuous improvement.

Table 1: Screening of Constituents of Potential Concern (COPCs) in Water Catchments

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Airstrip	24, 25, 27, 28	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to construct, and maintain the airstrip contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"><li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li></ul>	At the airstrip, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage (ARD) is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to construct and maintain the airstrip results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"><li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li></ul>	
		Nutrients	None expected	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"><li>All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids.<ul style="list-style-type: none"><li>Collected waters will be characterized and brought to the project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows.</li></ul></li><li>Personnel training.</li><li>Spill Response Plan will be in place throughout the life of the Project.</li><li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li><li>Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li><li>Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li></ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"><li>Restrict all construction activities to the approved construction footprint.</li><li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li><li>Implement best management practices associated with erosion and sediment control (ESC).</li></ul>	
		Other Chemicals	A release of glycol and other de-icing fluids to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"><li>All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids.<ul style="list-style-type: none"><li>Collected waters will be characterized and brought to the project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows.</li></ul></li><li>Personnel training</li><li>Spill and Emergency Response Plan will be in place throughout the life of the Project</li></ul>	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Roads	26, 29, 30, 31, 32, 33, 34, 35, 36, 37, 11, 10, 9, 8, 7, 6, 22, 38, 41, 42, 40, 43, 44, 45, 46, 47, 48	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to upgrade, construct, and maintain roads contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	On and adjacent to the Project's roads, ESC will be the focus. Best management practices are important for ESC throughout the life of the Project, and of particular importance during construction. Routine inspections and monitoring will be completed to document the effectiveness of the erosion and sediment control measures, and any required maintenance or replacement of ESC structures would be completed as required. Through the implementation of road design and best management practices, the runoff in these areas is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage (ARD) is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to upgrade, construct, and maintain roads results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> <li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li> <li>Traffic control measures.</li> <li>Travel management plan.</li> <li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li> <li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements.</li> <li>Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.</li> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breathe; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"> <li>Restrict all construction activities to the approved construction footprint.</li> <li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li> <li>Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to 100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li> <li>Traffic control measures.</li> </ul>	
		Other Chemicals	Radionuclides are a potential contaminant associated with the Project activities.	<ul style="list-style-type: none"> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> <li>Administrative controls will be in place to control radioactive materials and radiological clearance: All objects (equipment, vehicles, etc.) from potentially contaminated work areas that need to be transported off-site as non-radioactive materials must be thoroughly cleaned and checked for contamination prior to release.</li> </ul>	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Stream crossings	Kratchkowsky Creek bridge area and Hart Creek bridge area	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to upgrade, construct, and maintain roads adjacent to the stream crossings contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	The stream crossings are clear span bridges. At the stream crossing location, the infrastructure design in combination with management plans associated with the adjacent roads (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in these areas is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to upgrade, construct, and maintain roads adjacent to the stream crossings results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> <li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li> <li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li> <li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breathe; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"> <li>Restrict all construction activities to the approved construction footprint.</li> <li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li> <li>Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to 100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li> <li>Traffic control measures.</li> </ul>	
Borrow area	49	Other Chemicals	None expected	n/a	Erosion and sediment control will be important at the borrow area. Routine inspections and monitoring will be completed to document the effectiveness of the erosion and sediment control measures, and any required maintenance or replacement of ESC structures would be completed as required. Through the implementation of various best management practices, the runoff at the borrow area is classified as <b>non-contact water</b> .
		Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the borrow area contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If earthworks associated with the borrow area results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Nutrients	None expected.	n/a	



Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> <li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li> <li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li> <li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breathe; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"> <li>Restrict all construction activities to the approved construction footprint.</li> <li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li> <li>Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to 100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li> <li>Traffic control measures.</li> </ul>	
		Other Chemicals	None expected	n/a	
Diversion ditches around Project components (Figure 3)	12 (landfill north diversion), 15 (landfill south diversion), 16 (gypsum diversion), 18 (effluent north diversion), 20 (clean waste diversion)	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If diversion ditches are constructed with material containing metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	At the diversions ditches, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If diversion ditches are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> <li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li> <li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li> <li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive	<ul style="list-style-type: none"> <li>Restrict all construction activities to the approved construction footprint.</li> </ul>	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"> <li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li> <li>Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to 100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li> <li>Traffic control measures.</li> </ul>	
		Other Chemicals	None expected.	n/a	
Freeze Plant and Substation	2	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the freeze plant and substation foundations/pads are constructed with material containing metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	At the freeze plant and substation area, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the freeze plant and substation foundations/pads are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li> </ul>	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> <li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li> <li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li> <li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li> <li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li> </ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"> <li>Restrict all construction activities to the approved construction footprint.</li> <li>Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li> <li>Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to 100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li> <li>Traffic control measures.</li> </ul>	
		Other Chemicals	Freeze plant chemicals, e.g., calcium chloride brine	<ul style="list-style-type: none"> <li>Spill Response Plan will be in place throughout the life of the Project</li> </ul>	
Camp	22	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the camp foundations/pads are constructed with material containing metals, then there is the potential for metals to leach into	<ul style="list-style-type: none"> <li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are</li> </ul>	At the camp area, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material,

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as <b>non-contact water</b> .
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the camp foundations/pads are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	<ul style="list-style-type: none"><li>The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.</li></ul>	
		Nutrients	<p><a href="#">The domestic wastewater treatment plant (DWWTP) is a contained modular facility and as such represents low risk of routine or accidental release.</a></p> <p><a href="#">The domestic wastewater treatment plant pond stores treated domestic wastewater prior to conveyance to the process water pond that reports to the industrial wastewater treatment plant (IWWTP). The accidents and malfunctions assessment (EIS Section 14) considered four scenarios that could introduce COPCs to the environment from site “ponds and retention berms” (see Table 3-13, Appendix A or EIS Appendix 14-A), including overtopping, flooding and containment failure. The “ponds and retention berms” scenarios were deemed low risk or risks were deemed to be as low as reasonably practical (ALARP), given design and other mitigations.</a></p> <p><a href="#">Overtopping, flooding and containment failure related to releases at the domestic wastewater treatment plant pond is unlikely; however, it would have the potential for release of constituents in treated domestic wastewater to reach the aquatic environment (Whitefish Lake). For reference Whitefish Lake is approximately 500 m downgradient of the domestic wastewater treatment plant pond. Consequences of a release of treated domestic wastewater into Whitefish Lake could result in localized and/or transient effects such as increased nutrient concentrations (and associated algal growth), oxygen depletion, or toxicity to aquatic biota.</a></p>	<ul style="list-style-type: none"><li><a href="#">Personnel training and orientation</a></li><li><a href="#">Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</a></li><li><a href="#">Surface water management</a></li><li><a href="#">Pond designed for PMP</a></li><li><a href="#">Pond designed with composite liner system</a></li><li><a href="#">Monitoring (surface water and groundwater)</a></li><li><a href="#">Spill Response Plan will be in place throughout the life of the Project</a></li><li><a href="#">Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</a></li></ul>	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	<ul style="list-style-type: none"><li>Spill Response Plan will be in place throughout the life of the Project</li><li>Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.</li><li>A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing.</li><li>Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order.</li><li>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li></ul>	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024):	<ul style="list-style-type: none"><li>Restrict all construction activities to the approved construction footprint.</li></ul>	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators’ ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms’ ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	<ul style="list-style-type: none"><li>• Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure.</li><li>• Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below.</li><li>• Traffic control measures.</li></ul>	
		Other Chemicals	Radionuclides are a potential contaminant associated with the Project activities.	<ul style="list-style-type: none"><li>• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</li><li>• Administrative controls will be in place to control radioactive materials and radiological clearance: All objects (equipment, vehicles, etc.) from potentially contaminated work areas that need to be transported off-site as non-radioactive materials must be thoroughly cleaned and checked for contamination prior to release.</li></ul>	

Notes:

- [As described earlier in the SWMP, the screening completed in Table 1 is based on routine or normal operating conditions. Accidents and malfunction type risks were assessed separately in Section 14 of the EIS and mitigations associated with accident and malfunction events have been incorporated and described in that analysis in the EIS.](#)
- [As described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. For the purpose of the site water management strategy, water derived from the wash bay is by definition “contact water” \(i.e., fits the definition of contact water above\) and is not considered in the screening of non-contact water sources in Table 1 for that reason. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP and treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.](#)

n/a = not applicable  
ARD = acid rock drainage  
ARD/ML = acid rock drainage/metal leaching  
ESC = erosion and sediment control



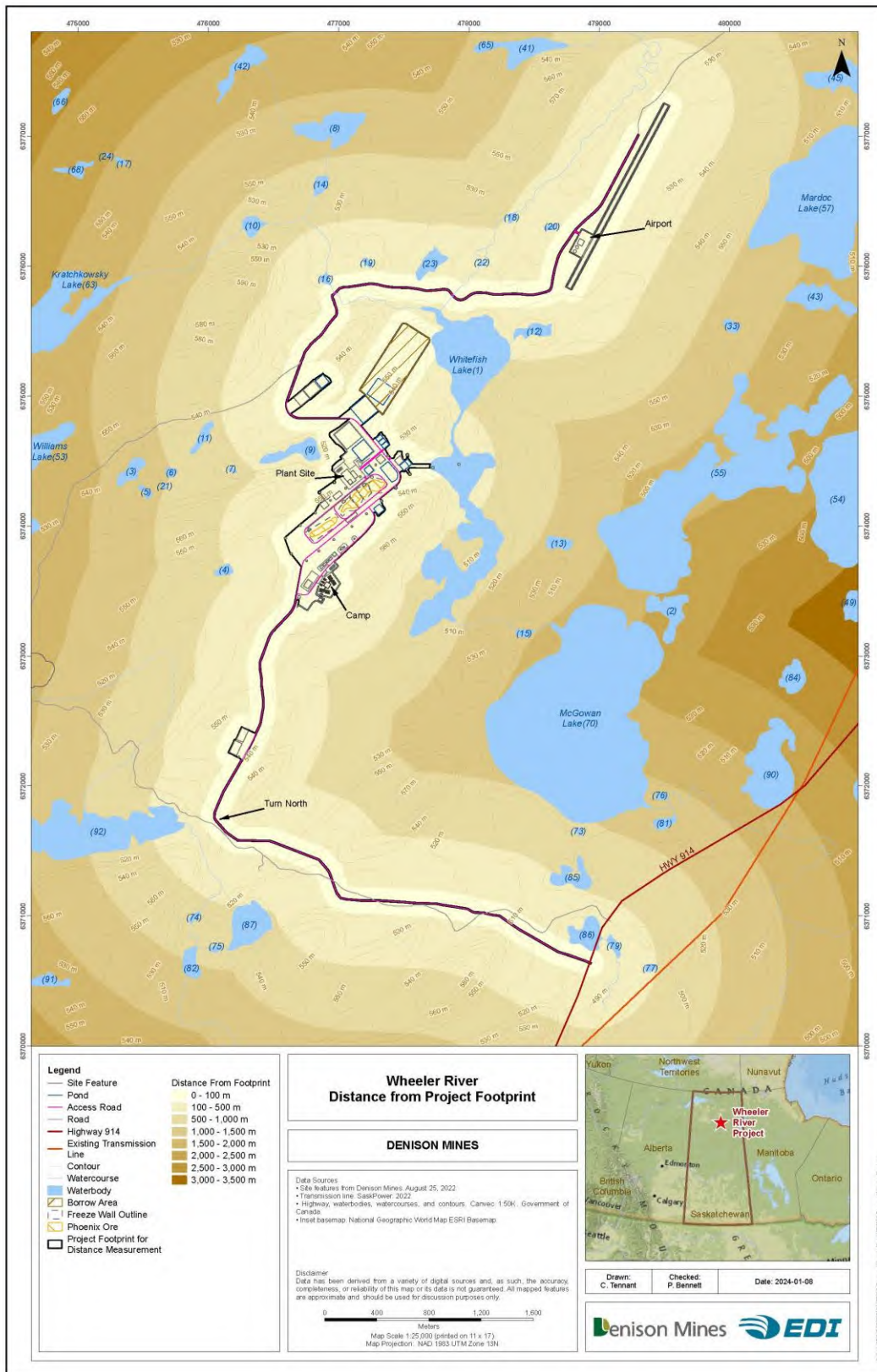


Figure 6: Distance from Project Footprint to Waterbodies

### **Delineation of Contact and Non-contact Water Source Areas on the Site**

Based on information in the EIS and additional clarifications contained here, contact water is expected at the wellfield, processing plant terrace, the refueling and de-icing area at the airstrip, and leachate collection areas at the landfills. Contact water will be collected in various ponds and eventually routed through the IWWTP for treatment prior to release to Whitefish Lake.

Based on the screening completed in Table 1 using Figures 1 through 5, the non-contact water areas are locations where clean water can be diverted away from Project infrastructure. Through design and implementation of best management practices, the catchment areas described above were determined to contain non-contact water. The runoff from these areas will not be collected and treated.

### **Estimation of Typical and Event Volumes from Contact and Non-contact Water Source Areas**

Refer to Figures 1 to 5 for information on the size of individual catchment areas, the volume of water expected on an annual basis and with a 1:100 year storm event, and the peak flow associated with a 1:100 year storm event.

At the wellfield and processing plant terrace the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m<sup>3</sup>. The wellfield runoff pond has been sized appropriately (38,200 m<sup>3</sup> with 1 m of freeboard) to contain this volume of water.

### **Water Management Structures**

The Stormwater Management Plan associated with non-contact water uses shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems. The approximate location of proposed ditches are shown in Figures 1 through 5.

Diversion ditching of non-contact water away from disturbed and developed areas. Diversion ditching is designed to divert as much clean non-contact surface water as reasonably possible away from any disturbed areas, facilities or works where that water may become contaminated, including but not limited to the wellfield, processing plant area, and waste management areas.

Road ditch inverts adjacent to roadways and graveled pads should be lower than the subgrade at the shoulder and ditches will be designed based on specific criteria for slopes (sideslopes, longitudinal slopes), bottom widths, a range of velocities, and a minimum freeboard (refer to Table 2). Ditch design criteria will be refined as the Project advances.

**Table 2: Preliminary Ditch Design Criteria**

<b>Ditch Element</b>	<b>Design Criteria</b>
Conveyance Capacity Requirements	a) 1:100 yr., 24 hr. event for diversion ditches and non-contact water collection ditches b) 24 hr. PMP event critical ditches where upset would be considered a release to environment (i.e., contact water)
Manning's Roughness Coefficient	n = 0.030



Preferred Ditch Sideslopes	3H:1V
Maximum Ditch Sideslopes	2H:1V (with depth restrictions and possible sideslope erosion protection determined on case-by-case basis)
Minimum Longitudinal Slope	0.20%
Maximum Longitudinal Slope	2.00% (steeper ditching require engineered channels)
Minimum Velocity	0.3 m/s
Maximum Velocity	0.73 m/s (subject to variance dependent on ditch bottom materials)
Preferred Ditch Bottom Width	1200 mm
Minimum Ditch Bottom Width	600 mm
Minimum Ditch Freeboard	200 mm (below road finished grade shoulder to 1:100 yr 24 hour rain event)

Armouring such as rip-rap or re-vegetation will be required for erosion prone areas on all road slopes and ditching. Because of the sandy soil conditions of this site, erosion control will be an important consideration in design for all ditching and grading features due to high erodibility of the soils. Ditches require armouring for a minimum horizontal distance of 3 metres around culvert inlets, or as determined by hydraulic modeling. The general rule for protecting the downstream of a culvert is that armouring of three (3) pipe diameters should be used for each 1 m/s of velocity reduction required.

### **Monitoring and Compliance**

Site water management plan monitoring will be conducted, primarily to confirm the best management practices related to ESC are functioning as intended. Routine inspections and management would be completed to document the effectiveness of the ESC measures, and any maintenance or replacement of ESC structures would be completed as required.

The EIS Section 2.9 Management System outlines the framework to support EIS review. The Project's detailed management programs and plans will be developed to support licensing and permitting. Of relevance to this Plan, the following is noted:

- The Spill Response Plan will outline how Denison will appropriately respond to and clean-up any unexpected spills. Spill reporting to Saskatchewan Ministry of Environment, ECCC, and the public will be required depending on the nature of the spill.
- The Effluent and Emissions Monitoring Plan includes sampling plans for stormwater during construction.
- The Construction Management Plan incorporates environmental considerations. Construction activities with higher potential risk of ESC problems include excavation and borrow areas, clearing and grubbing, ditch construction, and earthwork near/across streams and lakes
- Environment inspections will be conducted at various project areas on a frequency specified in future licences and permits. This may include for instance daily and weekly

inspections of fuel storage tanks, ponds, pads, lines, etc. to ensure compliance with operational conditions, best management practices and other requirements. Inspection (and sampling) plans for non-contact water mitigation measures such as silt fencing will coincide with precipitation events and spring runoff.

Various aspects of Project monitoring will not only be included in Denison's management system documentation but also included as conditions in permits, authorizations, and licences. The Provincial laws governing development in, or near, water are set out in *The Environmental Management and Protection Act, 2010* and *The Environmental Management and Protection (General) Regulations*. Denison will apply to the Saskatchewan Water Security Agency for an Aquatic Habitat Protection Work for any work near water and will adhere to the conditions of the permit. Fish and fish habitat are protected by provisions of the *Fisheries Act*. The Project will be constructed, operated and decommissioned in a manner compliant with Section 36 of the *Fisheries Act*. The Ministry of Environment enforces provincial legislation in collaboration with federal regulators.

### **Education and Training**

Denison will provide education and training to staff and contractors about the importance of non-contact water management and best practices associated with erosion and sediment control. This helps ensure that everyone involved in the safe Construction, Operation and Decommissioning of the Project understands their role in protecting the aquatic environment.

### **In Closing**

Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the EMS is provided along with a clear commitment for Denison to include Project design and water management-related mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases. We trust that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process, and the summary contained in this SWMP will facilitate ECCC's review.

### **References:**

- Saskatchewan Water Security Agency. 2024. Aquatic Habitat Protection Permit - Preventing the discharge of deleterious substances. <https://www.wsask.ca/preventing-the-discharge-of-deleterious-substances>.
- Saskatchewan Ministry of Highways and Infrastructure (SK MHI). 2012. Erosion and Sediment Control. June 2003, updated February 2012. Available online: [https://pubsaskdev.blob.core.windows.net/pubsask-prod/124304/EP\\_ESC%252B%2528Feb%252B2012%2529.pdf](https://pubsaskdev.blob.core.windows.net/pubsask-prod/124304/EP_ESC%252B%2528Feb%252B2012%2529.pdf)

## Part 2 – Response to Specific Questions Raised in IRs 12, 12-R1A and 12-R1B

The table below highlights questions raised in IRs 12, 12-R1A and 12-R1B that weren't necessary fully described by the updated site water management plan (see Part 1).

Question from the IR	Denison Response
From FIRT's Information Request Rationale (2023-12-05): CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.	Denison understands that validation of the current PMP will be assessed as part of CNSC licensing.
From Denison submission of responses to IRs (2023-08-18): Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.	Project design is bound by the EIS. Culverts within contact water areas are being designed to convey water associated with a PMP event.
The Proponent should include updated information on water treatment, flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.	Non-contact water is not collected and routed through the industrial wastewater treatment plant (IWWTP). The wellfield runoff pond has been designed to accommodate the PMP. Influent to the IWWTP would be metered into the plant, per the treatment design rates and there would be no changes in effluent release rates beyond the assessed rates and plant design criteria.



IR- 101

- Department: ECCC
- Project Effects Link: Fish and fish habitat
- Reference to EIS, appendices, or supportant documentation: Section 8.1.1.3, Section 8.2.1.3 Aquati Environment

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Oct. 18, 2024)
IR-101	-	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>Responses are numbered as listed in the IR. Figures associated with this IR are provided in Attachment IR-101.</p> <p>1) Below indicates the information that is presented in the draft EIS regarding wetland characteristics. This information was housed within the terrestrial environment component and potential impacts to wetlands as a valued component is further assessed under Section 9.2 of the draft EIS, and specifically Section 9.2.6.4. The following list indicates what information was provided in the draft EIS specific to information request #1. As such, repackaging the available information in Section 8 would be redundant and therefore in Denison's view unnecessary.</p> <p>a. <i>Locations of Wetlands</i> <b>Section 9, Figure 9.2-8</b> on page 9-83 of the draft EIS presents a map of the RSA and LSA detailing the locations of various wetland features including bogs and fens.</p> <p>b. <i>Wetland Types</i> <b>Section 9, Figure 9.2-8</b> on page 9-83, and <b>Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS provides the geographical distribution and listing of the following wetland types within the LSA:</p> <p>i.BS17 – Black spruce treed bog ii.BS18 – Labrador tea shrubby bog iii.BS19 – Graminoid bog iv.BS19/24 – Graminoid bog/Graminoid fen v.BS20 – Open bog vi.BS21 – Tamarack treed fen vii.BS23 – Willow shrubby rich fen viii.BS24 – Graminoid fen ix.BS25 – Open fen x.BS27 – Sedge rocky shore (shallow open water)</p> <p>c. <i>Wetland Size</i> <b>Section 9, Table 9.2-8</b> on pages 9-91 to 9-92 of the draft EIS lists the following wetland types and the cumulative area they encompass within the LSA:</p> <p>i.BS17 – 18.2 ha ii.BS18 – 23.3 ha iii.BS19 – 2.8 ha iv.BS19/24 – 0.8 ha v.BS20 – 0.6 ha vi.BS21 – 1.9 ha vii.BS23 – 0.6 ha viii.BS25 – 0.4 ha ix.BS27 – 4.2 ha</p> <p>d. <i>Wetland Water Surface Elevation</i> Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 <b>Figure 1 Elevations of wetland features in the LSA.</b></p> <ul style="list-style-type: none"><li>• Wetlands 1.5 km west of the SSA range from 526-524 masl</li><li>• Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl</li><li>• Waterbodies and surrounding wetlands 2 km east</li></ul>	<p>This response has not been accepted for the following reasons:</p> <p>1. The response (#1(d)) by the proponent states that “Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 Figure 1 Elevations of wetland features in the LSA” but it is not indicated that this information will be placed in the EIS. CNSC staff requests proponent to include the information provided in response #1(d) and Attachment IR-101 Figure 1 (Elevations of Wetland Features in the LSA) and Attachment IR-101 Figure 2: (Denison Wheeler River Project SSA and Wetland Feature Distribution) in the EIS.</p> <p>2. The Proponent stated in response #2 (a) and (b) that “surface water quality and sediment quality in wetlands were not specifically sampled in the wetland complexes adjacent to the Project footprint during the original baseline assessment.” CNSC staff requests the proponent to provide justification why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas. It is recommended to conduct direct measurements in the wetland areas.</p> <p>3. The information provided did not satisfy the IR. Additional information regarding the potential impacts to wetlands due to changes in surface water quality and sediment quality should be included within Section 8.3 of the main EIS. This is needed to fully understand the scope of potential effects to the aquatic environment.</p> <p>a. Update Section 8.3 to include additional information on predicted water and sediment quality impacts to wetlands from the Proponent’s response to directly consider wetlands as fish and fish habitat for the purpose of assessing water quality impacts.</p> <p>b. Update Section 8.3 to provide an assessment of potential effects to wetlands from water and sediment quality changes within the LSA.</p> <p>4. It is stated in response #4 that “[...] Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project” and CNSC staff agrees with the proponent and recommend collection of monitoring</p>	<p>1. This information has been incorporated into the EIS as Appendix 8-F.</p> <p>2. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the effectiveness of mitigation measures.</p> <p>3(a). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of their potential to provide fish and fish habitat. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>3(b). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of changes to water quality and sediment quality within the LSA due to the Project. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8.</p> <p>4. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the success of mitigative measures.</p>	<p>Responses to items one and four have been accepted, but items two and three require additional information.</p> <p>For item two, the Proponent has not included justification regarding why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas within their response. Please provide the missing justification for item two, as well as describe how baseline information will be used to further assess the effectiveness of mitigation measures. Water and sediment quality in wetlands differ than those in stream and lakes systems because of their distinct biota and hydrology. In wetlands, there is a greater cycling of nutrients, more nutrients and metals can be sequestered in sediment, and metal toxicity modifying water quality factors such as pH and dissolved organic carbon are not the same as in streams and lakes. Baseline data on water and sediment quality in wetlands are necessary to evaluate potential effects on fish and fish habitat of proposed discharge to Whitefish Lake upstream of the wetlands. The information would also be used to assess possible effectiveness of proposed mitigation measures.</p> <p>For item three, the Proponent has not provided the predicted sediment quality impacts within item three, which is part of the wetlands assessment that was requested.</p> <p>Please also update Section 8.3 to include additional information on predicted sediment quality impacts to wetlands and to provide an assessment of potential effects to wetlands from sediment quality changes within the LSA.</p> <p>This Information is required in order to identify and define potential effect pathways linked to project-related changes to wetland sediment quality and assess effects on wetland functions, fish and fish habitat, and other valued components. Potential effect pathways in wetlands can be different than those in lakes and streams and warrant a separate assessment.</p>	<p>Per the Round 3 IR, responses to items 1 and 4 from the Round 2 IR have been accepted, but items 2 and 3 require additional information.</p> <p>For Item 2, for clarity ECCC specified during the meeting on June 14, 2024, that the wetlands of interest are those located within the nearshore environments of Whitefish Lake (Upper, Mid and Lower) as these lakes will directly receive treated effluent during operation.</p> <p>Water quality was sampled both upstream (river inlet to lake) within the lakes and downstream (river outlet of lakes) (e.g., SA4, SA-5, SA-6, LA-5 and LA-6; refer to Appendix 8-D for the aquatic baseline report including photographs of water quality sampling areas for context). As identified in Denison's response to the IR-107 (round 3), the baseline water quality variability was very low between these stations and therefore overall representative of the LSA and encompassing depositional and non-depositional environments. This was deemed appropriate and suitable for the scale of the EIS.</p> <p>The rationale for using water and sediment quality specific to the inlet/lake/outlet is further described below.</p> <p>Surface water quality modelling included predictions of water and sediment concentrations in Whitefish Lake, the lake into which treated effluent will be released, as well as locations farther downstream. Water quality was predicted as the incremental change in constituent concentrations during periods of effluent discharge on a monthly time step. Sediment quality predictions (as concentrations of constituents in sediment) were made on the same time step from surface water concentrations using the partitioning coefficients (Kd). The Kd values are presented in Table 3-6 of the ERA. They consist of regional published values that have been calibrated on similar sites in northern Saskatchewan over several years and have been checked against Wheeler River measurement data as shown in Figure 3-2 and Figure 3-3 of the ERA.</p> <p>For the purposes of the analysis the Kd value was used for a lake environment meaning that one estimate of sediment quality was assumed to be reasonable for the purposes of the EIS because the wetlands are directly connected to the lake as they are functional nearshore environments of the waterbody itself.</p> <p>The wetland portions under discussion are more accurately described as littoral areas and these wetland portions are not cut-off from or</p>	<p>Denison has not adequately responded to the request to identify potential effects to sediment quality to support identification of project-related effect pathways to wetlands. The Kd values could differ significantly in wetland environments compared to in lake/stream measurements where all samples were taken and there are discrepancies in wetland classification within the EIS and information provided in IRs with the actual classification standards for various wetland types.</p> <p>For further explanation, the descriptions of the wetland areas provided in the round 3 response do not correspond to information provided in the last round of responses received from Denison. For example, Figure 2 of Appendix 8-F: Wetland Effects Assessment Report identifies a black spruce treed bog (ecotype BS17) between Whitefish Lake North and Whitefish Lake Middle (La-5), where effluent will be discharged. According to the Canadian Wetland Classification System (Warner &amp; Rubec, 1997), bogs are defined as receiving water only from precipitation, with no hydrological connections to groundwater or littoral areas. This does not match with the response of “<i>littoral areas and these wetland portions are not cut-off from or isolated from the main basin of the lake.</i>” The response also does not correspond to the BS17 ecotype described in Appendix 9-B: Terrestrial Environment Wildlife and Vegetation Baseline Inventory.</p> <p>The uncertainty introduced as to the conditions on site complicates the discussions on baseline conditions and potential impacts in wetlands which the Proponent assumes to provide fish habitats. Bogs and fens (ecotypes BS17, BS18, BS19, BS21) are identified in and around Whitefish Lake and these wetlands will have different water and sediment chemistry than lakes and creeks. For example, the partitioning coefficients of sediments in a fen would not be expected to be the same as those in a lake, though both may be depositional environments, sediments in the fen would be richer in organic matter because of the vegetation present. Organic matter in sediment is an important factor affecting soil-water partitioning coefficients. Because of this, the sediment in wetlands is likely to adsorb more metals than sediment found in lakes. So it is important to understand baseline conditions and model impacts in order to ensure the aquatic environment will not be impacted by the project’s planned discharges.</p> <p>The Proponent should clarify if the wetlands were misidentified in the Terrestrial Environment Wildlife and Vegetation Baseline Inventory. If they have been misidentified, then corrections should be made to the Baseline Inventory and Wetlands Assessment Report, and information provided in the Proponent’s round 3 response should be integrated in Section 8.3 of the EIS. If they have not been misidentified, then the Proponent should respond to round 3 information requests considering the wetland environment.</p> <p>In order to resolve this IR, Denison are expected to:</p> <p>1. Update wetland classification in the LSA according to the Canadian Wetland Classification System (Warner &amp; Rubec, 1997). Focus should be applied to</p>	<p>Denison reaffirms the approach taken with baseline sediment data as utilized in the EIS and more specifically in the ERA (e.g., pooled sediment data from locations in an unperturbed system in the same watershed where land use and type is homogeneous) as an appropriate and acceptable basis to define existing conditions (and the variability thereof) and to identify potential Project effects to sediment and evaluate the significance of these effects. The IMPACT model predicts how constituents travel through the environment and concentrations of constituents change as a result of interactions with natural flows and lake sediments. The Kds applied in the model have largely over predicted the baseline sediment concentrations throughout the lakes demonstrating that the model and model inputs are conservative, and impacts (i.e., incremental changes in constituent concentrations resulting from Project emissions to the aquatic environment) have not been under predicted.</p> <p>For context on a sensitivity analysis for sediment quality predictions, refer to Appendix 10-A, Section 6.2.2 Effluent Discharge Rate. A sensitivity analysis of key model parameters was undertaken to understand the degree to which the results or conclusions of the risk assessment would vary if parameters differed from what was assumed. In this section, sediment predictions are shown for a scenario where effluent is released at the maximum upper bound rate of 81 m³/hr and the maximum concentrations of COPCs in the receiving environment increases up to 120%. It is also a conservative prediction in that it assumes effluent is released during decommissioning at the same upper bound flow and quality as during operations. In this sensitivity analysis, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, with the exception of cadmium, molybdenum, selenium and vanadium; however, the predicted exceedances for cadmium, molybdenum, selenium and vanadium are all below their probably effect level (PEL), no-effect (NE2), or severe effect level (SEL) values, therefore, adverse effects to benthic communities are not anticipated under the upper bound discharge scenarios.</p> <p>Importantly, monitoring programs will be implemented to assess the environmental performance of the Project relative to the predictive assessment that has been completed in support of the EA process. Such monitoring is needed since there is always some level of uncertainty associated with EA predictions (and it is noted that uncertainty analysis has been completed as part of the EIS and considered within the context of assessing the significance of effects).</p>



		<p>within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.</p>		<p>of site are approximately between 499 and 497 masl</p> <ul style="list-style-type: none"> <li>Wetlands north of the SSA and in the vicinity of the proposed air strip range from 514-508 masl.</li> <li>Wetlands situated further north of the SSA in the LSA were at an elevation of approximately 526 masl</li> <li>Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl</li> <li>Most wetland evaluated south of the SSA had elevations ranging from 491-488 masl</li> </ul> <p>e. <i>Wetland Depth</i> – information associated with wetland depth for those in the LSA is not available.</p> <p>f. <i>Wetland Flow Pathways</i> - Nearly all wetlands are connected or adjacent to rivers and tributaries, and thus flow pathways are discernable in <b>Figure 9.2-8</b> of the draft EIS.</p> <p>g. <i>Presence of Fish and Fish Habitat</i> For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA.</p> <p>2) As noted in other parts of this IR response, the wetlands within the Project footprint are limited to two areas (i.e., stream crossings along the access road to the airstrip and powerline connection SE of Highway 914 [See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution in Attachment IR-101]) and these wetland areas can be avoided through design and construction mitigations. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>In regard to baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint:</p> <p>a. <u>Surface water quality in wetlands</u> – surface water quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, surface water quality was sampled and assessed at stream and lake stations situated upstream and downstream of wetland areas. These stations were selected for sampling as they were identified as providing repeatability (i.e., relative water depth) and informative with respect to desired segments of the system. For example, water quality was sampled at SA-4, SA-5, LA-6, SA-6 and LA-5</p>	<p>information on the wetland areas.</p>		<p>isolated from the main basin of the lake. As such, it can be assumed that the lake environment is likely to be as depositional as the nearshore environment. The lakes of interests are very shallow (on average 1.5 m in depth) and therefore deposition may be as likely in the “offshore” environment as the nearshore.</p> <p>The wetlands are not likely to have a dominating effect on the water quality of Whitefish Lake due to their lesser aerial extent vs. the lake proper and the connectivity between the zones suggests that water quality would be similar between the shoreline and the “offshore” (i.e. likely good exchange).</p> <p>With respect to Item 4, and to further confirm these assumptions discussed above, Denison has committed to the collection of additional baseline information with the wetlands for water quality and sediment quality prior to construction as part of operational licencing (Commitment 8-46).</p> <p>Denison has also committed to conducting a pre-construction preliminary EEM for the site. The EEM study design will be further guided by the final design of the diffuser and the behaviour of the effluent plume (Commitment 8-49).</p> <p>Based on this and if applicable, the EEM study design could include an investigation of the differences in WQ and SQ nearshore and offshore. This would allow for an understanding of the differences in water to sediment contaminant ratios between nearshore and offshore environments.</p>	<p>updating areas with hydrological connections to groundwater and littoral sources, which may have been misclassified as bogs. This should include any sub-classification of wetlands currently categorized as Shallow Open Water in Appendix 8-F: Wetland Effects Assessment Report. Updates should be made as necessary to all relevant reports, including the Terrestrial Environment Wildlife and Vegetation Baseline Inventory as needed.</p> <p>2. Update habitat mapping for wetlands to reflect any changes in wetland classifications, particularly for wetlands that may include fish and fish habitat.</p> <p>3. Update Table 8.3-3 and 8.3-4 in Section 8 of the EIS to include more specific information on wetlands that may contain fish and fish habitat, such as information on wetland type &amp; extent, vegetation, substrate type, organic matter content, etc.</p> <p>4. Provide a table with summary statistics (grain size analysis and sediment quality) from sediment sampling specific to each individual sampled lake or stream, rather than summary statistics for all waterbodies and watercourses pooled together.</p> <p>5. Provide the source reference for the Kd values used for the ERA in Table 3-6 and the specific characteristics of sediments (i.e. grain size and composition) of the regional study areas as they compare to LA-5, the LSA and the RSA.</p> <p>6. Conduct a statistical analysis with a power analysis comparing sediment characteristics (grain size analysis and sediment quality) from the various sub-samples taken within each waterbody to conclude if there are any significant differences between sub-sampling stations, and determine if there is within-lake variation in sediments. Denison should provide the methodology they will use to conduct the statistical analysis and power analysis for CNSC review and acceptance prior to completing the analysis. Based on the results of this statistical analysis, Denison should:</p> <p>a. If the results determine that there is enough statistical power to confirm there is no within-lake variation in sediment characteristics within LA-5, Denison should then complete a statistical analysis and power analysis comparing LA-5 to other sampled areas to determine if there is any between-lake variation in sediment characteristics.</p> <p>b. If the results determine that there is not enough statistical power, or that there is enough statistical power but there is significant within-lake variation between sub-samples in LA-5, Denison will require the additional baseline data that Denison has already committed to collecting, to update the modelling during the EA phase to support conclusions on significance of effects to the receiving environment.</p> <p>This IR relates closely to IR-107 that demonstrates that there is not enough</p>	<p>Specific to this IR, sediment sampling will be completed to verify the accuracy of predicted effects and the effectiveness of proposed mitigation measures.</p> <p>Monitoring and follow-up programs will be integrated within Denison’s overall Environmental Management System (EMS) framework and implemented through the various programs, plans and procedures that would be developed therein. Denison is committed to achieving continual improvement in environmental performance through its EMS. As part of this overall commitment to continual improvement, monitoring programs will be implemented via an adaptive management approach. Adaptive management is a systematic process for continuously improving environmental management practices by learning from their outcomes. It provides the flexibility to address/accommodate new circumstances, to adjust monitoring, to identify and implement new mitigation measures, or to modify existing measures throughout all Project phases. Further, it provides a means to confirm that the monitoring elements remain valid, meet regulatory requirements, and be responsive to evolving objectives.</p> <p>At the EIS stage, the conceptual plan is for sediment sampling at Whitefish Lake South (near-field), at an upstream reference location (Whitefish Lake North), and at downstream locations (far-field) every three years. The far-field monitoring locations will be located in Whitefish Lake South prior to its discharge to McGowan Lake. The details of the sediment monitoring program will be refined as the Project advances. Sediment constituent concentrations will be compared to the values used in the EIS and to applicable regulatory criteria or objectives. As noted, above sampling effort will be predetermined that meet the rigor required of federal / provincial requirements as described in relevant technical guidance documentation for operational monitoring.</p> <p>In general, applying equally to sediment quality as with all other environmental aspects that have been considered in the EIS, where an environmental monitoring program identifies predicted effects are greater than anticipated, Denison would evaluate whether these effects could result in changes to the conclusions in this EIS. If changes are confirmed, then Denison would evaluate the need for revised mitigation actions and management practices to manage effects. As highlighted above, Denison’s interpretation of monitoring data would include reference to environmental performance criteria. An exceedance of environmental performance criteria would trigger Denison to respond to further investigate the potential issue. Based on this investigation, where need for revised mitigations is identified these measures would be developed and implemented. It is expected that the adaptive management process would be informed by input sought from Indigenous people,</p>
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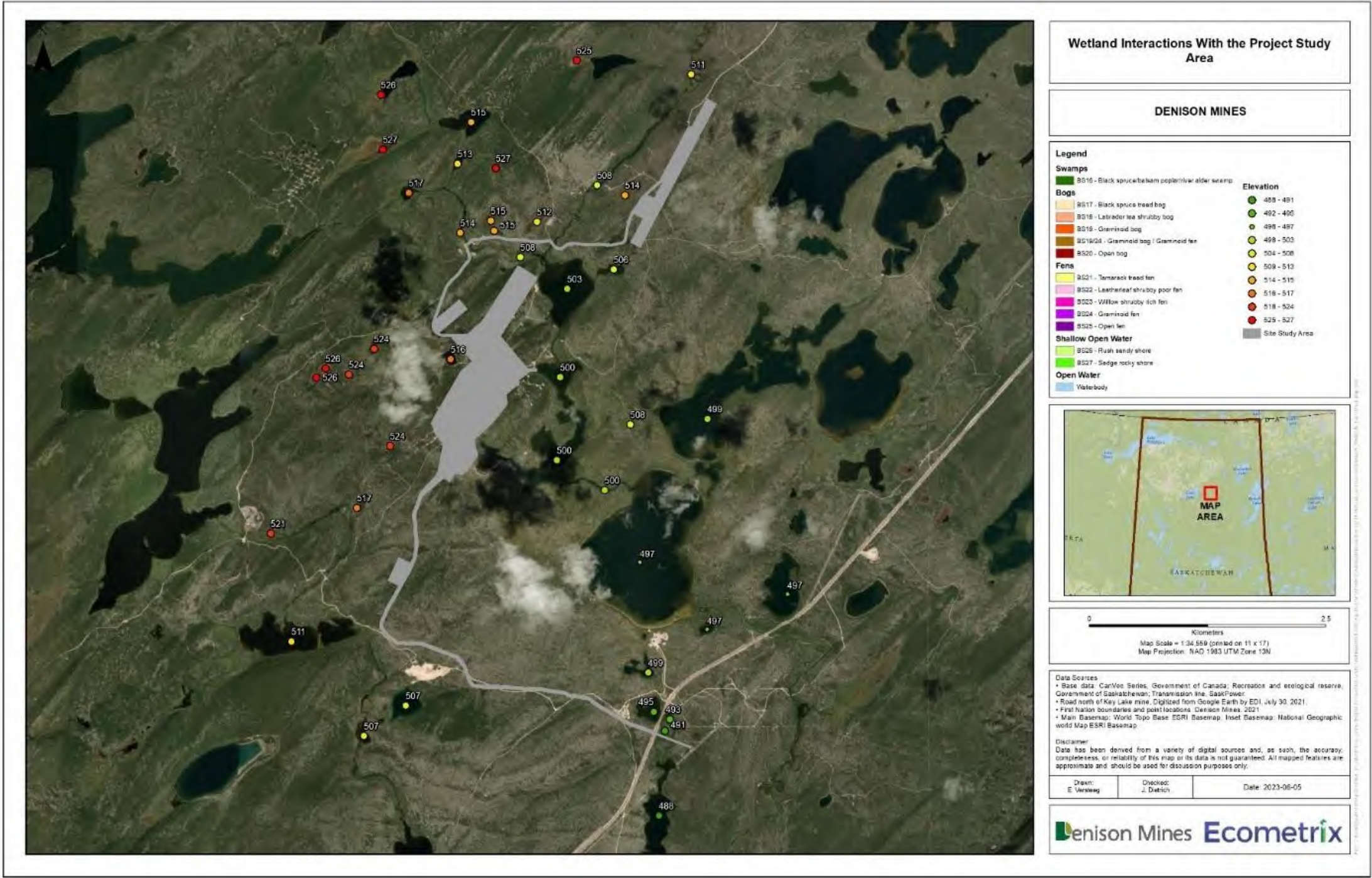
				<p>following the flow path from upstream to downstream, respectively. The water quality at these nodes was inclusive of upstream wetland influences. For further reference to surface water sampling station during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>b. <u>Sediment quality in wetlands</u> - sediment quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, sediment quality was sampled and assessed at depositional lake stations situated upstream and downstream of wetland areas. The sediment quality at these nodes would be inclusive of upstream wetland surface water and sediment influences. For further reference to sediment sampling stations during baseline, please refer to Figure 8.2-4 of the EIS.</p> <p>3) For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA</p> <p>However, when further scrutinizing the potential overprinting of wetland features as a result of the Project it is evident that even this loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and powerline connections are proposed (<b>See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution (Attachment IR-101)</b>).</p> <p>Wetlands associated with stream crossings have been identified to have mitigative designs (clear-span) to ensure no impacts to fish and fish habitat. The hydro-line as shown in Figure 1 will be constructed to avoid direct impacts to fish and fish habitat following best installation practices. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat.</p> <p>As discussed in Section 8.1.6.1 of the EIS, water levels in the ponds and lakes in the vicinity of the of the Project are expected to experience negligible effects, with magnitudes of changes in water levels predicted to be in the sub-centimeter range. As natural fluctuations in lake water levels were approximately 0.4 m from 2011 to 2019, Project-related changes are not expected to be of a magnitude to compromise the Surface Water Quantity VC. It can then be considered a reasonable assumption that any changes to wetland features will have similar sub-centimeter impacts to water levels due to changes in surface flow and/or groundwater and therefore do not pose an indirect effect to water quantity or fish and fish habitat associated with these wetland features.</p> <p>4) As no impact is expected due to overprinting or due to draw down effects by the ISR, additional mitigation measures are not warranted. Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the</p>				<p>baseline data to support conclusions on significance of effects.</p>	<p>stakeholders, and regulatory agencies.</p> <p>The following section provides a response to each to the specific IR questions:</p> <p>1. The project's ecosite classification is outlined in Section 9. Ecosite classification was completed using the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlin et al. 2010) Ecosite information was transferred directly into Appendix 8-F which originated in January 2024 during the EIS review process in response to FIRT IRs.</p> <p>Refer to Section 9 for the wetland assessment and Appendix 9-B for the terrestrial baseline report with information on ecosite mapping in Section 2.1.3 and ecosite characterization methods and results in Section 2.2. The measurable parameter for the wetlands assessment in Section 9 was change in areal extent of wetlands; this was also considered in Appendix 8-F.</p> <p>The EIS guidelines do not require use of the suggested classification scheme (Canadian Wetland Classification System (Warner &amp; Rubec, 1997). Denison used information from the province's land classification system and have fulfilled that EIS requirement.</p> <p>Effectively, to be conservative in one assessment (assessing change in areal extent of wetlands in Section 9) we have introduced questions and confusion in Appendix 8-F. The data was fit for purpose for Section 9 and to be consistent, it was carried over into Appendix 8-F without any adjustments or reclassifications.</p> <p>This IR is not questioning the assessment of changes in areal extent of wetlands, but the purported under estimation of risk through the effluent modelling. As such, no updates to the wetland classifications are warranted at this time. Further, Denison has committed to completing additional wetland studies (see response to point 2).</p> <p>2. Additional wetland surveys will be completed after the EA stage, per commitment 8-46 in Denison's commitment register (i.e., "To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.").</p> <p>Appendix 8-F has been updated and specifically, a new appendix (Appendix A) has been added. This new appendix provides photos and text to orient the reviewer to the in-lake wetlands of interest. While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of</p>
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				<p>project. However, such changes are expected to be less than measurable.</p>						<p>interest are littoral / nearshore zones in the lake and connecting channels.</p> <p>The balance of this IR response outlines the rationale for why the CNSC’s suggested wetland mapping updates to the EIS would not change any EIS conclusions and are not required at this stage for EA determination.</p> <p>3.Any wetlands that were present within water bodies, were mapped as part of the baseline program and results would be incorporated into the existing fish habitat summaries provided in Tables 8.3-3 and Table 8.3-4. Refer to Section 8.3.3 for the existing environment methods and results. It is noted in the EIS that detailed information regarding fish and fish habitat baseline data collection and analyses are provided in Appendix 8-D, Appendix 8-B, and additional information pertaining to wetlands is provided in Appendix 8-F.</p> <p>4. Sediment grain size results for McGowan Lake, Whitefish Lake south, Whitefish Lake north and Russell Lake are summarized in EIS Section 8 Table 8.4-2, and sediment chemical composition results are summarized in Table 8.4-3.</p> <p>The baseline sediment grain size and chemistry analysis for all stations within the baseline study area are provided in Appendix 8-D Aquatic Baseline, Tables A-3 and A-4 of Appendix A, respectively.</p> <p>5. A summary of the source reference for the Kds is provided in Attachment IR-101 (Round 4), and a discussion on sediment grain size for the Wheeler River and regional study area is also provided.</p> <p>6. Based on discussions between the CNSC and Denison in September 2024, the primary request from the CNSC was related to additional information on the IMPACT Kds, which has been provided as part 5 of this response. The requested power and additional statistical analyses can be completed as part of licensing and will include results from pre-operational sediment sampling. Any pre-operational sediment sampling results will be included in the environmental risk assessment (ERA) update to support Denison's application for a licence to operate. Additionally, the pre-operational sediment sample results in combination with existing data will be the basis of future comparisons of measured data from effluent exposed and reference areas. Such comparisons would be based on statistically based study designs that meet the rigor required of federal / provincial requirements as described in relevant technical guidance documentation for operational monitoring.</p>
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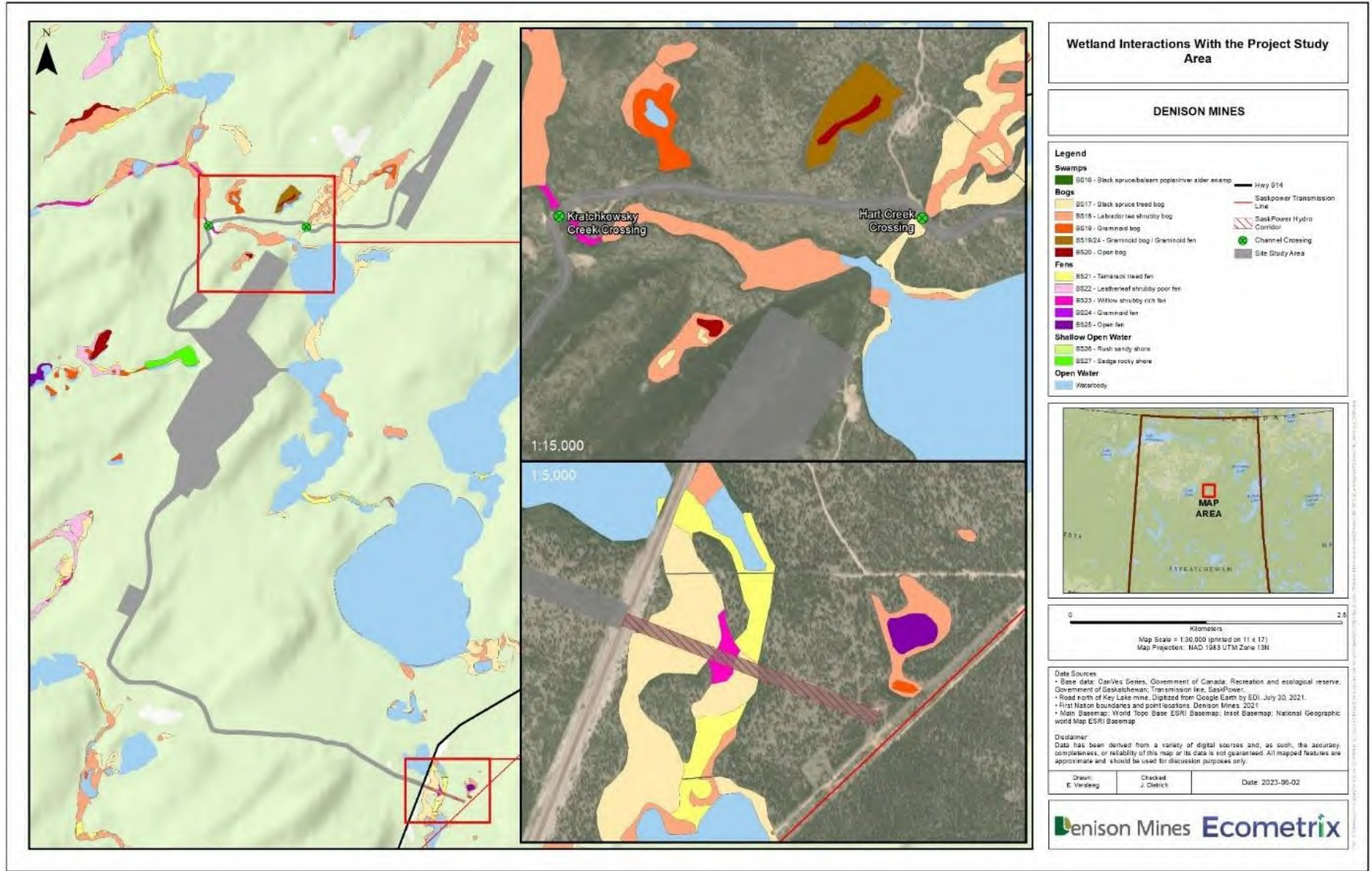
Attachment: IR-101 (included in Round 1 submission)

Supporting figures to the response provided in table:



Attachment IR-101 Figure 1 – Elevations of Wetland Features in the LSA.





Attachment IR-101 Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution

Round 2: New EIS Appendix 8-F





 enison Mines

## Wheeler River Project

Revised Draft Environmental Impact Statement

January 2024

*Powering*  
**PEOPLE, PARTNERSHIPS  
AND PASSION.**

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**TO:**

Denison Mines – Janna Switzer

**FROM:**

Ecometrix

**REF:**Wheeler River Project EIS – Appendix 8-F:  
Wetland Effects Assessment Report**DATE:**

19 January 2024

## 1.0 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Responses to these IRs were provided in July and August of 2023. Additional FIRT IRs were provided to Denison on December 5, 2024. Of these IR-101 was not adequately answered and additional information was requested.

This appendix provides additional information to address IR-101 provided by Environment Canada and Climate Change (ECCC) as part of the second round of FIRT comments. The comment included a request for a further summary of wetland characterization information from available sources, baseline information pertaining to water quality and sediment quality, and assessment of potential effects to wetlands within the LSA for all phases of the Project and provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.

## 2.0 Scope of the Assessment

This section addresses the potential effects of the Project on the Fish and Fish Habitat VC for which wetland habitats are considered a component. The purpose of this assessment is to assess potential changes to wetlands (as represented by the Fish and Fish Habitat VC) in consideration of all phases of the Project at the Project Area, local, and regional study area scales. Pathways affecting wetlands are directly associated with potential changes to the Surface Water Quantity (hydrology), Surface Water Quality, Sediment Quality, and Benthic Invertebrates VCs. Changes to



hydrology, water quality, sediment quality, and benthic invertebrate communities may directly affect wetlands as both fish and wildlife habitat and food resources. The assessment approach reflects these connections within the environment, as the significance determination for the Surface Water Quantity and Surface Water Quality VCs was conducted at the receptor VC level.

The Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are interrelated, to varying extents, and are linked to other VCs, including:

Surface Water Quality – surface water contributes to local moisture regimes, and surface water quality can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Surface Water Quantity – surface water contributes to local moisture regimes, and surface water quantity contributes to site drainage and discharge, which can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Sediment Quality – Vegetation and Ecosystems, Listed Plant Species, and Wetlands contribute to ecosystem form and function that stabilize riparian areas and influence quality of surface water runoff to aquatic systems.

This appendix will focus on the interrelations between these VCs as they apply to Wetland function.

Pathways that are of interest include those associated with site clearing and the potential for erosion-driven mobilization of suspended sediment into local surface waters; groundwater interactions with surface water features including wetlands; the establishment of new subwatershed boundaries and the resulting effects of effluent discharge to the receiving environment; and the potential overprinting of wetland habitat by Project infrastructure.

## **2.1 Key indicators and Measurable Parameters**

The KIs for the wetland component of the Fish and Fish Habitat VC include potential changes in surface water quantity, surface water quality, and available wetland habitat from baseline conditions. The rationale for each KI and associated MPs is summarized in Table 1.

**Table 1: Key Indicators and Measurable Parameters for the Wetlands Valued Component**

Key Indicator	Rationale for Key Indicator	Measurable Parameter
Change in available wetland habitat from baseline conditions	2. Project activities may result in a change in the extent of Wetlands. 3. Of provincial and federal management concern 4. Contributes to biodiversity and habitat for wildlife species and listed plant species. 5. Cultural importance. 6. Contributes to biodiversity, maintenance of hydrologic cycles, nutrient cycling, water quality, and carbon storage. 7. Sensitive to disturbance. 8. Historically addressed for other mining projects in northern Saskatchewan.	Aerial extent (m <sup>2</sup> or ha) of overprinted wetland habitat.
Change to water levels or flows from baseline conditions	Project activities are expected to result in changes to local hydrology. A reduction or increase in flows may result due to the elimination or redirection of subwatershed area and through Project water management (i.e., water taking, storage, and effluent discharge). These changes in flow to the environment may alter stream flows, lake levels and such feature interactions (inundation) with wetland features required for fish and wildlife during all life stages.	Changes in water levels (m) or percent changes to flow conditions (%).
Change in surface water quality from baseline conditions	Changes in water quality are regulated (subsection 36(1) of the <i>Fisheries Act</i> and the MDMER). Changes that may occur as a result of the Project include: <ul style="list-style-type: none"> <li>• mobilization of solids into local watersheds; and</li> <li>• deposition of deleterious substances into the receiving environment as a result of mine effluent and/or surface runoff.</li> </ul>	Change in the concentration of constituents that are directly related to Project activities, measured as a mass of a chemical per unit volume in water (e.g., mg/L).

## 2.2 Spatial and Temporal Boundaries

The areas used to assess the effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are (Figure 1):

**Project Area:** the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area is considered to be a conservative estimate of the area of direct disturbance effects on VCs in this assessment.

**Vegetation LSA:** the area that surrounds the Project Area where all direct effects and most indirect effects are likely to occur on the Vegetation and Ecosystems, Listed Plant Species, and

Wetlands VCs. The Vegetation LSA is defined as the Project Area plus a 250 m buffer along roads and a 500 m buffer around all other infrastructure (1,161.8 ha).

**Terrestrial RSA:** the area that surrounds and includes the Vegetation LSA, established to assess the potential, largely indirect effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs in a regional context. The Terrestrial RSA (40,173.6 ha) is defined as a minimum 8 km buffer around the Vegetation LSA and has been delineated to capture all indirect effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs and provide context for the type, distribution, extent, and prevalence of plant species and ecosystems in the region. The Terrestrial RSA also defines the area within which cumulative effects are likely to occur (i.e., CEA boundary).

Temporal boundaries identify when an effect is expected to occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, with the associated interactions with each VC and KI (where applicable). In the EA, the temporal boundaries are described as appropriate for each activity and cumulatively for the life of the Project.

The temporal boundaries for the EA represent the timeframes that the Project is expected to interact with and potentially affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. The temporal boundaries are aligned with the Project development schedule as described in the EIS: Construction; Operation; Decommissioning; and Post-Decommissioning.

### 3.0 Existing Conditions

Wetlands are defined as “land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment” (National Wetlands Working Group 1997). As such, ecosites have been determined to be wetland ecosystems where these conditions are expected to occur. This includes both wetland ecosites and sparsely vegetated ecosites where the water table is within 50 cm of the ground surface (McLaughlan et al. 2010). No wetlands within the Terrestrial RSA have been designated as Ramsar Wetlands of International Importance (The RAMSAR Convention Secretariat 2022).

Project-specific investigations pertaining to the Terrestrial Environment were conducted by Omnia Ecological Consulting (Omnia; Calgary, AB) from 2017 to 2019. Details on the methods, survey parameters and assumptions, and comprehensive data summaries/findings are presented in the Project-specific baseline report (Omnia 2020; see **Error! Reference source not found.** of the EIS) and a supplementary baseline annex report completed in 2021 (EDI 2021; see **Error! Reference source not found.** of the EIS).

Project baseline studies for vegetation presented a description of the ecosystems/habitat types (i.e., ecosite classifications) within the Terrestrial RSA. Vegetation communities and ecosystems are represented by provincial ecosite classifications for the Boreal Shield Ecozone in accordance with the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010). These ecosite classifications were summarized within a 1:20,000 interpreted ecosite mapping product compiled within the Terrestrial RSA with the use of the following inputs:

- 1:5,000 anthropogenic features mapping;
- historical fires data;
- provincial Predicted Ecosite Mapping;
- current and historical imagery; and
- field sampling/ground truthing sites (EIS Appendix 9-B).

As the Boreal Shield Ecozone experiences a largely natural fire regime, much of the vegetation within the Terrestrial RSA (70.6%) is comprised of post-fire regeneration (i.e., shrubby structural stages). Twenty (20) upland ecosites were identified within the RSA with relative percentages by area estimated for each ecosite code.

The assessment also identified fourteen (14) wetland ecosite types within the RSA which included swamps, bogs, fens and shallow open water ecosite codes. The area of these wetlands was also estimated to provide a relative percent area of representation within the RSA.

This cataloguing of ecosite presence and relative area composition across the RSA provides the basis for understanding landscape change and succession over the course of the construction and operation of the Wheeler River Operation.

Waterbodies were conservatively included here as wetlands, as they have the potential to be classified as shallow open water wetlands (i.e., water bodies 2 m deep or less; Warner et al. 1997). Waterbodies represent the most common wetland ecosystem within the Vegetation LSA and the Terrestrial RSA, comprising 3.9% (44.9 ha) and 10.7% (4,101.9 ha), respectively. The black spruce treed bog is the second most common wetland ecosystem within the Vegetation LSA (18.2 ha, 1.6%) and the Terrestrial RSA (1,157.1 ha; 2.9%). The Labrador tea shrubby bog is the most common wetland ecosystem in the Vegetation LSA, comprising 2.0% (23.3 ha), and the second most common wetland ecosystem in the Terrestrial RSA (989.9 ha, 2.5%). All other wetland ecosites are relatively uncommon, each comprising less than 0.5% of the Vegetation LSA and

Terrestrial RSA. The location, size and relative area composition of the wetland features is provided in Table 2 and Figure 1).

**Table 2: Summary of Wetlands**

Ecosite Code <sup>1</sup>	Ecosite Description <sup>1</sup>	Structure Code <sup>2</sup>	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
<b>Swamps</b>						
BS16	Black spruce / balsam poplar / river alder swamp	6	--	--	8.8	<0.1
<b>Swamps Subtotal</b>			--	--	<b>8.8</b>	<b>&lt;0.1</b>
<b>Bogs</b>						
BS17	Black spruce treed bog	5	18.2	1.6	1,157.1	2.9
BS18	Labrador tea shrubby bog	3	23.3	2.0	967.6	2.4
		3a	--	--	20.3	0.1
		3b	--	--	2.0	<0.1
		Total	23.3	2.0	989.9	2.5
BS19	Graminoid bog	2	2.8	0.2	160.5	0.4
BS19/24 <sup>3</sup>	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS20	Open bog	1	0.6	<0.1	65.5	0.2
<b>Bogs Subtotal</b>			<b>45.6</b>	<b>3.9</b>	<b>2,374.2</b>	<b>5.9</b>
<b>Fens</b>						
BS19/24 <sup>3</sup>	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS21	Tamarack treed fen	5	1.9	0.2	66.5	0.2
BS22	Leatherleaf shrubby poor fen	3a	-	-	28.5	0.1
BS23	Willow shrubby rich fen	3b	0.6	<0.1	20.9	0.1
BS24	Graminoid fen	2	-	-	9.0	<0.1
BS25	Open fen	1	0.4	<0.1	5.7	<0.1
<b>Fens Subtotal</b>			<b>3.6</b>	<b>0.3</b>	<b>131.8</b>	<b>0.3</b>
<b>Shallow Open Water</b>						
BS26	Rush sandy shore	2	-	-	15.1	<0.1

Ecosite Code <sup>1</sup>	Ecosite Description <sup>1</sup>	Structure Code <sup>2</sup>	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
BS27	Sedge rocky shore	2	4.2	0.4	29.3	0.1
Waterbody <sup>4</sup>	--	0	44.9	3.9	4,101.9	10.7
<b>Shallow Open Water Subtotal</b>			<b>49.0</b>	<b>4.2</b>	<b>4,146.3</b>	<b>10.3</b>
<b>Total Wetlands<sup>5</sup></b>			<b>98.3</b>	<b>8.5</b>	<b>6,661.1</b>	<b>16.6</b>

**Notes:**

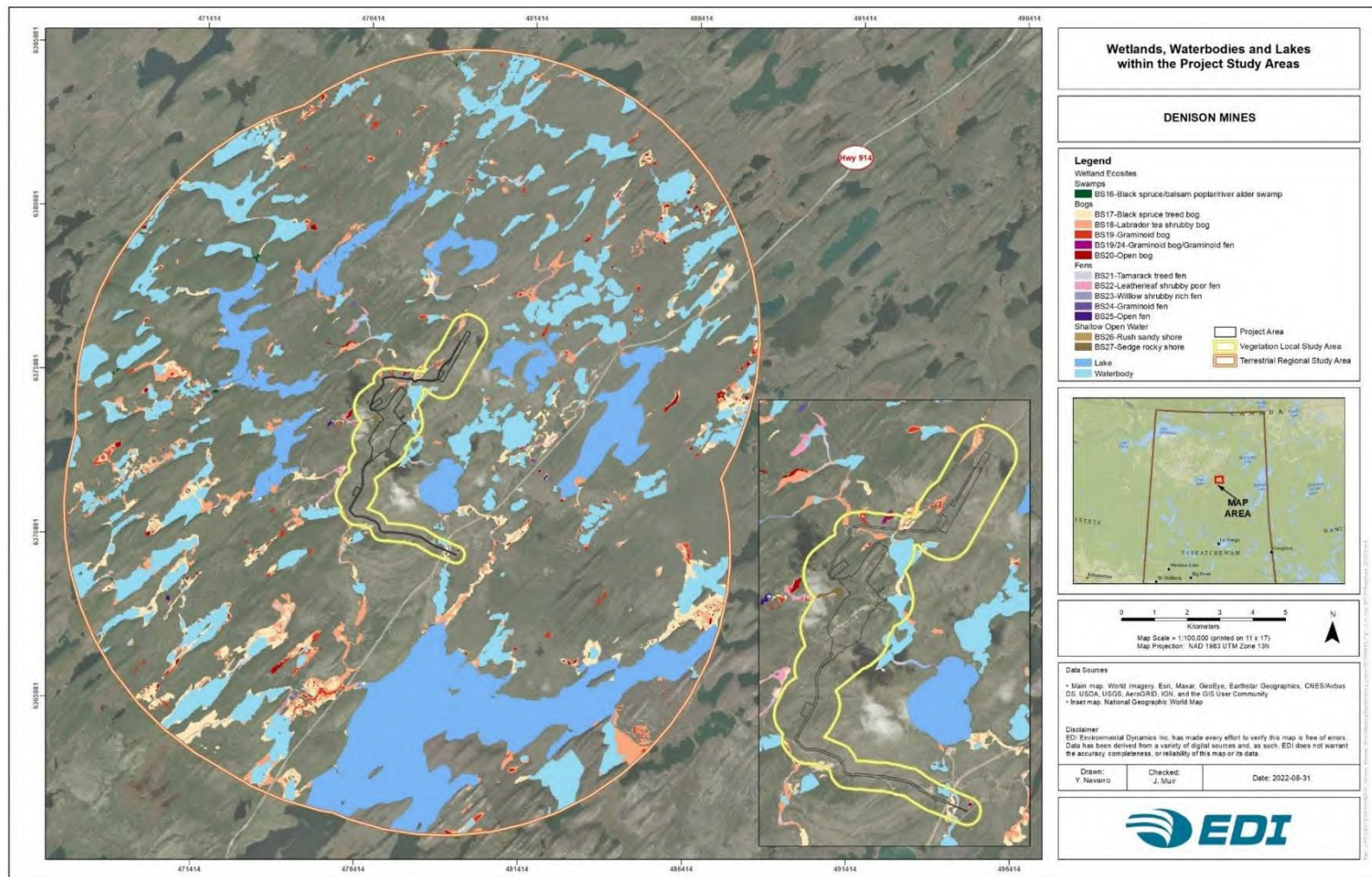
- 1 Ecosystems are described in detail in the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010).
- 2 Modified from the Field Manual for Describing Terrestrial Ecosystems (BC Ministry of Environment, Lands, and Parks, and BC Ministry of Forests 1998). 0 = unvegetated; 1 = sparse / bryophyte / lichen; 2 = herb/graminoid; 3a = low shrub; 3b = tall shrub; 5 = young forest, 6 = mature forest.
- 3 This ecosite type is an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between these ecosites due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). As such, this ecosite has conservatively been split between bog and fen classifications.
- 4 Areas of open water <2 m deep are defined as shallow open water wetland ecosystems (National Wetlands Working Group 1997); as such, unnamed waterbodies and areas of open water observed to exhibit an average depth of <2 m (Ecometrix Incorporated 2020) have been conservatively included as wetland ecosystems.
- 5 Some numbers are rounded for presentation purposes. Therefore, the totals may not equal the sum of the individual values.



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**Figure 1: Wetlands, Waterbodies and Lakes within the Project Study Areas**

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Surface elevations for the wetland have been assessed and the information is summarized below and in the Figure 1 .

- Wetlands 1.5 km west of the Project Area range from 526-524 masl
- Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl
- Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl
- Wetlands north of the Project Area and in the vicinity of the proposed air strip range from 514-508 masl.
- Wetlands situated further north of the Project Area in the LSA were at an elevation of approximately 526 masl
- Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl
- Most wetland evaluated south of the Project Area had elevations ranging from 491-488 masl

Wetland depth, presence of fish or fish habitat, water quality and sediment quality are not currently available for the non-waterbody wetlands (i.e. those not identified as a lake or watercourse in Section 8 of the EIS). However, Denison is committed to conducting field surveys to collect this data prior to the initiation of construction of the Operation. This will allow for baseline information to be available to compare future changes and assess the success of mitigation measures and the predicted effects or lack thereof.

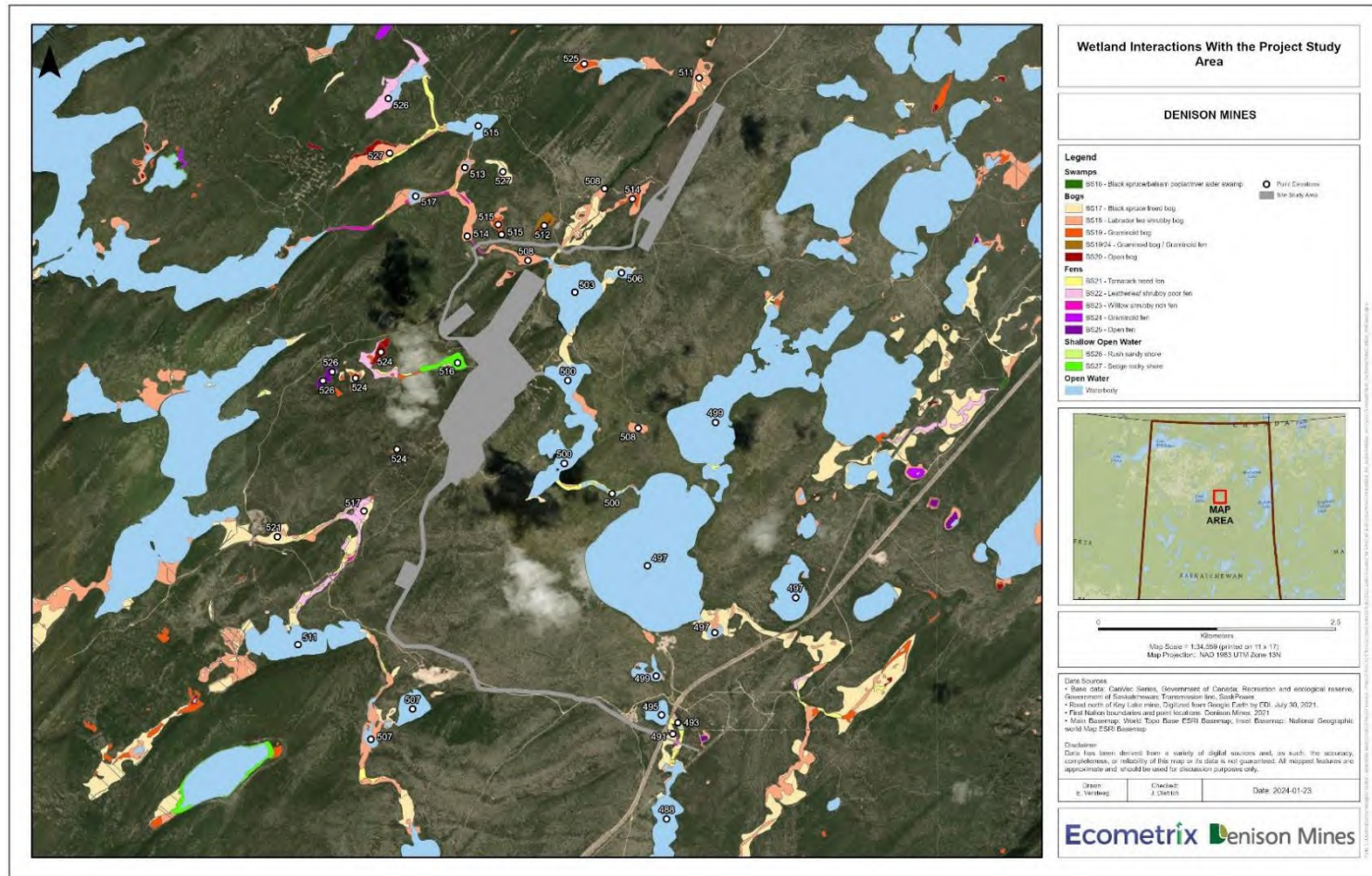
For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.



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**Figure 2: Elevations of wetland features in the LSA**

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## 4.0 Assessment of Project Related Effects

### 4.1 Potential Interactions Between the Project and Valued Component/Key Indicators

The Project will require the Construction, Operation, and Decommissioning of several components (as described in Section 2 of the EIS). Potential interactions between these Project components and activities and Fish and Fish Habitat in the form of Wetlands and their associated KIs are summarized by Project phase and activity in Table.

Potential interactions in Table are ranked as:

**Primary Interaction** (✓): Project activity is expected to interact with the VC / KI which may result in an adverse effect on the VC (i.e., a measurable or detectable change in the MP) and is further considered in the effects assessment as the primary contributor to potential adverse effects.

**Other Interaction** (✓): Project activity is expected to interact with the VC / KI. While the interaction is further considered in the effects assessment, it is not expected to be a primary contributor to potential adverse effects.

**No Interaction:** Project activity is not expected to interact with the VC or the KI, no adverse effects are expected, and rationale is provided for not considering this potential interaction further.

**Table 4: Potential Project Interactions for Wetlands Valued Component**

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Development of access roads and air strip	✓
Site preparation and earthworks; clearing, leveling and grading of the Project Area	✓
Power generation - generators	✓
Installation of main substation and distribution of power around site	✓
Wellfield and freeze hole drilling; ground freezing	✓
Batch plant operation (concrete); crusher at borrow area	✓
Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Water management (including treatment and site runoff)	✓
Groundwater supply	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Surface water withdrawal	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Air transportation for workers	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Operation of the ISR wellfield	
Wellfield and freeze wall drilling	✓
Operation and expansion of freeze wall	✓
Batch plant operation (grout and cement); crusher in borrow area	✓
Expansion of pond and pads	✓
Operation of the processing plant and production of uranium concentrate	
Water withdrawal from groundwater or surface water body	✓
Management of surface water (including seepage and site runoff)	✓
Water treatment, both domestic and industrial	
Water release to surface water body	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Hazardous waste management (temporary storage, handling, and off-site transportation)	✓
Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates	✓
On-site and off-site operation of vehicles and transport of materials	✓
Power supply – primarily power from the grid, also generators and back-up generators	✓
Package and transport of nuclear substances	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
Air transportation for workers	✓
Progressive decommissioning and reclamation	✓
Regulatory site inspections	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Engagement – site visit from Interested Parties	✓
Site water management, treatment, and release	✓
Mining horizon remediation and thawing of freeze wall	✓
Process water treatment and release	✓
Closure of ISR and freeze wells and related infrastructure	✓
Decontamination of surface facilities and injection, recovery and monitoring wells	
Asset removal (including site power transmission lines and electrical infrastructure)	✓
Demolition and disposal of non-salvageable surface infrastructure and materials	✓
Remediation of contaminated areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)	✓
Generators	✓
Waste management (composting and landfill operation)	
Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Reclamation of disturbed areas	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Environmental monitoring	✓
Regulatory site inspections	✓
Engagement - Site visit from Interested Parties	✓

1 Operational activities include maintenance.

## 4.2 Potential Project-related Effects

Based on the timing and nature of the interactions identified in Table 4, the following adverse effects have a potential to occur on the Wetland VC (Table 5). The key indicator of effects to wetlands is the change in areal extent of wetlands in the study area.



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**Table 5: Potential Project-related Effects on Wetlands Valued Component During all Project Phases**

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
<b>Construction</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Introduction and/or Proliferation of Invasive Plants	✓
Changes in Water Quantity (water levels or flow)	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓
<b>Operation</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
<b>Decommissioning</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
<b>Post-Decommissioning</b>	

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Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Direct disturbance	✓
Introduction and/or Proliferation of Invasive Plants	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓

## 4.3 Mobilization of Suspended Materials

### Construction

The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features including wetlands as a result of land disturbance and clearing. The mobilization of suspended material into natural surface water features is readily mitigatable by virtue of the mine development plan and through the implementation of standard water management and sediment control practices. Water management infrastructure (e.g., collection ditches, ponds, pumping stations) and various aspects of the water management and sediment control management systems will be put into place coincident with the initiation of construction activities. Waters (e.g., runoff) associated with areas under development will be collected and stored within management infrastructure (e.g., clean waste rock pond, see Figure 2.2-14 in Section 2 of the EIS). In the event that releases to the natural environment are necessary, they would only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, fish and fish habitat including wetlands are expected.

### Operation

During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of surface water management through the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds. No specific discharge is expected to wetland features in the Project Area. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No

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downstream effects on surface waters, natural sediments, or fish and fish habitat including wetlands are expected.

#### **Decommissioning and Post-Decommissioning**

During Decommissioning and Post-Decommissioning, the site-wide water management system will continue to operate such that Denison will maintain control of the site aspect affected water through the IWWTP. Surface drainage during Decommissioning activities will continue to be directed to the system of collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds to facilitate the control of suspended solids and achieve low TSS levels in the discharge, thereby minimizing any potential for adverse changes to water quality, sediment quality, and fish and fish habitat including wetland features.

### **4.4 Overprinting of Wetlands as Fish Habitat**

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction (Figure 3). Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA (**Error! Reference source not found. 2**).

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is isolated to those areas where stream crossings for access roads and hydro-line connections are proposed (Figure 3). With the use of single span bridges and implementation of best management practices, direct wetland disturbance associated with the crossings of Kratchkowsky Creek and Hart Creek is expected to be avoided. It should be noted that SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection. As such, wetland disturbance related to

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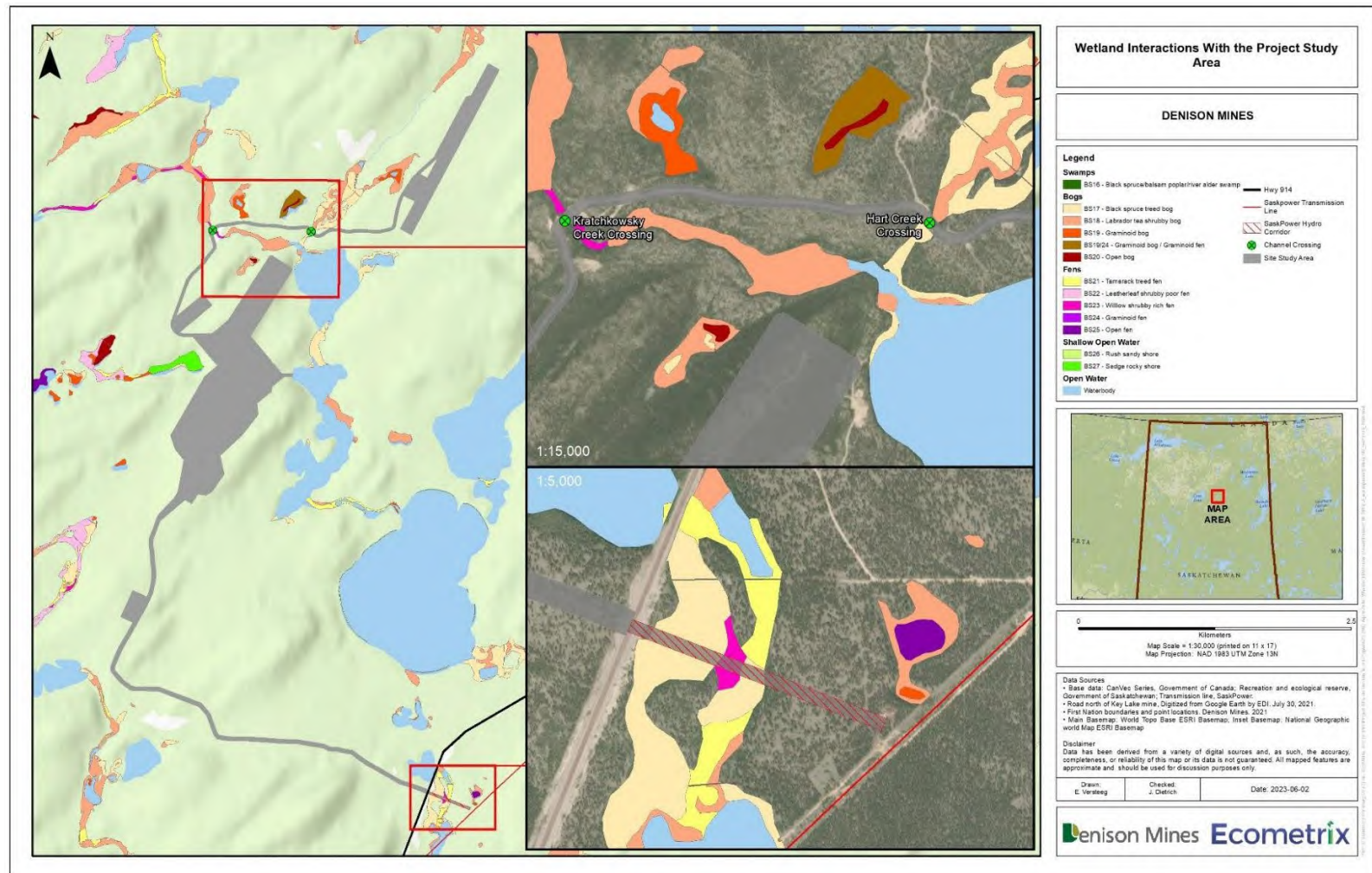
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the SaskPower Hydro Corridor is expected to be addressed through the SaskPower permitting process.

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**Figure 3: Denison Wheeler River Project Area and Wetland Feature Distribution**

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## 4.5 Controlled Discharge to Receiving Environments

According to the site water balance (Figure 2.2-14 in Section 2 of the EIS), there is no planned discharge to Whitefish Lake during Construction. Other than LA-5 (Whitefish Lake) no other controlled discharge will occur to the natural environment and no wetlands will be impacted as a result.

## 4.6 Change in Water Levels and Flow

As detailed in Section **Error! Reference source not found.** of the EIS, the projected withdrawal and discharge rates proposed for the Project are the largest influence on the hydrological effects of the Project. The largest predicted change in streamflow rate is -3.1% at the LA-5 and SA-2 nodes (immediately downstream of the Project) during Operation and Decommissioning, as projected against the 5<sup>th</sup> percentile low flow dataset in March. Lake levels and wetlands are expected to deviate less than  $\pm 0.01$  m due to all Project influences. All Project influences on the environment are expected to return to baseline conditions during Post-Decommissioning. These changes are within the range of fluctuation of environmental flows and water levels and are unlikely to affect fish passage or life history environmental cues.

## 4.7 Introduction and/or Proliferation of Invasive Plants

Vegetation clearing and soil disturbance during Construction are expected to create conditions suitable for the introduction and proliferation of invasive plants. Vehicles and construction equipment can inadvertently transport seeds and other invasive plant propagules in tires or the undercarriage to previously unaffected areas. The effects of invasive plants on native vegetation diversity are well documented and recognized as the second greatest threat to listed species after habitat loss (Enserink 1999). Competition with native species can lead to a reduction in the growth and vigour of native species (including Wetlands), as well as changes in the diversity, structure and function of ecosystems and habitats.

The potential for the introduction and proliferation of invasive plants by transport on vehicles and equipment is expected to continue throughout Operation during wellfield and freeze wall drilling, expansion of ponds and pads, drill waste rock, process precipitates and industrial wastewater treatment plant precipitates, on-site and off-site operation of vehicles and transport of materials, package and transport of nuclear substances, and air transportation for workers (i.e., landing and taking off of airplanes). Progressive decommissioning and reclamation has the potential to introduce invasive plants on vehicles and equipment and if seed used for revegetation is not supplied from a native seed source (Polster 2003) with a certificate of analysis indicating an absence of invasive plant seeds.

The potential for the introduction and proliferation of invasive plants is expected to continue throughout Decommissioning (e.g., during closure of the ISR and freeze wells and infrastructure,



asset removal, demolition and disposal of non-salvageable surface infrastructure and materials, remediation of contaminated areas, reclamation of disturbed areas, and operation of vehicles and transportation of materials). The potential for the introduction and proliferation of invasive plants is expected to continue throughout Post-Decommissioning, but at lower levels due to reduced vehicle traffic.

## **4.8 Edge Effects**

Edge habitat refers to an area on either side of a border between vegetation communities. Edges between vegetation communities often result in altered microclimatic conditions that can influence environmental conditions further away from the edge (Bannerman 1998). Edge effects are expected to extend into areas of native vegetation and habitats at the interface of disturbed areas and undisturbed native ecosystems, and could include altered microclimatic conditions that can influence quality in habitat away from the edge (Bannerman 1998). Where edge effects occur, Wetlands may experience changes in light intensity, temperature, wind, moisture, relative humidity, and patterns of snow accumulation and melt relative to undisturbed conditions. This can, in turn, affect plant health and alter natural disturbance regimes (e.g., blowdown), plant population persistence, and the structure and function of ecosystems and habitats. If changes to microclimatic conditions or vegetative structure at an edge exceed a species habitat preference or physiological tolerance, then edge habitat may result in lower occupancy or use, reduced survival, or lowered reproductive success.

Edge effects at the interface of disturbed areas and native ecosystems are expected to occur along the edges of the Project Area resulting from vegetation clearing during site preparation and earthworks during Construction. Edge effects are expected to continue throughout Operation, Decommissioning, and Post-Decommissioning, decreasing over time as revegetation and tree growth within reclaimed areas of the Project create a gradual structural transition at forest edges, aided by natural encroachment.

## **4.9 Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries**

During the 'future centuries' scenario as described in Section 8.3.1.3 of the EIS, remediation works will be completed and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post-mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport. The results of this was described in Section 8.3.4.2.5 with respect to Fish and Fish Habitat and therefore wetlands.

The results of the numerical modelling (as provided in Section 7 and Appendix 10-A in Section 10 of the EIS) support the conclusion that with the implementation of appropriate mitigation during the decommissioning and restoration phases of the Project, the residual effects of the

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Project on the intermediate Groundwater VC will not result in an adverse effect on surface water. Dissolved constituent concentrations emanating over hundreds to thousands of years in the future from the deep Ore Zone to Whitefish Lake are expected to remain below fresh water environmental quality criteria in Whitefish Lake.

Although the precise location of the groundwater discharge to the surface is somewhat uncertain, the groundwater transport scenarios that have been evaluated (Appendix 7-C of the EIS) to date suggest groundwater discharge impacted from mining will most likely be relegated to Whitefish Lake. The discharge to Whitefish Lake is generally predicted to occur along the eastern shore of the lake, as this is interpreted to be the eastern edge of the underlying desilicified zone. The Laborador Tea Shrubby Bog habitat located on the eastern shore of Whitefish Lake may be in the zone of influence of groundwater discharge, yet chemically will remain below freshwater environmental quality criteria. Groundwater impacts to other surrounding wetlands will be negligible as groundwater is not predicted to discharge within any area beyond the central portion of Whitefish Lake.

## 4.10 Indirect Effects

Indirect disturbance associated with the potential to adversely affect BS19/24 includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section **Error! Reference source not found.**). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while ecosite BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing waterbodies, alteration of water quantity would be expected to have the highest potential to cause an adverse effect. Therefore, maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.

## 5.0 Mitigation Measures

Mitigation measures specific to the wetlands, discussed in the following subsection are applicable during all Operation phases and expected to be effective immediately following implementation and managed through the EMP.

### Disturbance Reduction

- Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.

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- Disturbance to vegetation and soils will be avoided by clearly delineating Project Area boundaries (e.g., with the use of fencing, staking, or flagging), adhering to construction plans and schedules, and by restricting off-site machine use.
- Wetland boundaries in the proximity of planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable.
- Should they occur, areas prone to potential instability and areas in proximity to water bodies and drainage features will be identified and appropriate setbacks will be established and maintained.
- Temporary workspaces or laydown areas will be sited and constructed within existing disturbance or on previously compacted soils, where practicable. In areas requiring clearing only, grubbing will be avoided, and roots and groundcover will be retained to the extent feasible.
- Pre-construction listed plant surveys will be completed within the Project Area.
- Listed plants located adjacent to planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable and reduce the potential for accidental encroachment outside of the Project footprint.
- Should Listed Plants be identified within the Vegetation LSA prior to Construction, site- and species-specific mitigation measures to avoid and/or limit Project effects will be determined by a Qualified Vegetation Ecologist. Specific mitigation measures will depend on the species, its life history characteristics, time of year, and the location of the occurrence in relation to Project activities.
- Herbicide use will be avoided within 100 m of any known listed plant occurrences. Where herbicide use is unavoidable, use will be restricted to direct application instead of broadcast spraying and completed by qualified personnel.

### **Soil Handling and Reclamation**

- Construction activities will be sequenced (i.e., site clearing, grading preparations, major earthworks and construction of infrastructure/facilities) so that surface vegetation, mineral soil and organic matter can be salvaged for later use in Project Decommissioning.
- Soil resources within the Project Area will be stripped/salvaged and stockpiled within the Project Area in accordance with relevant soil management BMPs, i.e., providing guidance on ground-truthing soil conditions, flagging potential hazards and sensitivities, and

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modifying practices in relation to environmental conditions and avoiding or minimizing inadvertent/incidental disturbance.

- A soil monitoring program/protocol (or equivalent) will be undertaken to verify soil salvage volumes and reclamation suitability (Section 9.1.8.2).
- Soil stockpiling locations will be sited to reduce soil handling and travel distances and designed to minimize the potential for soil degradation and downgradient effects, e.g., having defined height and width that optimize soil storage and stockpile stability, and having integrated erosion control measures and surface water management features (if/where necessary). Sediment and erosion control measures will be implemented in accordance with BMPs and commensurate to site conditions and sensitivities.
- Sediment and erosion control measures and surface water management features will be installed and maintained at the Project. Erosion controls (e.g., sediment fencing, check-damns and/or sediment ponds) will be installed as necessary and at the discretion of construction personnel commensurate to site conditions and sensitivities to manage/mitigate erosion and sedimentation.
- Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable with the use of suitable native species and in accordance with the Reclamation and Closure Plan.

### **Surface Water Management**

- Snow melt and runoff will be controlled within the Project Area to prevent the potential release of contaminated runoff from affecting vegetation in adjacent areas.
- Sediment and erosion control measures will be implemented in accordance with the EMS.
- Surface water management features (e.g., culverts and ditches) will be constructed and maintained (as per Project design specification) along access roads and facility sites to facilitate surface drainage continuity and hydrologic connectivity—especially in proximity to wetlands, water crossings, and waterbodies.
- Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction, and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and at facility sites.

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### **Invasive Plant Management**

- Equipment and vehicles will arrive at the Project Area clean, and will be inspected for soil, plant material, and seeds, and cleaned as appropriate, to limit the potential for the introduction of invasive plants and noxious weeds.
- Areas with a high risk for the potential spread of invasive plants and noxious weeds (i.e., within or adjacent to existing infestations) will be avoided to the extent practicable; if work must occur in these areas, invasive plant management will be implemented before starting work.
- Gravel, fill, straw matting, or similar materials to be used for erosion control will be inspected to minimize the potential for seeds or propagules of invasive plants being brought to site.
- All employees and contractors on the Project will receive an employee orientation appropriate to the work they are undertaking, including instruction on the definition of invasive plants and their potential effects, mitigation measures to avoid the introduction and spread of invasive plants, and training on the presence and identification of common invasive plant species and those known to occur within the Project Area.
- Invasive plant monitoring will be conducted periodically by personnel skilled in invasive plant identification during all Project phases to assess, evaluate, and document invasive plant occurrences within the Project Area. Invasive plant surveys will be completed during a biologically appropriate time of year (e.g., when invasive plants can be identified) within areas identified as most susceptible to invasive plant introduction and spread, including roads, ROW, debris and vegetation management areas (e.g., slash piles, timber decks, exposed soil or stockpiles) and other regularly disturbed habitats.
- Three general treatment options may be used alone or in combination to control of invasive plants in the Project Area:
  - mechanical control – involves the physical removal of the plants;
  - chemical control – involves application of synthetic and/or natural herbicides; and,
  - biological control measures – involves use of living organisms (e.g., rusts, insects) to control selected invasive plant species.
- The type of treatment option selected for an invasive plant occurrence will be based on a combination of specific information including the identity of the invasive plant species and its provincial designation, the size and extent of the occurrence, time of year, the proximity of the occurrence to other susceptible areas (e.g., rare plant occurrences, wetlands, waterbodies), and the available control options. Where possible, control of

invasive plants will be completed in consultation with a qualified professional to minimize potential effects on native vegetation, ecosystems and wetlands.

- Seed used during re-vegetation will be certified weed free, with a valid “Certificate of Seed Analysis”.

## 6.0 Residual Effects Evaluation

### 6.1 Residual Effects Characterization

Residual effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs have been assessed in relation to the RSA, and characterized in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, context, and likelihood (**Error! Reference source not found.** 6). Residual effect evaluation of residual effects are provided in Tables 7, 8 and 9.

**Table 6: Definitions of Effect Characteristics Considered When Determining the Significance of Residual Effects**

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect will be adverse or positive.	<p><b>Adverse</b> – Negative effect or effect is not desirable.</p> <p><i>Water Quantity</i> – Effect moves MPs (flow or water level) in a direction detrimental to water quantity relative to baseline conditions. A Project-related increase in surface water flows and levels during flooding, or a decrease in surface water flow below environmental flow requirements.</p> <p><i>Water Quality</i> – An increase in constituent concentrations attributable to the Project in comparison to baseline conditions and trends.</p> <p><i>Wetlands / Fish Habitat</i> – A physical loss of available fish habitat (extent of area) in comparison to baseline conditions.</p> <p><b>Positive</b> – Beneficial effect or effect is desirable.</p>
Magnitude	The amount of change in a measurable parameter relative to baseline conditions.	<p><b>Low</b></p> <ul style="list-style-type: none"> <li>▪ measurable decrease in the spatial extent of Wetlands, but less than a 10% loss; all original wetland classes are present.</li> <li>▪ A measurable change that is not within the variability of baseline conditions but below relevant water quality objectives and criteria. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is &lt;5% from baseline conditions</li> </ul>



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Residual Effect Characteristic	Definition	Rating
		<p><b>Moderate</b></p> <ul style="list-style-type: none"><li>▪ measurable decrease in the spatial extent of Wetlands between 10% and 30% loss; measurable changes in the diversity of wetland classes; some original wetland classes may be absent.</li><li>▪ A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is &gt;5% from baseline conditions, and could, therefore, have an adverse effect on Fish and Fish Habitat within the LSA.</li></ul> <p><b>High</b></p> <ul style="list-style-type: none"><li>▪ measurable decrease in the spatial extent of Wetlands greater than 30% loss; some original wetland classes are absent.</li><li>▪ monthly flows (&gt;10%), or lake surface elevation (m) in a waterbody or watercourse that is greater than the range of natural variability and large enough that fish can no longer rely on this habitat to carry out one or more of their life processes. A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives and is likely to have an adverse effect on Wetlands (Fish and Fish Habitat) within the LSA, with the effect extending beyond the LSA.</li></ul>
Geographic Extent	The geographic area within which the residual effect is expected to occur.	<p><b>Project Area</b> – Effect is limited to the Project Area.</p> <p><b>Local</b> – Effect is limited to the Vegetation LSA.</p> <p><b>Regional</b> – Effect extends beyond the Vegetation LSA into the Terrestrial RSA.</p> <p><b>Beyond Regional</b> – Effect extends beyond the Terrestrial RSA.</p>
Duration	Length of time over which the residual effect is expected to persist.	<p><b>Short-term</b> – Less than 3 years (i.e., effect happens during Construction only).</p> <p><b>Medium-term</b> – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</p> <p><b>Long-term</b> – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</p>
Frequency	How often the residual effect is expected to occur.	<p><b>Infrequent</b> – Effect occurs several times at sporadic intervals.</p> <p><b>Frequent</b> – Effect occurs many times on a regular basis.</p> <p><b>Continuous</b> – Effect occurs continuously.</p>

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Residual Effect Characteristic	Definition	Rating
Reversibility	Whether or not the residual effect can be reversed once the activity causing the residual effect ceases.	<b>Fully Reversible</b> – A residual effect that diminishes to baseline conditions. <b>Partially Reversible</b> – A residual effect that partially diminishes to baseline conditions. <b>Irreversible</b> – A residual effect that will not diminish to baseline conditions.
Context	The extent to which the VC or KI has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	<b>Low</b> – VC/KI has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. No listed species present. <b>Moderate</b> – VC/KI has moderate resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or an intermediate level of historic or ongoing anthropogenic or natural disturbance with the capacity to assimilate more change. Presence of listed species <b>High</b> – VC/KI has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance. Presence of SARA-listed species
Likelihood	Likelihood that the residual effect will occur including consideration of the likelihood that the mitigation will be successful.	<b>Likely</b> – A moderate to high probability that the residual effect will occur. <b>Unlikely</b> – A low probability that the residual effect will occur.

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**Table 7: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Surface Water Quality**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	The Project (specifically the discharge of effluent to the natural environment) will cause a change in the concentration of constituents, as measured as a mass of a chemical per unit volume in water (e.g., mg/L). Surface water quality in the local receiving environment will be adversely affected by effluent discharge to the aquatic environment, thereby providing a pathway to adversely affect surface waters. However, no discharge is planned to wetlands outside of Whitefish Lake.
Magnitude	Low	The magnitude of the residual effect is predicted to be low as constituents that may be introduced as part of Project activities are expected to remain below criteria for the protection of aquatic life and human health.
Geographic Extent	Local	The geographic extent of the residual effect is predicted to be confined to the immediate waterbody adjacent to the Project (i.e., Whitefish Lake). The estimated mixing zone is less than 5 m, implementing an effluent discharge configuration that promotes mixing.
Duration	Long-term	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuous	For the purposes of this EIS, a conservative scenario was identified, with effluent discharge being considered as continuous during Operation and Decommissioning.
Reversibility	Fully reversible	Surface water quality is expected to return to pre-development levels following Post-Decommissioning as Project-related sources will cease to operate.
Context	Low	Wetland health is expected to be resilient to changes in surface water quality in the context of this assessment, as COPC meet protective criteria even at the extreme low water scenario. Therefore, under applicable mitigative measures and average flow conditions, the contextual resilience of the aquatic system to respond to change is considered to be great.
Likelihood	Likely	A high probability exists that a change in water quality from background conditions will occur, but be restricted to Whitefish Lake and not other surrounding wetland features.

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**Table 8: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Area Extent**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Impacts to wetlands in the LSA from physical disturbance or overprinting are expected to be minor in nature and relegated to wetlands located at stream crossings for access roads and the hydro-line corridor. In both cases the approach to design will be one of avoidance and minimal disturbance with clear span bridges and minimal clearing required for hydro-line installation where avoidance of open water areas can be met.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Less than 0.1% of Wetlands within the Terrestrial RSA are predicted to be directly affected as a result of Project Construction, and up to 1.5% may be indirectly affected during all Project phases.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically to wetlands located at stream crossings for access roads and the hydro-line corridor
Duration	Long-term	Once natural drainage patterns are re-established following Operation, the structure and function of Wetlands altered as a result of indirect Project effects are expected to re-establish after Post-Decommissioning (more than 38 years).
Frequency	Frequent	While direct affects to specific Wetlands will occur over a short time period during Construction, Wetland alteration by indirect effects is anticipated to occur frequently throughout Construction, Operation, and Decommissioning, and infrequently during Post-Decommissioning.
Reversibility	Partially Reversible	Wetland effects are predicted to be partially reversible during Decommissioning once natural hydrologic conditions are reinstated. Alterations to wetland extent, structure and/or function as a result of indirect Project effects during all Project phases are predicted to be reversible over time once natural hydrologic conditions are reinstated and edge effects, dust, water quality changes, and invasive plant propagule pressure are reduced at the end of Decommissioning.
Context	Moderate	Wetlands can exhibit low resilience and high susceptibility to disturbance; however, disturbance is common within the Terrestrial RSA, and existing Wetlands have been historically disturbed by access roads and exploration activities.
Likelihood	Likely	The infrastructure associated with the bridges and the hydro-line are likely to affect the localized area for which they span in a limited way.

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**Table 9: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Surface Water Quantity (Hydrology)**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Water quantity (flow and level) will be reduced in LA-5 as a result of the overprinting of its reporting drainage area by mine infrastructure and through site water balance. Water taking has an additional potential to reduce water levels in LA-5 and associated wetlands.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Under all scenarios, the Project-related change in hydrology (flows or levels) compared to baseline conditions is less than 5% of baseline conditions, and generally less than 3%.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically the lakes and wetlands within proximity to the Project site (i.e., LA-5, LA-6, and LA-1).
Duration	Moderate	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuously	Although the mine is unlikely to require water taking on a continuous basis, this has been assessed as a bounding scenario and, as such, must be considered as a continuous effect.
Reversibility	Fully reversible	Surface water hydrology is expected to return to pre-development levels following Post-Decommissioning.
Context	Moderate	Surface water flow regimes are variable, and it is this variability that provides for morphological form to be maintained and for ecological reliance (i.e., wetlands, fish habitat). Some change to environmental flows is tolerated by wetland biota.
Likelihood	Low	Due to the localized nature and low magnitude of the effect on surface water hydrology, the likelihood of an effect is considered to be very low; therefore, the likelihood of an effect on Wetlands is expected to be low.

## 6.2 Significance and Confidence

The residual effect of change in the areal extent of the Wetlands VC as a result of the Project is not expected to result in a change to the wetlands KI that will alter its integrity within the Terrestrial RSA to the point where it is not sustainable or unavailable to contribute to ecological functions.

The threshold for significance for the Wetlands VC relates to predicted changes in the concentrations of water quality parameters, where changes could result in exceedances of

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relevant water quality benchmarks that are protective of aquatic biota in waterbodies that receive mine-affected drainage. The threshold for significance for Wetlands also includes predicted changes in surface water flows greater than baseline environmental flows and direct habitat loss.

The significance of the residual effects on the Wetlands VC has been deemed **not significant**. Following mitigation, the residual effects are not expected to cause a change in Wetland habitat (or associated KIs) to the extent that they might alter the ecological integrity of the VC in the LSA beyond an acceptable level.

The predicted confidence with respect to the Wetlands VC is high as the mobilization of suspended materials can be readily mitigated, making the effects prediction relative to this effect pathway easily understood.

Confidence in the assessment of predicted effects on water levels or flow is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that the water withdrawal and discharge scenarios presented herein represent the bounding case, and hydrogeological modelling projections are not changed (Section 8.1 of the EIS).

Potential effects on water quality as a result of Project discharges to local receiving environments were assessed by way of numerical modeling. These predictions are generally considered conservative in nature because the assumptions on which they are based are conservative. For example:

- The assessment is based on a continuous (year-round) discharge at an expected average effluent rate of 0.0101 m<sup>3</sup>/s (36.5 m<sup>3</sup>/hr) throughout Construction, Operation, and Decommissioning, despite the likelihood that effluent discharge will not be continuous and will only discharge when site water balance requires, based on water storage capabilities.
- The constituents in effluent discharge have been estimated conservatively. Presented discharge concentrations provided herein include contingency factors of one to three times.
- Baseline water quality is defined by the 95th percentile concentrations of individual constituents. Such an assumption is conservative as it constrains the assimilative capacity associated with the receiving environment. By definition, the assimilative capacity of a receiving environment is equal to the incremental difference between the existing baseline condition and the assessment benchmark (i.e., water quality criterion) on which the evaluation is based. Use of the 95th percentile concentration, rather than a measure



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of central tendency (i.e., 50th percentile, geomean), means that the incremental change in a given constituent concentration that can be assimilated by the receiving environment (whereby use of the receiving environment is protected) is relatively small in magnitude.

Due to the conservative nature of the assumptions on which the numerical assumptions are based, a high degree of confidence can be assumed.

### 6.3 Summary of Project Related Residual Adverse Effects

The results of the characterizations for these residual effects are summarized in Table 10. The residual effects of the Project on the Wetland KIs were predicted to be **not significant**. Thus, the residual effects of the Project on the Wetlands VC are predicted to be **not significant**.

**Table 10: Summary of Project-related Residual Effects**

Valued Component	Residual Effect	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance
Wetlands	Change in Water Quality	C, O, D	A	L	L	LT	C	FR	L	L	NS
	Change in Water Level or Flow	C, O, D	A	L	L	MT	C	FR	L	L	NS
	Change in the Areal Extent of Wetlands	C, O, D	A	L	L	LT	F	PR	M	L	NS

- <sup>1</sup> Direction: Adverse (A), Positive (P)
- Magnitude: Low (L), Moderate (M), High (H)
- Geographic Extent: Local (L), Regional (R), Beyond Regional (BR)
- Duration: Short-term (ST), Medium-term (MT), Long-term (LT)
- Frequency: Infrequent (IF), Frequent (F), Continuous (C)
- Reversibility: Fully Reversible (FR), Partially Reversible (PR), Irreversible (IR)
- Context: Low (L), Moderate (M), High (H)
- Likelihood: Unlikely (U), Likely (L)
- Significance: Not-Significant (NS), Significant (S)
- Level of Confidence: High (H), Moderate (M), Low (L)

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## 7.0 Cumulative Effects

The cumulative effects are discussed in detail in Section 9.2.7 of the EIS and are not re-examined herein.

## 8.0 Summary

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction. Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA.

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and hydro-line connections are proposed.

Avoidance through design as well as mitigation measures to control sedimentation to wetland features during construction, operation and decommissioning phases. Water quantity and quality are not expected to cause impacts to wetlands as the change in surface water feature levels and flow are nearly negligible and water will not be discharged to wetlands save for Whitefish Lake, for which effluent will not be released unless meeting criteria for the protection of aquatic life.

Residual effects on the Wetlands VC resulting from the Project were identified and assessed as **not significant**. Existing provincial legislation (Environmental Management and Protection Act [Government of Saskatchewan 2010] and the Water Security Agency Act [Government of Saskatchewan 2019b]) requires written approval (i.e., Aquatic Habitat Protection Permits) prior to any works within a wetland.

To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction of the operation to provide an updated baseline for assessing the success of mitigation measures and

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to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.

## 9.0 References

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## **Attachment IR-101 (Round 4)**

### **Kds**

As outlined in Section 2.2 of the IMPACT Model Report (Appendix A to Appendix 10-A), as constituents travel through a series of connected waterbodies such as lakes, concentrations in water can decrease as a result of mixing with natural inflows from the surrounding watershed and interactions with lake sediment. The sediment-water exchange of constituents is estimated using chemical-specific partitioning coefficients (Kds). The Kd describes the relationship between the concentration of a constituent in the solid (in this case sediment) and the aqueous phases (in this case surface water) for a system that is at equilibrium.

The sediment-water partitioning coefficients are based on regional data which includes the following:

- Environmental baseline studies at Key Lake from 1976 to 1978 which were presented in the Key Lake EIS (KLMC, 1979), including additional baseline data collected in 1982 (IES, 1983a,b), and 1999 (Conor Pacific, 2000). Since operations began in 1983 ongoing environmental monitoring data has been collected
- Environmental baseline studies at McArthur River from 1992 to 1994 (EMA, 1992; TAEM, 1993a,b; Golder 1994a,b) to support the 1995 EIS (Cameco, 1996). Since operations began in 2000 ongoing environmental monitoring data has been collected
- Environmental baseline studies for the proposed Millennium mine from 2006 to 2008 from Moon Lake, Slush Lake, Lake A, Lake B, and Lake C.

Monitoring data of this sort that can be used to derive Kds are particularly valuable. As noted above, in this context Kd describes the relationship between the concentration of a constituent in sediment and surface water. In order to define a reliable and predictive relationship there must be sufficient distribution of sediment and surface water quality and a relatively wide range. The data collected in the studies referenced above not only have regional relevance but include data collected under true baseline conditions (pre-operational conditions), operational conditions in areas the receive mill/mine effluents and reference areas during operational conditions that are uninfluenced by mill/mine effluents but provided a time series of data collected over time. Together these data meet the test of having sufficient distribution of sediment and surface water quality that are wide ranging and support Kd development. This is in contrast to developing Kds with baseline data only where many constituents in water and sediment are at or below laboratory detection and/or are not wide distributed enough to develop a predictive relationship.

The background water and sediment quality observed for Key Lake, McArthur River, and Millennium is shown on Figure IR-101-1 and Figure IR-101-2 below. Regional sediment to water partitioning coefficients were estimated through model calibration and comparison to literature values. Measured water and sediment concentrations were compared to approximate a Kd, and then further refined to achieve a best estimate of water and sediment concentrations. Limitations were found when data were below the detection limit. Kds have been refined over time when better detection limits were achieved in monitoring data (e.g., Pb-210 and Po-210 in 2015 based on McArthur River data). The sediment-water partitioning coefficients were applied to the

Wheeler River Project, and are shown in Table IR-101-1 below (Table 3-6 in the ERA Appendix 10-A). The source of the Kd has been added to the table.

When comparing the water and sediment quality data in Figure IR-101-1 and Figure IR-101-2 to the Wheeler River baseline data, the Wheeler River baseline data falls within the spread of the regional data used since the 1970s. The exception is where improved detection limits have been achieved, showing lower water quality data. Plots of the baseline water quality data that were provided in Appendix A of the ERA in Appendix 10-A are reproduced below for ease of comparison. A few examples are described below:

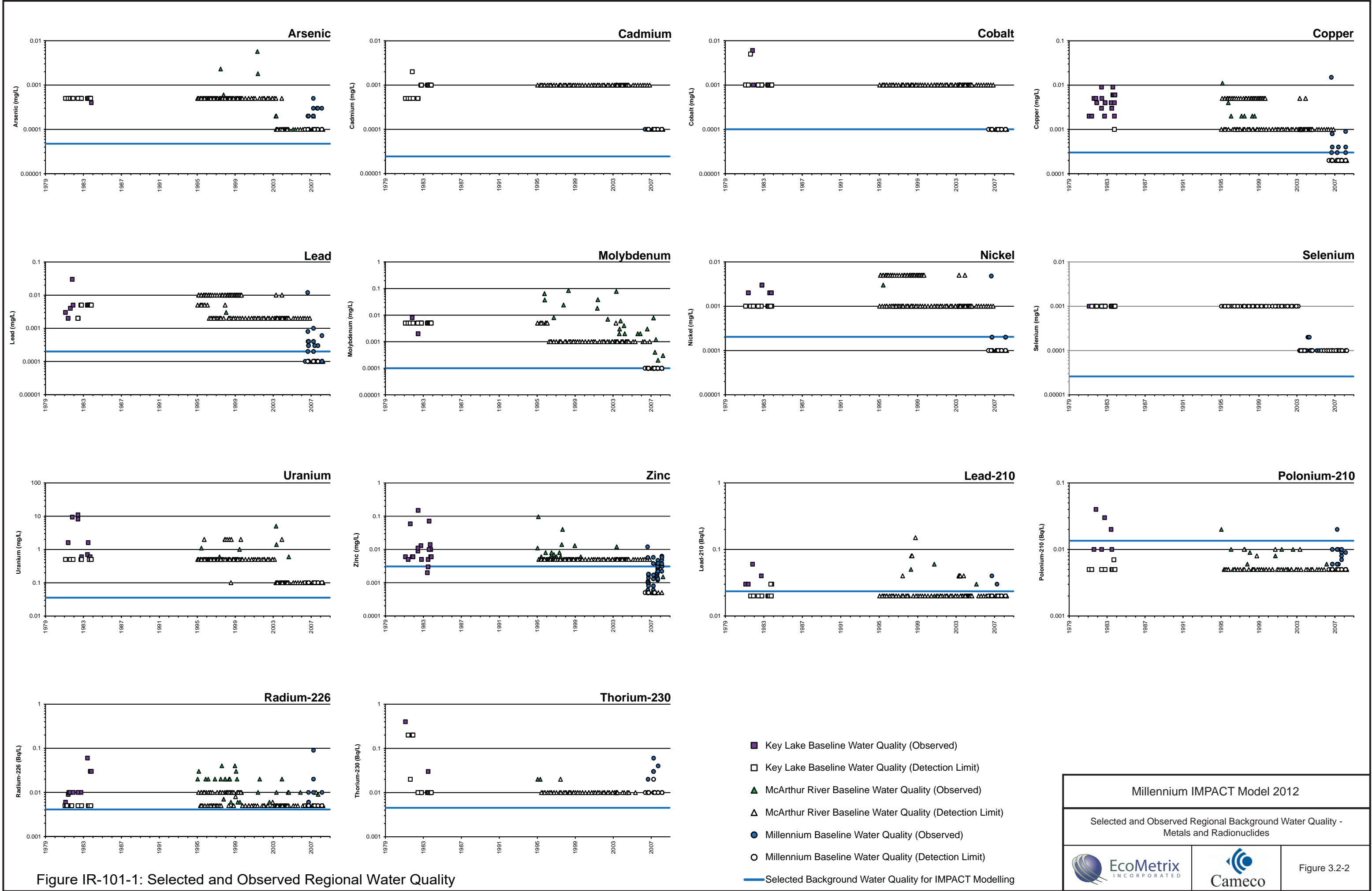
- Arsenic:
  - The regional data ranges from 0.0001 mg/L to 0.01 mg/L in water and 0.2 mg/kg to 11 mg/kg in sediment.
  - The Wheeler River data ranges from 0.0001 mg/L to 0.0003 mg/L in water and 0.4 mg/kg to 7.2 mg/kg in sediment.
- Cadmium
  - The regional data ranges from 0.0001 mg/L to 0.001 mg/L in water and 0.2 mg/kg to 10.5 mg/kg in sediment.
  - The Wheeler River data ranges from 0.00001 mg/L to 0.00007 mg/L in water and 0.1 mg/kg to 0.7 mg/kg in sediment.
  - The difference in water is related to improved detection limits in the Wheeler River baseline data compared to the regional data
- Copper
  - The regional data ranges from 0.0002 mg/L to 0.02 mg/L in water and 0.5 mg/kg to 11 mg/kg in sediment.
  - The Wheeler River data ranges from 0.0002 mg/L to 0.0008 mg/L in water and 0.5 mg/kg to 8.4 mg/kg in sediment.
- Selenium
  - The regional data ranges from 0.0001 mg/L to 0.001 mg/L in water and 0.008 mg/kg to 9 mg/kg in sediment.
  - The Wheeler River data ranges from 0.0001 mg/L to 0.0002 mg/L in water and 0.1 mg/kg to 1.8 mg/kg in sediment.

As the Wheeler River Project progresses through the licensing process, additional baseline data will be collected. The water and sediment data will continue to be validated against the regional Kds, to determine if the data are within the spread of the regional dataset, or if changes to the Kds are warranted.

**Table IR-101-1: Distribution Coefficients ( $K_d$ ) Used in the IMPACT Model**

COPC	Distribution Coefficient	Source
	L/kg (dw)	
Arsenic	9.64E+04	Millennium (Ecometrix, 2013)
Cadmium	1.50E+04	Millennium (Ecometrix, 2013)
Chromium	1.16E+04	Calibrated for Wheeler River
Cobalt	2.50E+03	Millennium (Ecometrix, 2013)
Copper	3.00E+03	Millennium (Ecometrix, 2013)
Molybdenum	3.17E+03	Millennium (Ecometrix, 2013)
Selenium	2.00E+04	Millennium (Ecometrix, 2013)
Uranium	2.00E+04	Millennium (Ecometrix, 2013)
Vanadium	9.10E+04	Calibrated for Wheeler River
Zinc	1.50E+04	Millennium (Ecometrix, 2013)
Lead-210	1.20E+05	McArthur River (Ecometrix, 2015)
Polonium-210	1.20E+05	McArthur River (Ecometrix, 2015)
Radium-226	1.20E+04	Millennium (Ecometrix, 2013)
Thorium-230	2.30E+03	Millennium (Ecometrix, 2013)
Uranium-234	2.00E+04	Millennium (Ecometrix, 2013)
Uranium-238	2.00E+04	Millennium (Ecometrix, 2013)





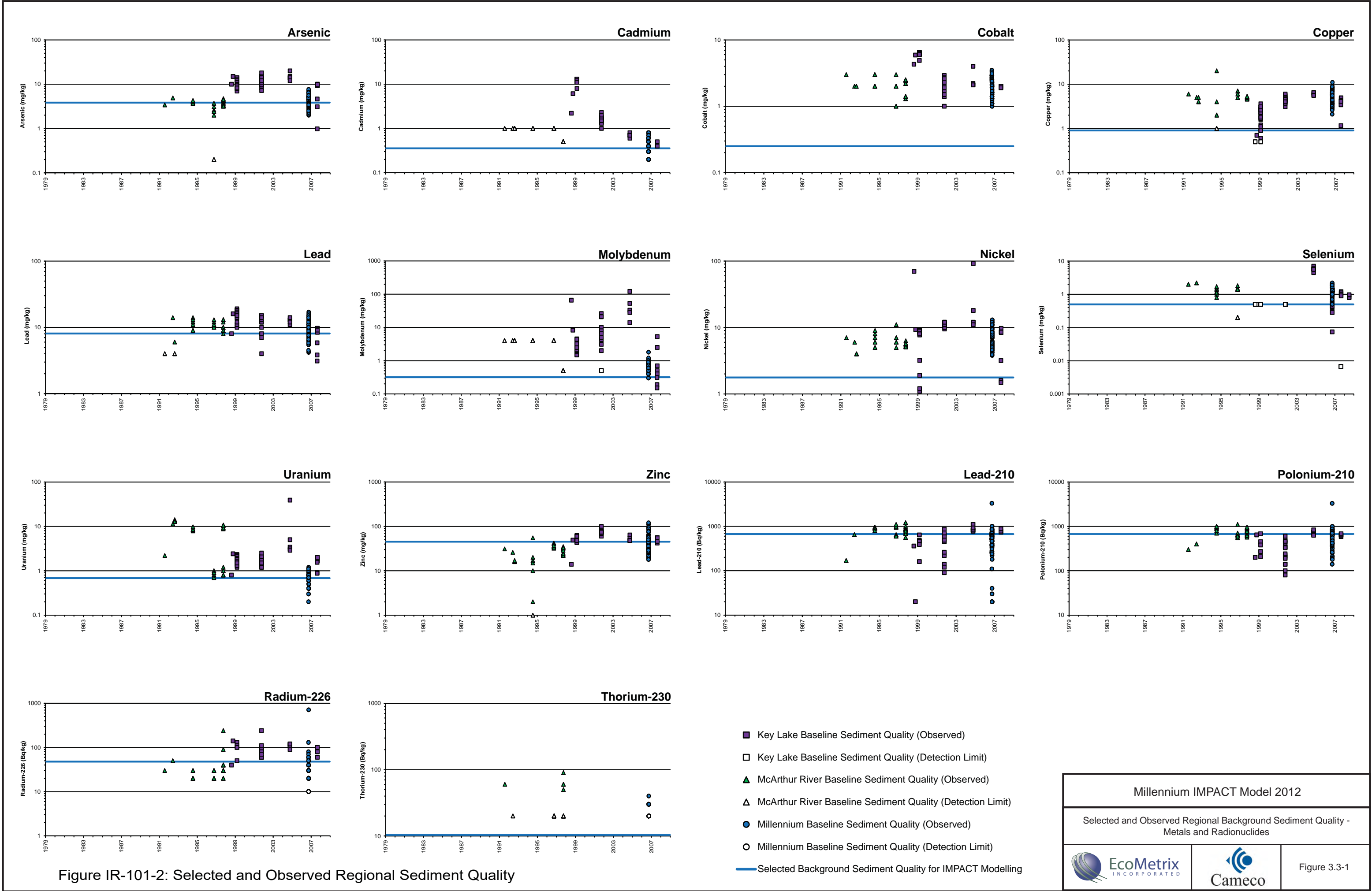
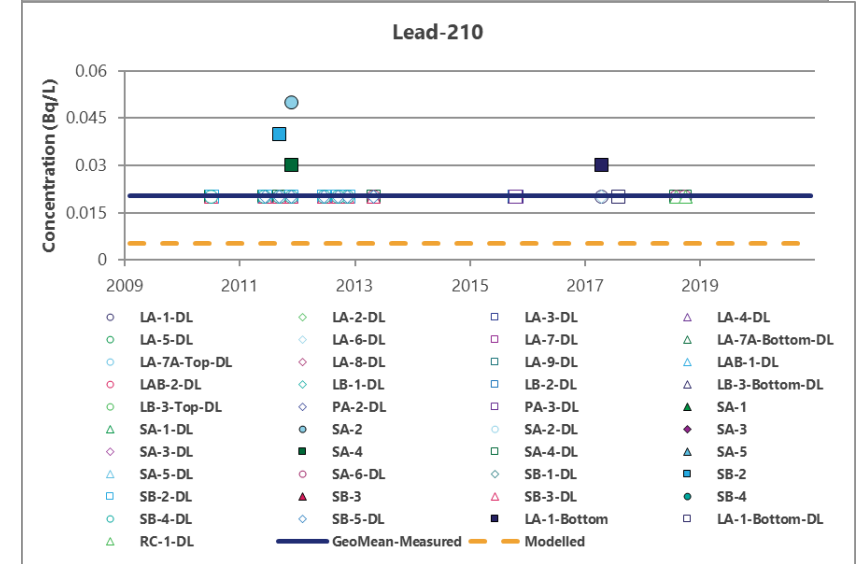
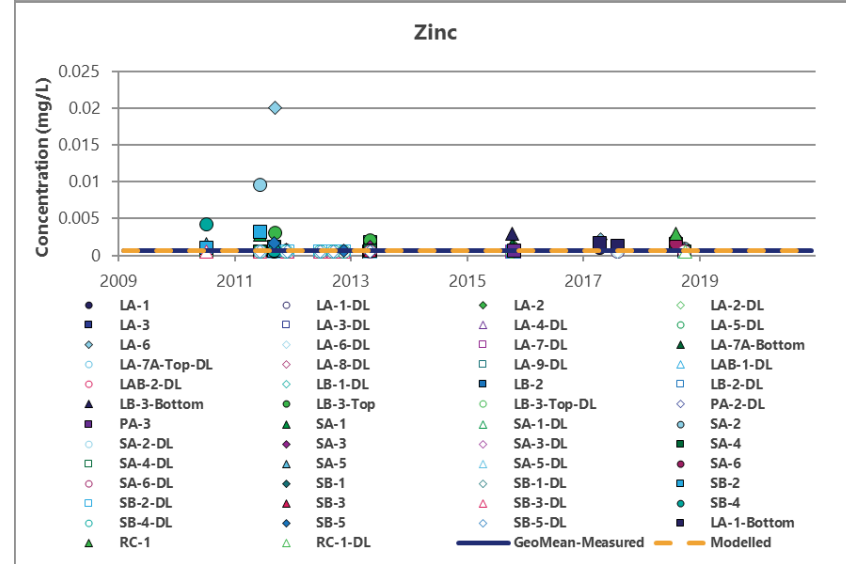
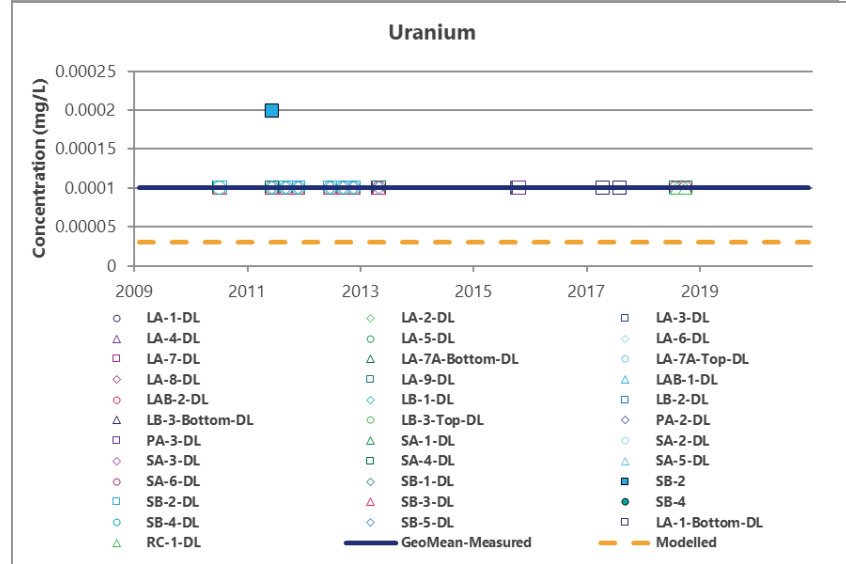


Figure IR-101-2: Selected and Observed Regional Sediment Quality



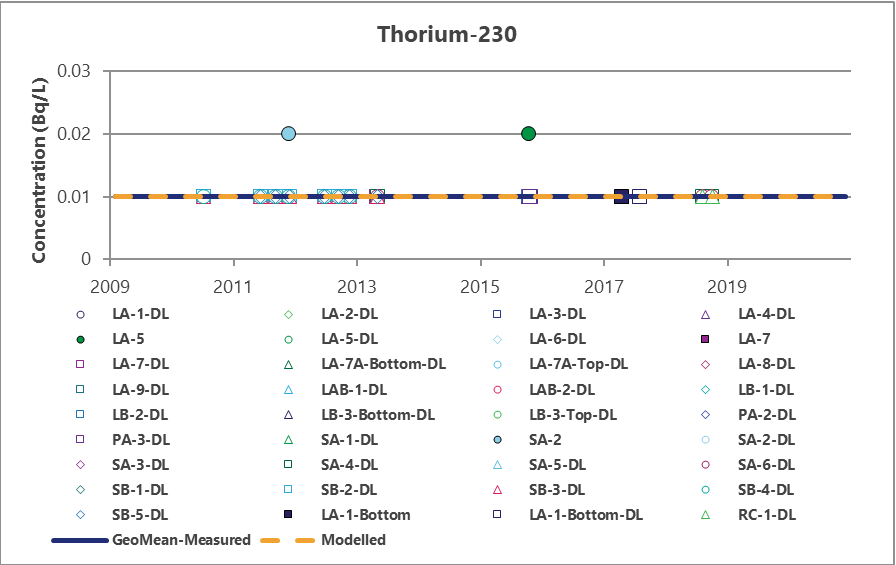
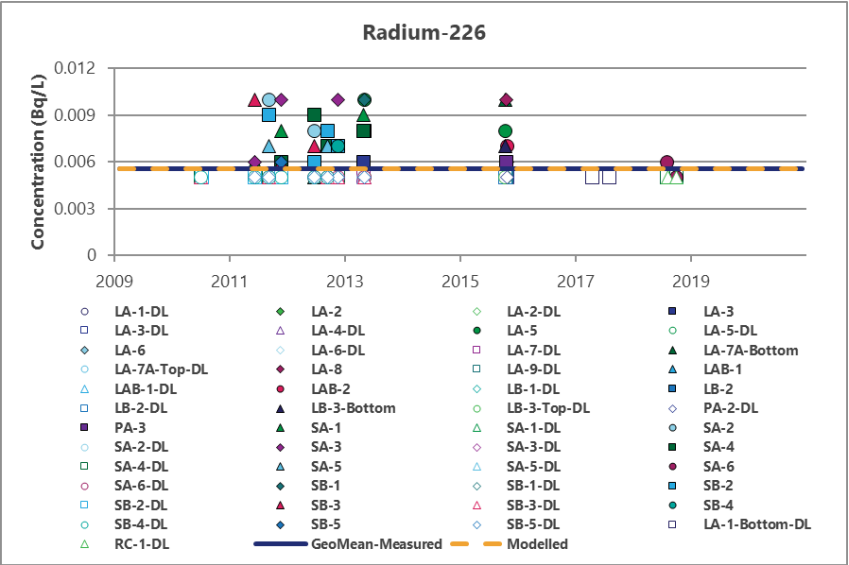
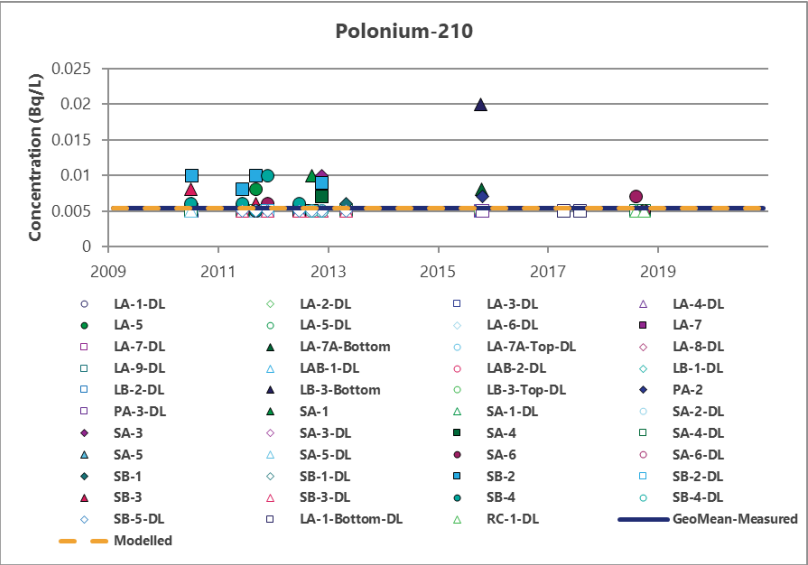
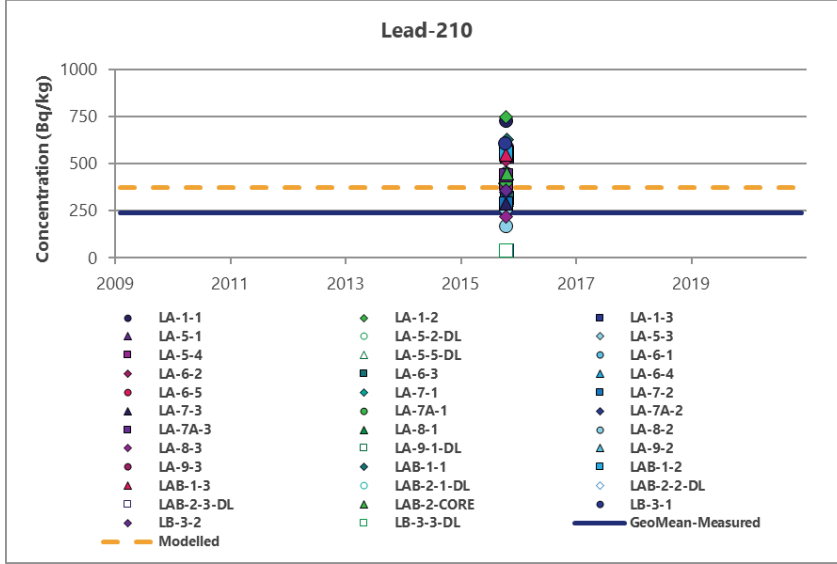
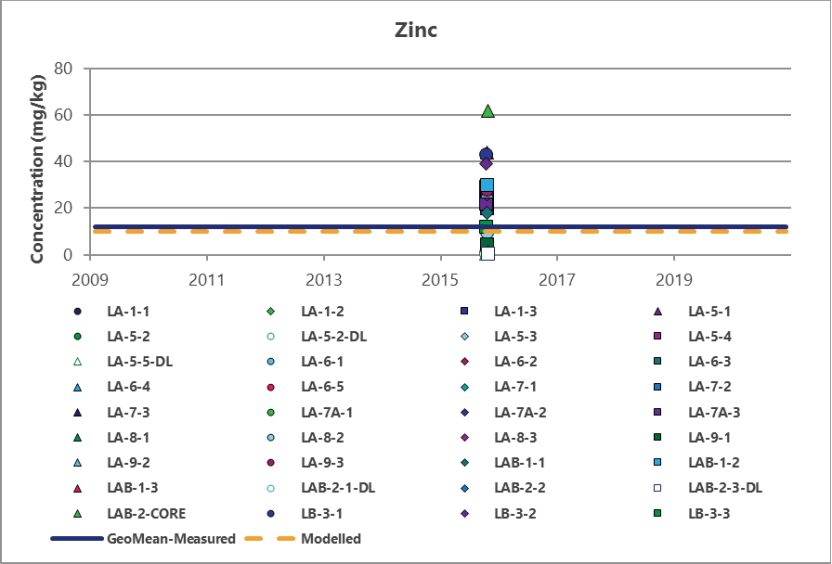
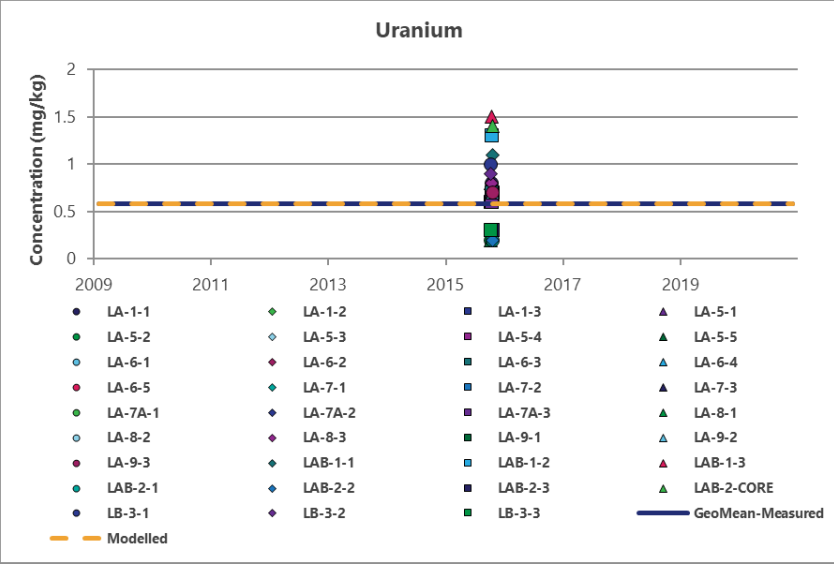
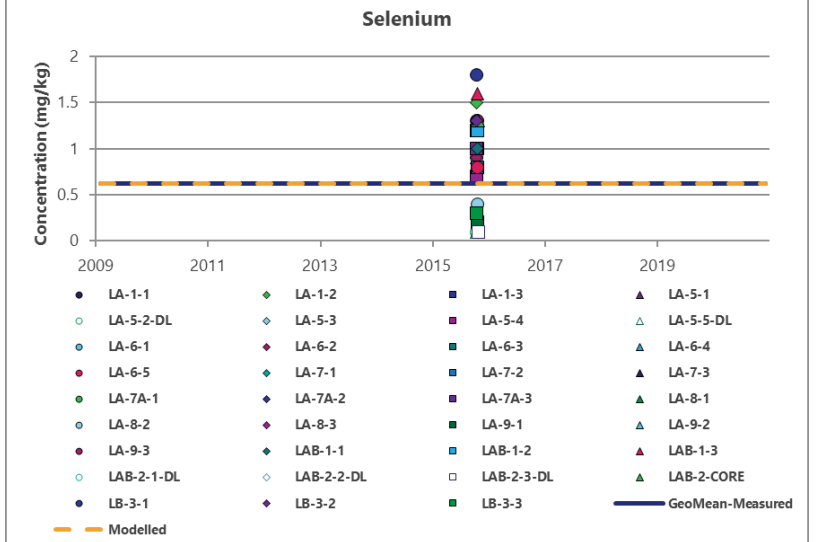
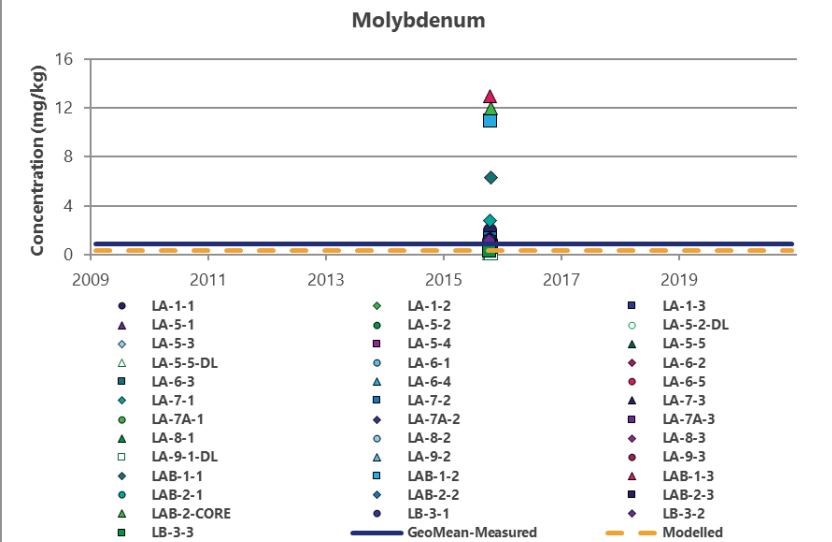
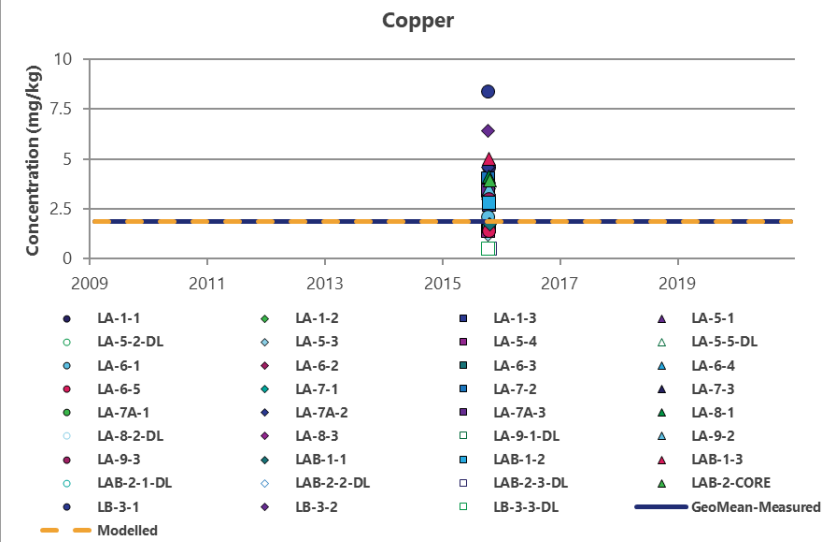
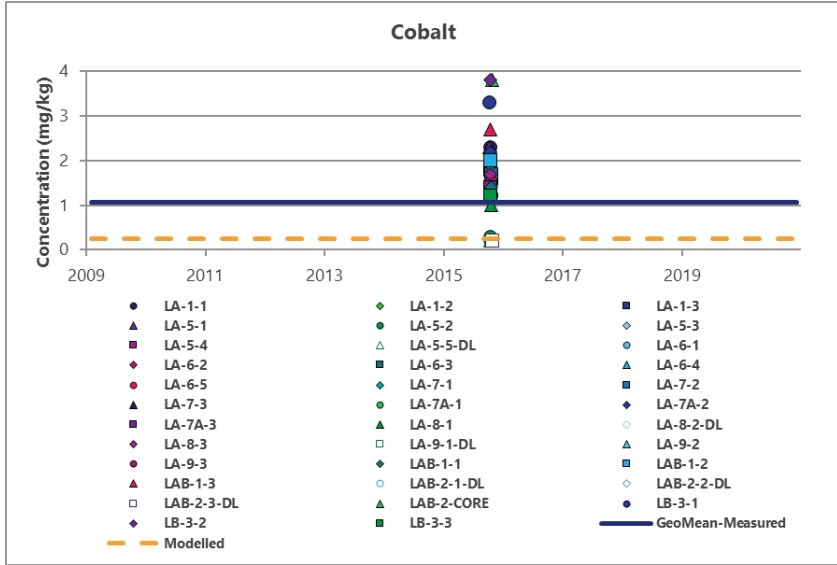
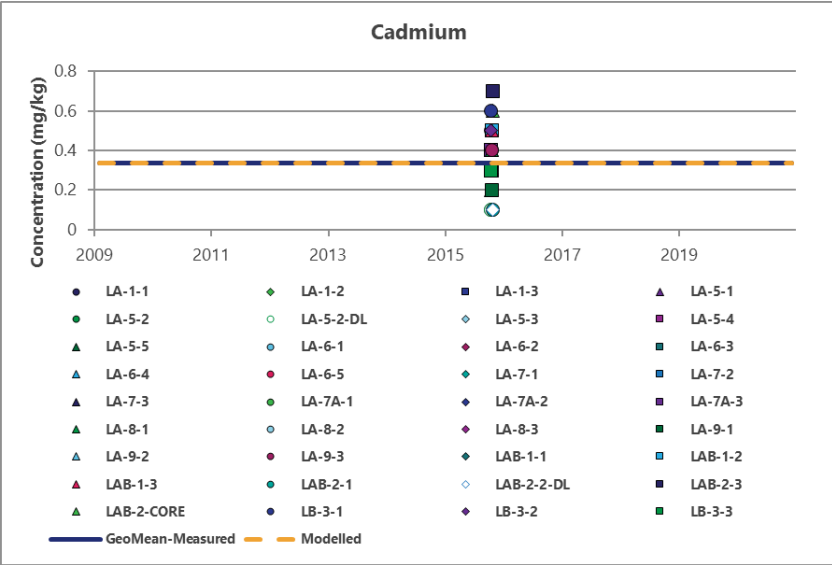
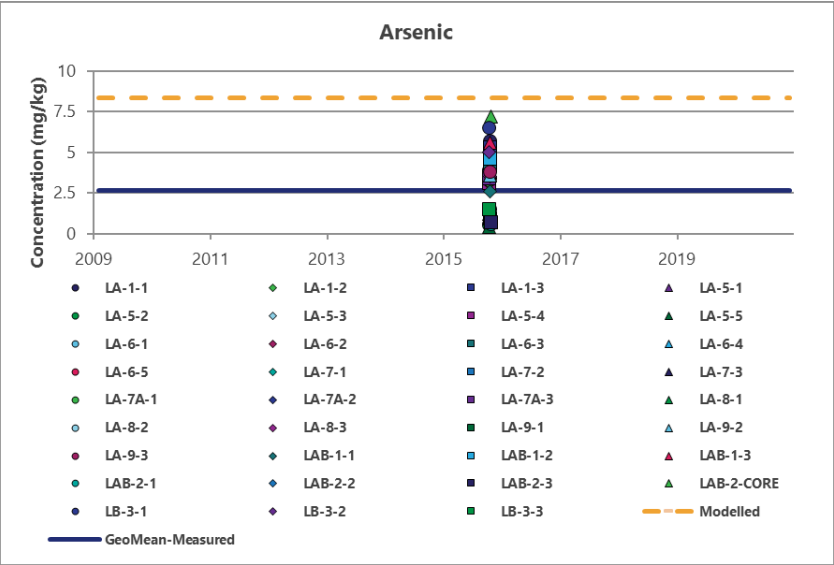


Figure IR-101-3: Selected and Observed Wheeler River Water Quality



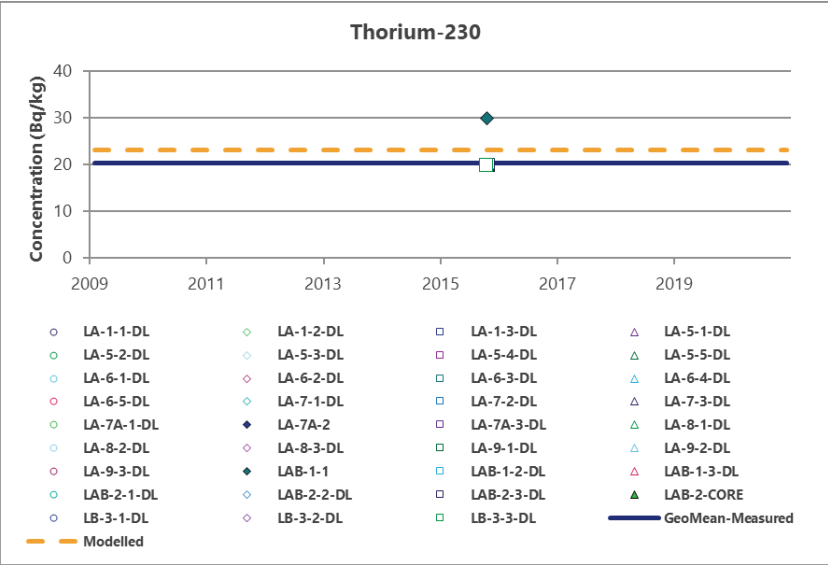
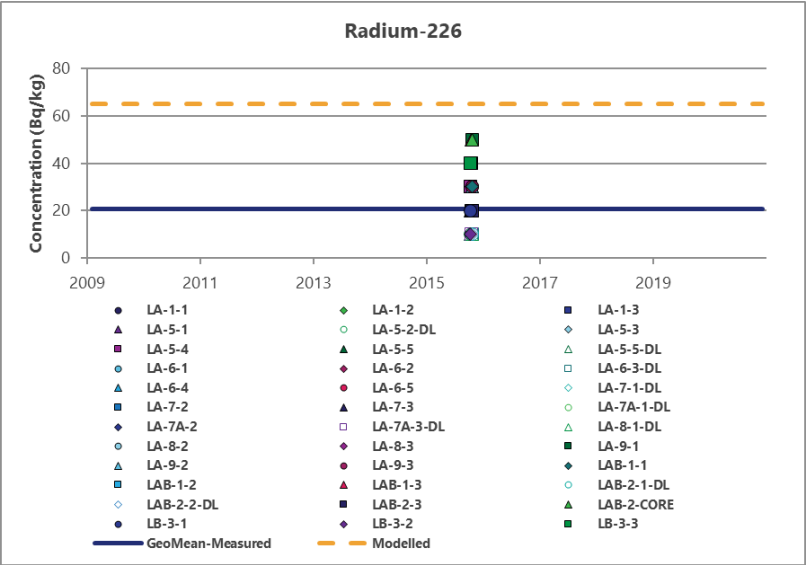
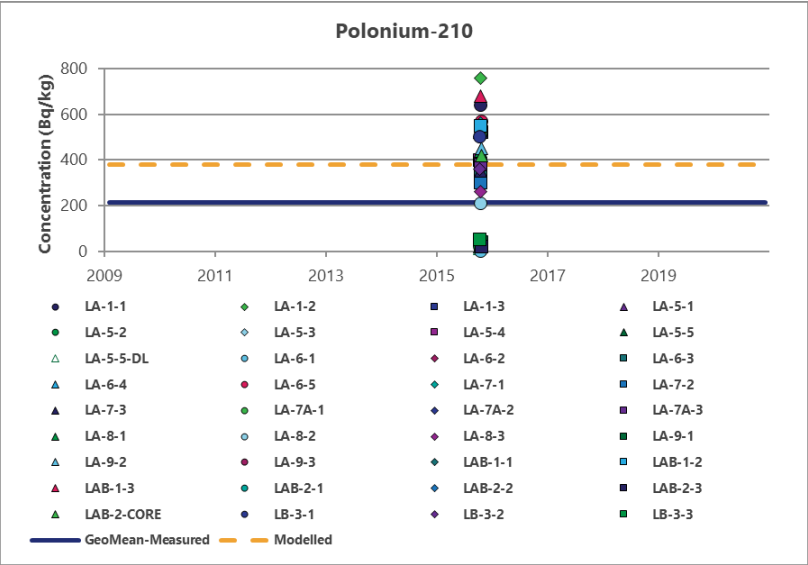
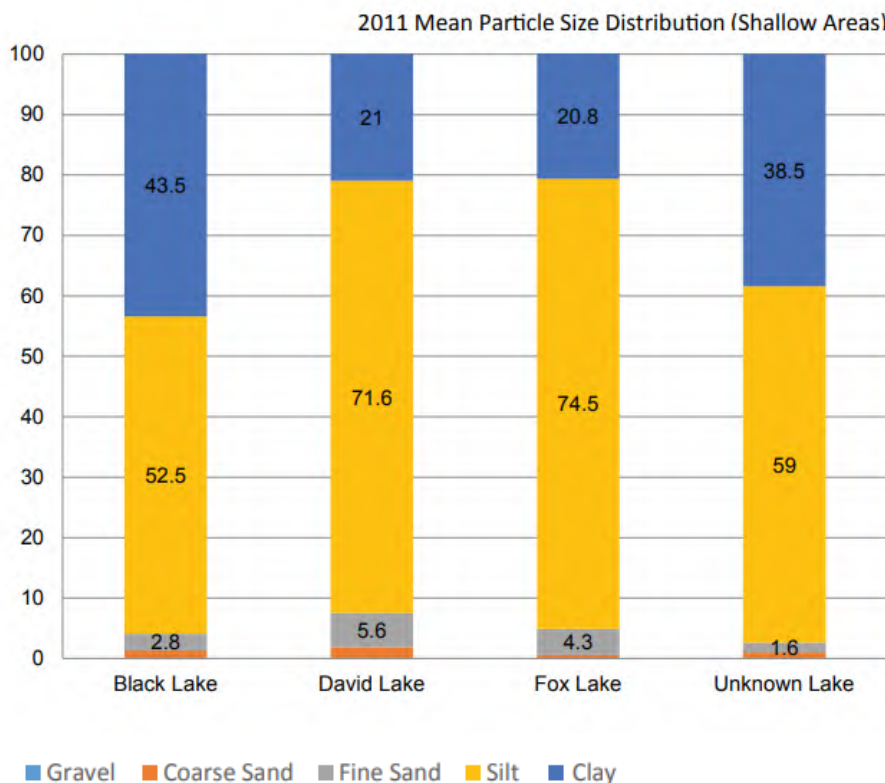


Figure IR-101-4: Selected and Observed Wheeler River Sediment Quality

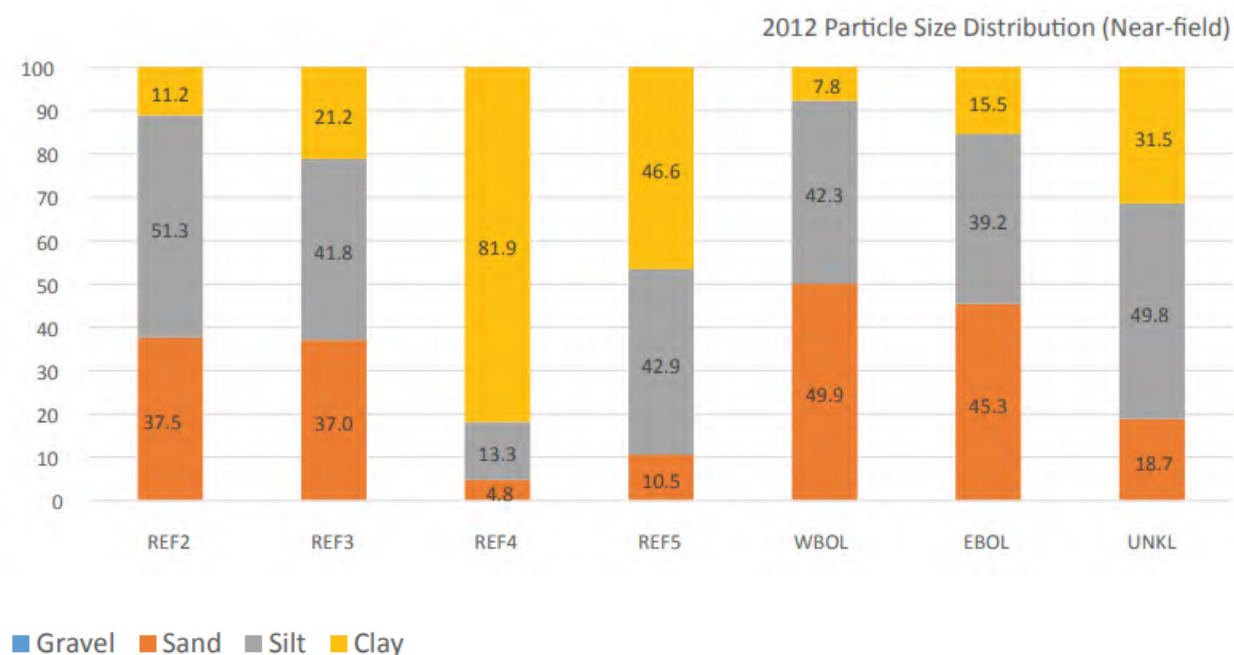


## Grain Size

EIS Section 8.4.3.2.1 states that grain size in the top 0-2 cm of sediment was predominantly clay-size fractions followed by silt (Whitefish Lake North, McGowan Lake, and Russell Lake). In Whitefish Lake South, grain size was predominantly clay, followed by sand and then silt. Data from the Key Lake Operation, located 35 km southwest of the Project, and McArthur River Operation, located 35 km northeast of the Project, were used as part of regional data for the Wheeler River Project. Based on the 2015 Environmental Performance Report (EPR) for the Key Lake Operation, sediment grain size in the top 0-2 cm, was predominantly silt followed by clay, and a small amount of sand (Figure IR-101-1). Based on the 2015 EPR for the McArthur River Operation, sediment grain size in the top 0-2 cm was predominantly silt and clay, followed by sand (Figure IR-101-2).



**Figure IR-107-1: Grain Size Distribution in Shallow Areas in David Creek Drainage (Ecometrix, 2015a)**



**Figure IR-107-2: Grain Size Distribution in Shallow Areas in Reference and Exposure Sediment in McArthur River Operation Area (Ecometrix, 2015b)**

**References:**

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TAEM (Terrestrial & Aquatic Environmental Managers Ltd.). 1993a. Aquatic Biological Resources of the McArthur River Uranium Project Area, Saskatchewan. A report prepared for Cameco Corporation, Saskatoon, Saskatchewan. Appendix 12C of the 1995 McArthur River EIS.

TAEM. 1993b. Surface Water Hydrology Baseline Investigations McArthur River Uranium Project. A report prepared for Cameco Corporation, Saskatoon, Saskatchewan. Appendix 6G of the 1995 McArthur River EIS.

**TO:**

Denison Mines – Janna Switzer

**FROM:**

Ecometrix

**REF:**

Wheeler River Project EIS – Appendix 8-F:  
Wetland Effects Assessment Report

**DATE:**

3 October 2024

## 1.0 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Responses to these IRs were provided in July and August of 2023. Additional FIRT IRs were provided to Denison on December 5, 2024. Of these IR-101 was not adequately answered and additional information was requested. [This appendix was initially included in the January 2024 revised draft EIS and has been updated in October 2024 in response to Round 4 IR-101.](#)

This appendix provides additional information to address IR-101 provided by Environment Canada and Climate Change (ECCC) as part of the second [and fourth](#) round of FIRT comments. The comment included a request for a further summary of wetland characterization information from available sources, baseline information pertaining to water quality and sediment quality, and assessment of potential effects to wetlands within the LSA for all phases of the Project and provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.

## 2.0 Scope of the Assessment

This section addresses the potential effects of the Project on the Fish and Fish Habitat VC for which wetland habitats are considered a component. The purpose of this assessment is to assess potential changes to wetlands (as represented by the Fish and Fish Habitat VC) in consideration of all phases of the Project at the Project Area, local, and regional study area scales. Pathways affecting wetlands are directly associated with potential changes to the Surface Water Quantity (hydrology), Surface Water Quality, Sediment Quality, and Benthic Invertebrates VCs. Changes to

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hydrology, water quality, sediment quality, and benthic invertebrate communities may directly affect wetlands as both fish and wildlife habitat and food resources. The assessment approach reflects these connections within the environment, as the significance determination for the Surface Water Quantity and Surface Water Quality VCs was conducted at the receptor VC level.

The Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are interrelated, to varying extents, and are linked to other VCs, including:

Surface Water Quality – surface water contributes to local moisture regimes, and surface water quality can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Surface Water Quantity – surface water contributes to local moisture regimes, and surface water quantity contributes to site drainage and discharge, which can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Sediment Quality – Vegetation and Ecosystems, Listed Plant Species, and Wetlands contribute to ecosystem form and function that stabilize riparian areas and influence quality of surface water runoff to aquatic systems.

This appendix will focus on the interrelations between these VCs as they apply to Wetland function.

Pathways that are of interest include those associated with site clearing and the potential for erosion-driven mobilization of suspended sediment into local surface waters; groundwater interactions with surface water features including wetlands; the establishment of new subwatershed boundaries and the resulting effects of effluent discharge to the receiving environment; and the potential overprinting of wetland habitat by Project infrastructure.

## 2.1 Key indicators and Measurable Parameters

The KIs for the wetland component of the Fish and Fish Habitat VC include potential changes in surface water quantity, surface water quality, and available wetland habitat from baseline conditions. The rationale for each KI and associated MPs is summarized in Table 1.

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**Table 1: Key Indicators and Measurable Parameters for the Wetlands Valued Component**

Key Indicator	Rationale for Key Indicator	Measurable Parameter
Change in available wetland habitat from baseline conditions	<ul style="list-style-type: none"><li>Project activities may result in a change in the extent of Wetlands.</li><li>Of provincial and federal management concern</li><li>Contributes to biodiversity and habitat for wildlife species and listed plant species.</li><li>Cultural importance.</li><li>Contributes to biodiversity, maintenance of hydrologic cycles, nutrient cycling, water quality, and carbon storage.</li><li>Sensitive to disturbance.</li><li>Historically addressed for other mining projects in northern Saskatchewan.</li></ul>	Aerial extent (m <sup>2</sup> or ha) of overprinted wetland habitat.
Change to water levels or flows from baseline conditions	Project activities are expected to result in changes to local hydrology. A reduction or increase in flows may result due to the elimination or redirection of subwatershed area and through Project water management (i.e., water taking, storage, and effluent discharge). These changes in flow to the environment may alter stream flows, lake levels and such feature interactions (inundation) with wetland features required for fish and wildlife during all life stages.	Changes in water levels (m) or percent changes to flow conditions (%).
Change in surface water quality from baseline conditions	Changes in water quality are regulated (subsection 36(1) of the <i>Fisheries Act</i> and the MDMER). Changes that may occur as a result of the Project include: <ul style="list-style-type: none"><li>mobilization of solids into local watersheds; and</li><li>deposition of deleterious substances into the receiving environment as a result of mine effluent and/or surface runoff.</li></ul>	Change in the concentration of constituents that are directly related to Project activities, measured as a mass of a chemical per unit volume in water (e.g., mg/L).

## 2.2 Spatial and Temporal Boundaries

The areas used to assess the effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are (Figure 1):

**Project Area:** the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area is considered to be a conservative estimate of the area of direct disturbance effects on VCs in this assessment.

**Vegetation LSA:** the area that surrounds the Project Area where all direct effects and most indirect effects are likely to occur on the Vegetation and Ecosystems, Listed Plant Species, and



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Wetlands VCs. The Vegetation LSA is defined as the Project Area plus a 250 m buffer along roads and a 500 m buffer around all other infrastructure (1,161.8 ha).

**Terrestrial RSA:** the area that surrounds and includes the Vegetation LSA, established to assess the potential, largely indirect effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs in a regional context. The Terrestrial RSA (40,173.6 ha) is defined as a minimum 8 km buffer around the Vegetation LSA and has been delineated to capture all indirect effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs and provide context for the type, distribution, extent, and prevalence of plant species and ecosystems in the region. The Terrestrial RSA also defines the area within which cumulative effects are likely to occur (i.e., CEA boundary).

Temporal boundaries identify when an effect is expected to occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, with the associated interactions with each VC and KI (where applicable). In the EA, the temporal boundaries are described as appropriate for each activity and cumulatively for the life of the Project.

The temporal boundaries for the EA represent the timeframes that the Project is expected to interact with and potentially affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. The temporal boundaries are aligned with the Project development schedule as described in the EIS: Construction; Operation; Decommissioning; and Post-Decommissioning.

### 3.0 Existing Conditions

Wetlands are defined as “land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment” (National Wetlands Working Group 1997). As such, ecosites have been determined to be wetland ecosystems where these conditions are expected to occur. This includes both wetland ecosites and sparsely vegetated ecosites where the water table is within 50 cm of the ground surface (McLaughlan et al. 2010). No wetlands within the Terrestrial RSA have been designated as Ramsar Wetlands of International Importance (The RAMSAR Convention Secretariat 2022).

Project-specific investigations pertaining to the Terrestrial Environment were conducted by Omnia Ecological Consulting (Omnia; Calgary, AB) from 2017 to 2019. Details on the methods, survey parameters and assumptions, and comprehensive data summaries/findings are presented in the Project-specific baseline report (Omnia 2020; see Appendix 9-B of the EIS) and a supplementary baseline annex report completed in 2021 (EDI 2021; see Appendix 9-C of the EIS).

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Project baseline studies for vegetation presented a description of the ecosystems/habitat types (i.e., ecosite classifications) within the Terrestrial RSA. Vegetation communities and ecosystems are represented by provincial ecosite classifications for the Boreal Shield Ecozone in accordance with the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010). These ecosite classifications were summarized within a 1:20,000 interpreted ecosite mapping product compiled within the Terrestrial RSA with the use of the following inputs:

- 1:5,000 anthropogenic features mapping;
- historical fires data;
- provincial Predicted Ecosite Mapping;
- current and historical imagery; and
- field sampling/ground truthing sites (EIS Appendix 9-B).

As the Boreal Shield Ecozone experiences a largely natural fire regime, much of the vegetation within the Terrestrial RSA (70.6%) is comprised of post-fire regeneration (i.e., shrubby structural stages). Twenty (20) upland ecosites were identified within the RSA with relative percentages by area estimated for each ecosite code.

The assessment also identified fourteen (14) wetland ecosite types within the RSA which included swamps, bogs, fens and shallow open water ecosite codes. The area of these wetlands was also estimated to provide a relative percent area of representation within the RSA.

This cataloguing of ecosite presence and relative area composition across the RSA provides the basis for understanding landscape change and succession over the course of the construction and operation of the Wheeler River Operation.

Waterbodies were conservatively included ~~here~~ as wetlands, as they have the potential to be classified as shallow open water wetlands (i.e., water bodies 2 m deep or less; Warner et al. 1997). Waterbodies represent the most common wetland ecosystem within the Vegetation LSA and the Terrestrial RSA, comprising 3.9% (44.9 ha) and 10.7% (4,101.9 ha), respectively. The black spruce treed bog is the second most common wetland ecosystem within the Vegetation LSA (18.2 ha, 1.6%) and the Terrestrial RSA (1,157.1 ha; 2.9%). The Labrador tea shrubby bog is the most common wetland ecosystem in the Vegetation LSA, comprising 2.0% (23.3 ha), and the second most common wetland ecosystem in the Terrestrial RSA (989.9 ha, 2.5%). All other wetland ecosites are relatively uncommon, each comprising less than 0.5% of the Vegetation LSA and Terrestrial RSA. The location, size and relative area composition of the wetland features

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is provided in Table 2 and Figure 1). The initial classification and subsequent assessment of wetlands in the Terrestrial Environment (EIS Section 9) took a conservative approach in that the area of wetlands within the terrestrial study areas was likely over-estimated to assess potential changes in areal extend of wetlands.

**Table 2: Summary of Wetlands**

Ecosite Code <sup>1</sup>	Ecosite Description <sup>1</sup>	Structure Code <sup>2</sup>	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
<b>Swamps</b>						
BS16	Black spruce / balsam poplar / river alder swamp	6	--	--	8.8	<0.1
<b>Swamps Subtotal</b>			--	--	<b>8.8</b>	<b>&lt;0.1</b>
<b>Bogs</b>						
BS17	Black spruce treed bog	5	18.2	1.6	1,157.1	2.9
BS18	Labrador tea shrubby bog	3	23.3	2.0	967.6	2.4
		3a	--	--	20.3	0.1
		3b	--	--	2.0	<0.1
		Total	23.3	2.0	989.9	2.5
BS19	Graminoid bog	2	2.8	0.2	160.5	0.4
BS19/24 <sup>3</sup>	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS20	Open bog	1	0.6	<0.1	65.5	0.2
<b>Bogs Subtotal</b>			<b>45.6</b>	<b>3.9</b>	<b>2,374.2</b>	<b>5.9</b>
<b>Fens</b>						
BS19/24 <sup>3</sup>	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS21	Tamarack treed fen	5	1.9	0.2	66.5	0.2
BS22	Leatherleaf shrubby poor fen	3a	-	-	28.5	0.1
BS23	Willow shrubby rich fen	3b	0.6	<0.1	20.9	0.1
BS24	Graminoid fen	2	-	-	9.0	<0.1
BS25	Open fen	1	0.4	<0.1	5.7	<0.1

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Ecosite Code <sup>1</sup>	Ecosite Description <sup>1</sup>	Structure Code <sup>2</sup>	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
<b>Fens Subtotal</b>			<b>3.6</b>	<b>0.3</b>	<b>131.8</b>	<b>0.3</b>
<b>Shallow Open Water</b>						
BS26	Rush sandy shore	2	-	-	15.1	<0.1
BS27	Sedge rocky shore	2	4.2	0.4	29.3	0.1
Waterbody <sup>4</sup>	--	0	44.9	3.9	4,101.9	10.7
<b>Shallow Open Water Subtotal</b>			<b>49.0</b>	<b>4.2</b>	<b>4,146.3</b>	<b>10.3</b>
<b>Total Wetlands<sup>5</sup></b>			<b>98.3</b>	<b>8.5</b>	<b>6,661.1</b>	<b>16.6</b>

**Notes:**

- 1 Ecosystems are described in detail in the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010).
- 2 Modified from the Field Manual for Describing Terrestrial Ecosystems (BC Ministry of Environment, Lands, and Parks, and BC Ministry of Forests 1998). 0 = unvegetated; 1 = sparse / bryophyte / lichen; 2 = herb/graminoid; 3a = low shrub; 3b = tall shrub; 5 = young forest, 6 = mature forest.
- 3 This ecosite type is an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between these ecosites due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). As such, this ecosite has conservatively been split between bog and fen classifications.
- 4 Areas of open water <2 m deep are defined as shallow open water wetland ecosystems (National Wetlands Working Group 1997); as such, unnamed waterbodies and areas of open water observed to exhibit an average depth of <2 m (Ecometrix Incorporated 2020) have been conservatively included as wetland ecosystems.
- 5 Some numbers are rounded for presentation purposes. Therefore, the totals may not equal the sum of the individual values.

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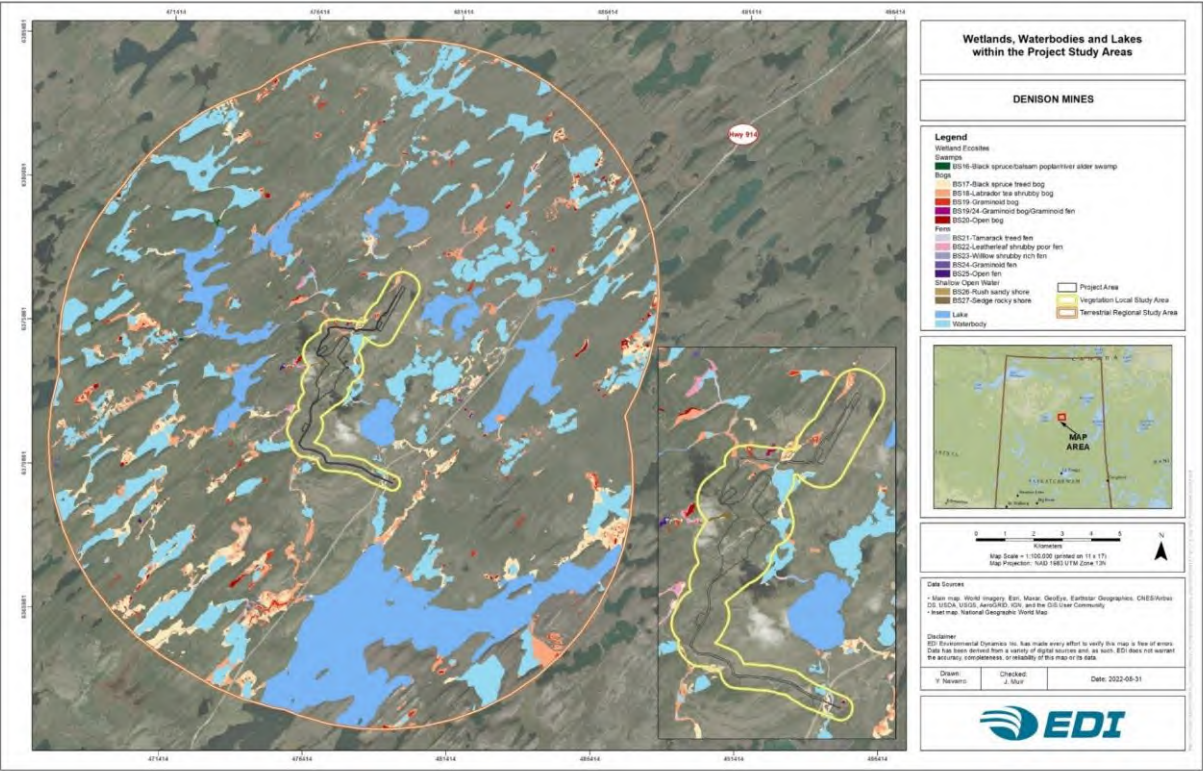


Figure 1: Wetlands, Waterbodies and Lakes within the Project Study Areas

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Surface elevations for the wetland have been assessed and the information is summarized below and in the Figure 1-

- Wetlands 1.5 km west of the Project Area range from 526-524 masl
- Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl
- Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl
- Wetlands north of the Project Area and in the vicinity of the proposed air strip range from 514-508 masl.
- Wetlands situated further north of the Project Area in the LSA were at an elevation of approximately 526 masl
- Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl
- Most wetland evaluated south of the Project Area had elevations ranging from 491-488 masl

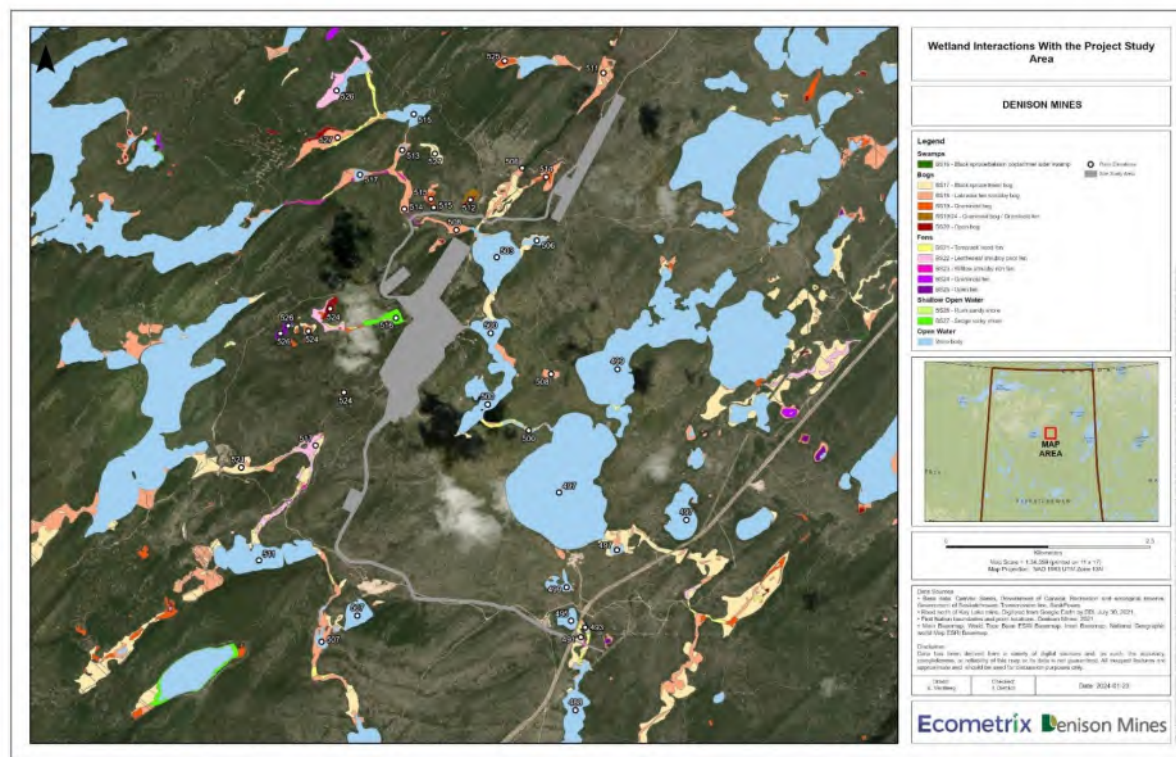
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Wetland depth, presence of fish or fish habitat, water quality and sediment quality are not currently available for the non-waterbody wetlands (i.e. those not identified as a lake or watercourse in Section 8 of the EIS). However, Denison is committed to conducting field surveys to collect this data prior to the initiation of construction of the Operation. This will allow for baseline information to be available to compare future changes and assess the success of mitigation measures and the predicted effects or lack thereof.

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Refer to Appendix A below for additional information on the in-lake wetlands.



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**Figure 2: Elevations of wetland features in the LSA**

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## 4.0 Assessment of Project Related Effects

### 4.1 Potential Interactions Between the Project and Valued Component/Key Indicators

The Project will require the Construction, Operation, and Decommissioning of several components (as described in Section 2 of the EIS). Potential interactions between these Project components and activities and Fish and Fish Habitat in the form of Wetlands and their associated KIs are summarized by Project phase and activity in [TableTable 4](#).

Potential interactions in [TableTable 9.2-9](#) are ranked as:

**Primary Interaction (✓):** Project activity is expected to interact with the VC / KI which may result in an adverse effect on the VC (i.e., a measurable or detectable change in the MP) and is further considered in the effects assessment as the primary contributor to potential adverse effects.

**Other Interaction (✓):** Project activity is expected to interact with the VC / KI. While the interaction is further considered in the effects assessment, it is not expected to be a primary contributor to potential adverse effects.

**No Interaction:** Project activity is not expected to interact with the VC or the KI, no adverse effects are expected, and rationale is provided for not considering this potential interaction further.

**Table 4: Potential Project Interactions for Wetlands Valued Component**

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Development of access roads and air strip	✓
Site preparation and earthworks; clearing, leveling and grading of the Project Area	✓
Power generation - generators	✓
Installation of main substation and distribution of power around site	✓
Wellfield and freeze hole drilling; ground freezing	✓
Batch plant operation (concrete); crusher at borrow area	✓
Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Water management (including treatment and site runoff)	✓
Groundwater supply	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Surface water withdrawal	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Air transportation for workers	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Operation of the ISR wellfield	
Wellfield and freeze wall drilling	✓
Operation and expansion of freeze wall	✓
Batch plant operation (grout and cement); crusher in borrow area	✓
Expansion of pond and pads	✓
Operation of the processing plant and production of uranium concentrate	
Water withdrawal from groundwater or surface water body	✓
Management of surface water (including seepage and site runoff)	✓
Water treatment, both domestic and industrial	
Water release to surface water body	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Hazardous waste management (temporary storage, handling, and off-site transportation)	✓
Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates	✓
On-site and off-site operation of vehicles and transport of materials	✓
Power supply – primarily power from the grid, also generators and back-up generators	✓
Package and transport of nuclear substances	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
Air transportation for workers	✓
Progressive decommissioning and reclamation	✓
Regulatory site inspections	✓

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Project Phase/Activity	Wetlands Valued Component and Key Indicator
Engagement – site visit from Interested Parties	✓
Site water management, treatment, and release	✓
Mining horizon remediation and thawing of freeze wall	✓
Process water treatment and release	✓
Closure of ISR and freeze wells and related infrastructure	✓
Decontamination of surface facilities and injection, recovery and monitoring wells	
Asset removal (including site power transmission lines and electrical infrastructure)	✓
Demolition and disposal of non-salvageable surface infrastructure and materials	✓
Remediation of contaminated areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)	✓
Generators	✓
Waste management (composting and landfill operation)	
Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Reclamation of disturbed areas	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Environmental monitoring	✓
Regulatory site inspections	✓
Engagement - Site visit from Interested Parties	✓

1 Operational activities include maintenance.

## 4.2 Potential Project-related Effects

Based on the timing and nature of the interactions identified in Table 4, the following adverse effects have a potential to occur on the Wetland VC (Table 5). The key indicator of effects to wetlands is the change in areal extent of wetlands in the study area.

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**Table 5: Potential Project-related Effects on Wetlands Valued Component During all Project Phases**

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
<b>Construction</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Introduction and/or Proliferation of Invasive Plants	✓
Changes in Water Quantity (water levels or flow)	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓
<b>Operation</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
<b>Decommissioning</b>	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
<b>Post-Decommissioning</b>	

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Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Direct disturbance	✓
Introduction and/or Proliferation of Invasive Plants	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓

## 4.3 Mobilization of Suspended Materials

### **Construction**

The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features including wetlands as a result of land disturbance and clearing. The mobilization of suspended material into natural surface water features is readily mitigatable by virtue of the mine development plan and through the implementation of standard water management and sediment control practices. Water management infrastructure (e.g., collection ditches, ponds, pumping stations) and various aspects of the water management and sediment control management systems will be put into place coincident with the initiation of construction activities. Waters (e.g., runoff) associated with areas under development will be collected and stored within management infrastructure (e.g., clean waste rock pond, see Figure 2.2-14 in Section 2 of the EIS). In the event that releases to the natural environment are necessary, they would only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, fish and fish habitat including wetlands are expected.

### **Operation**

During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of surface water management through the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds. No specific discharge is expected to wetland features in the Project Area. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No



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downstream effects on surface waters, natural sediments, or fish and fish habitat including wetlands are expected.

#### **Decommissioning and Post-Decommissioning**

During Decommissioning and Post-Decommissioning, the site-wide water management system will continue to operate such that Denison will maintain control of the site aspect affected water through the IWWTP. Surface drainage during Decommissioning activities will continue to be directed to the system of collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds to facilitate the control of suspended solids and achieve low TSS levels in the discharge, thereby minimizing any potential for adverse changes to water quality, sediment quality, and fish and fish habitat including wetland features.

#### **4.4 Overprinting of Wetlands as Fish Habitat**

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction (Figure 3). Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA (Table 2).

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is isolated to those areas where stream crossings for access roads and hydro-line connections are proposed (Figure 3). With the use of single span bridges and implementation of best management practices, direct wetland disturbance associated with the crossings of Kratchkowsky Creek and Hart Creek is expected to be avoided. It should be noted that SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection. As such, wetland disturbance related to the SaskPower Hydro Corridor is expected to be addressed through the SaskPower permitting process.

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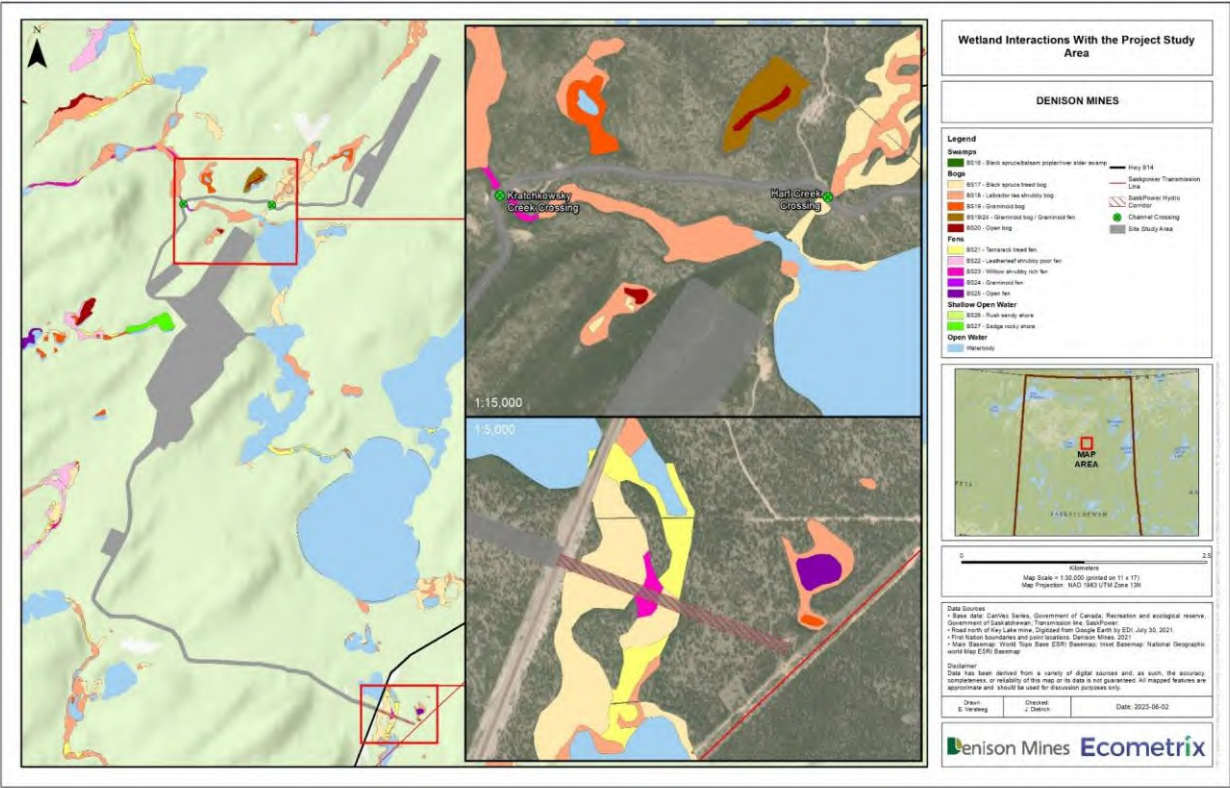


Figure 3: Denison Wheeler River Project Area and Wetland Feature Distribution

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## 4.5 Controlled Discharge to Receiving Environments

According to the site water balance (Figure 2.2-14 in Section 2 of the EIS), there is no planned discharge to Whitefish Lake during Construction. Other than LA-5 (Whitefish Lake) no other controlled discharge will occur to the natural environment and no wetlands will be impacted as a result.

## 4.6 Change in Water Levels and Flow

As detailed in Section 8.1 of the EIS, the projected withdrawal and discharge rates proposed for the Project are the largest influence on the hydrological effects of the Project. The largest predicted change in streamflow rate is -3.1% at the LA-5 and SA-2 nodes (immediately downstream of the Project) during Operation and Decommissioning, as projected against the 5<sup>th</sup> percentile low flow dataset in March. Lake levels and wetlands are expected to deviate less than  $\pm 0.01$  m due to all Project influences. All Project influences on the environment are expected to return to baseline conditions during Post-Decommissioning. These changes are within the range of fluctuation of environmental flows and water levels and are unlikely to affect fish passage or life history environmental cues.

## 4.7 Introduction and/or Proliferation of Invasive Plants

Vegetation clearing and soil disturbance during Construction are expected to create conditions suitable for the introduction and proliferation of invasive plants. Vehicles and construction equipment can inadvertently transport seeds and other invasive plant propagules in tires or the undercarriage to previously unaffected areas. The effects of invasive plants on native vegetation diversity are well documented and recognized as the second greatest threat to listed species after habitat loss (Enserink 1999). Competition with native species can lead to a reduction in the growth and vigour of native species (including Wetlands), as well as changes in the diversity, structure and function of ecosystems and habitats.

The potential for the introduction and proliferation of invasive plants by transport on vehicles and equipment is expected to continue throughout Operation during wellfield and freeze wall drilling, expansion of ponds and pads, drill waste rock, process precipitates and industrial wastewater treatment plant precipitates, on-site and off-site operation of vehicles and transport of materials, package and transport of nuclear substances, and air transportation for workers (i.e., landing and taking off of airplanes). Progressive decommissioning and reclamation has the potential to introduce invasive plants on vehicles and equipment and if seed used for revegetation is not supplied from a native seed source (Polster 2003) with a certificate of analysis indicating an absence of invasive plant seeds.

The potential for the introduction and proliferation of invasive plants is expected to continue throughout Decommissioning (e.g., during closure of the ISR and freeze wells and infrastructure,

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asset removal, demolition and disposal of non-salvageable surface infrastructure and materials, remediation of contaminated areas, reclamation of disturbed areas, and operation of vehicles and transportation of materials). The potential for the introduction and proliferation of invasive plants is expected to continue throughout Post-Decommissioning, but at lower levels due to reduced vehicle traffic.

#### 4.8 Edge Effects

Edge habitat refers to an area on either side of a border between vegetation communities. Edges between vegetation communities often result in altered microclimatic conditions that can influence environmental conditions further away from the edge (Bannerman 1998). Edge effects are expected to extend into areas of native vegetation and habitats at the interface of disturbed areas and undisturbed native ecosystems, and could include altered microclimatic conditions that can influence quality in habitat away from the edge (Bannerman 1998). Where edge effects occur, Wetlands may experience changes in light intensity, temperature, wind, moisture, relative humidity, and patterns of snow accumulation and melt relative to undisturbed conditions. This can, in turn, affect plant health and alter natural disturbance regimes (e.g., blowdown), plant population persistence, and the structure and function of ecosystems and habitats. If changes to microclimatic conditions or vegetative structure at an edge exceed a species habitat preference or physiological tolerance, then edge habitat may result in lower occupancy or use, reduced survival, or lowered reproductive success.

Edge effects at the interface of disturbed areas and native ecosystems are expected to occur along the edges of the Project Area resulting from vegetation clearing during site preparation and earthworks during Construction. Edge effects are expected to continue throughout Operation, Decommissioning, and Post-Decommissioning, decreasing over time as revegetation and tree growth within reclaimed areas of the Project create a gradual structural transition at forest edges, aided by natural encroachment.

#### 4.9 Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries

During the 'future centuries' scenario as described in Section 8.3.1.3 of the EIS, remediation works will be completed and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post-mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport. The results of this was described in Section 8.3.4.2.5 with respect to Fish and Fish Habitat and therefore wetlands.

The results of the numerical modelling (as provided in Section 7 and Appendix 10-A in Section 10 of the EIS) support the conclusion that with the implementation of appropriate mitigation during the decommissioning and restoration phases of the Project, the residual effects of the

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Project on the intermediate Groundwater VC will not result in an adverse effect on surface water. Dissolved constituent concentrations emanating over hundreds to thousands of years in the future from the deep Ore Zone to Whitefish Lake are expected to remain below fresh water environmental quality criteria in Whitefish Lake.

Although the precise location of the groundwater discharge to the surface is somewhat uncertain, the groundwater transport scenarios that have been evaluated (Appendix 7-C of the EIS) to date suggest groundwater discharge impacted from mining will most likely be relegated to Whitefish Lake. The discharge to Whitefish Lake is generally predicted to occur along the eastern shore of the lake, as this is interpreted to be the eastern edge of the underlying desilicified zone. The Laborador Tea Shrubby Bog habitat located on the eastern shore of Whitefish Lake may be in the zone of influence of groundwater discharge, yet chemically will remain below freshwater environmental quality criteria. Groundwater impacts to other surrounding wetlands will be negligible as groundwater is not predicted to discharge within any area beyond the central portion of Whitefish Lake.

#### 4.10 Indirect Effects

Indirect disturbance associated with the potential to adversely affect BS19/24 includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while ecosite BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing waterbodies, alteration of water quantity would be expected to have the highest potential to cause an adverse effect. Therefore, maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.

### 5.0 Mitigation Measures

Mitigation measures specific to the wetlands, discussed in the following subsection are applicable during all Operation phases and expected to be effective immediately following implementation and managed through the EMP.

#### **Disturbance Reduction**

- Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.

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- Disturbance to vegetation and soils will be avoided by clearly delineating Project Area boundaries (e.g., with the use of fencing, staking, or flagging), adhering to construction plans and schedules, and by restricting off-site machine use.
- Wetland boundaries in the proximity of planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable.
- Should they occur, areas prone to potential instability and areas in proximity to water bodies and drainage features will be identified and appropriate setbacks will be established and maintained.
- Temporary workspaces or laydown areas will be sited and constructed within existing disturbance or on previously compacted soils, where practicable. In areas requiring clearing only, grubbing will be avoided, and roots and groundcover will be retained to the extent feasible.
- Pre-construction listed plant surveys will be completed within the Project Area.
- Listed plants located adjacent to planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable and reduce the potential for accidental encroachment outside of the Project footprint.
- Should Listed Plants be identified within the Vegetation LSA prior to Construction, site- and species-specific mitigation measures to avoid and/or limit Project effects will be determined by a Qualified Vegetation Ecologist. Specific mitigation measures will depend on the species, its life history characteristics, time of year, and the location of the occurrence in relation to Project activities.
- Herbicide use will be avoided within 100 m of any known listed plant occurrences. Where herbicide use is unavoidable, use will be restricted to direct application instead of broadcast spraying and completed by qualified personnel.

#### **Soil Handling and Reclamation**

- Construction activities will be sequenced (i.e., site clearing, grading preparations, major earthworks and construction of infrastructure/facilities) so that surface vegetation, mineral soil and organic matter can be salvaged for later use in Project Decommissioning.
- Soil resources within the Project Area will be stripped/salvaged and stockpiled within the Project Area in accordance with relevant soil management BMPs, i.e., providing guidance on ground-truthing soil conditions, flagging potential hazards and sensitivities, and



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modifying practices in relation to environmental conditions and avoiding or minimizing inadvertent/incidental disturbance.

- A soil monitoring program/protocol (or equivalent) will be undertaken to verify soil salvage volumes and reclamation suitability (Section 9.1.8.2).
- Soil stockpiling locations will be sited to reduce soil handling and travel distances and designed to minimize the potential for soil degradation and downgradient effects, e.g., having defined height and width that optimize soil storage and stockpile stability, and having integrated erosion control measures and surface water management features (if/where necessary). Sediment and erosion control measures will be implemented in accordance with BMPs and commensurate to site conditions and sensitivities.
- Sediment and erosion control measures and surface water management features will be installed and maintained at the Project. Erosion controls (e.g., sediment fencing, check-damns and/or sediment ponds) will be installed as necessary and at the discretion of construction personnel commensurate to site conditions and sensitivities to manage/mitigate erosion and sedimentation.
- Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable with the use of suitable native species and in accordance with the Reclamation and Closure Plan.

#### **Surface Water Management**

- Snow melt and runoff will be controlled within the Project Area to prevent the potential release of contaminated runoff from affecting vegetation in adjacent areas.
- Sediment and erosion control measures will be implemented in accordance with the EMS.
- Surface water management features (e.g., culverts and ditches) will be constructed and maintained (as per Project design specification) along access roads and facility sites to facilitate surface drainage continuity and hydrologic connectivity—especially in proximity to wetlands, water crossings, and waterbodies.
- Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction, and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and at facility sites.

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### **Invasive Plant Management**

- Equipment and vehicles will arrive at the Project Area clean, and will be inspected for soil, plant material, and seeds, and cleaned as appropriate, to limit the potential for the introduction of invasive plants and noxious weeds.
- Areas with a high risk for the potential spread of invasive plants and noxious weeds (i.e., within or adjacent to existing infestations) will be avoided to the extent practicable; if work must occur in these areas, invasive plant management will be implemented before starting work.
- Gravel, fill, straw matting, or similar materials to be used for erosion control will be inspected to minimize the potential for seeds or propagules of invasive plants being brought to site.
- All employees and contractors on the Project will receive an employee orientation appropriate to the work they are undertaking, including instruction on the definition of invasive plants and their potential effects, mitigation measures to avoid the introduction and spread of invasive plants, and training on the presence and identification of common invasive plant species and those known to occur within the Project Area.
- Invasive plant monitoring will be conducted periodically by personnel skilled in invasive plant identification during all Project phases to assess, evaluate, and document invasive plant occurrences within the Project Area. Invasive plant surveys will be completed during a biologically appropriate time of year (e.g., when invasive plants can be identified) within areas identified as most susceptible to invasive plant introduction and spread, including roads, ROW, debris and vegetation management areas (e.g., slash piles, timber decks, exposed soil or stockpiles) and other regularly disturbed habitats.
- Three general treatment options may be used alone or in combination to control of invasive plants in the Project Area:
  - mechanical control – involves the physical removal of the plants;
  - chemical control – involves application of synthetic and/or natural herbicides; and,
  - biological control measures – involves use of living organisms (e.g., rusts, insects) to control selected invasive plant species.
- The type of treatment option selected for an invasive plant occurrence will be based on a combination of specific information including the identity of the invasive plant species and its provincial designation, the size and extent of the occurrence, time of year, the proximity of the occurrence to other susceptible areas (e.g., rare plant occurrences, wetlands, waterbodies), and the available control options. Where possible, control of

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invasive plants will be completed in consultation with a qualified professional to minimize potential effects on native vegetation, ecosystems and wetlands.

- Seed used during re-vegetation will be certified weed free, with a valid "Certificate of Seed Analysis".

## 6.0 Residual Effects Evaluation

### 6.1 Residual Effects Characterization

Residual effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs have been assessed in relation to the RSA, and characterized in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, context, and likelihood (Table 6). Residual effect evaluation of residual effects are provided in Tables 7, 8 and 9.

**Table 6: Definitions of Effect Characteristics Considered When Determining the Significance of Residual Effects**

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect will be adverse or positive.	<b>Adverse</b> – Negative effect or effect is not desirable. <i>Water Quantity</i> – Effect moves MPs (flow or water level) in a direction detrimental to water quantity relative to baseline conditions. A Project-related increase in surface water flows and levels during flooding, or a decrease in surface water flow below environmental flow requirements. <i>Water Quality</i> – An increase in constituent concentrations attributable to the Project in comparison to baseline conditions and trends. <i>Wetlands / Fish Habitat</i> – A physical loss of available fish habitat (extent of area) in comparison to baseline conditions. <b>Positive</b> – Beneficial effect or effect is desirable.
Magnitude	The amount of change in a measurable parameter relative to baseline conditions.	<b>Low</b> <ul style="list-style-type: none"><li>▪ measurable decrease in the spatial extent of Wetlands, but less than a 10% loss; all original wetland classes are present.</li><li>▪ A measurable change that is not within the variability of baseline conditions but below relevant water quality objectives and criteria. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is &lt;5% from baseline conditions</li></ul>

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Residual Effect Characteristic	Definition	Rating
		<p><b>Moderate</b></p> <ul style="list-style-type: none"><li>measurable decrease in the spatial extent of Wetlands between 10% and 30% loss; measurable changes in the diversity of wetland classes; some original wetland classes may be absent.</li><li>A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is &gt;5% from baseline conditions, and could, therefore, have an adverse effect on Fish and Fish Habitat within the LSA.</li></ul> <p><b>High</b></p> <ul style="list-style-type: none"><li>measurable decrease in the spatial extent of Wetlands greater than 30% loss; some original wetland classes are absent.</li><li>monthly flows (&gt; 10%), or lake surface elevation (m) in a waterbody or watercourse that is greater than the range of natural variability and large enough that fish can no longer rely on this habitat to carry out one or more of their life processes. A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives and is likely to have an adverse effect on Wetlands (Fish and Fish Habitat) within the LSA, with the effect extending beyond the LSA.</li></ul>
Geographic Extent	The geographic area within which the residual effect is expected to occur.	<p><b>Project Area</b> – Effect is limited to the Project Area.</p> <p><b>Local</b> – Effect is limited to the Vegetation LSA.</p> <p><b>Regional</b> – Effect extends beyond the Vegetation LSA into the Terrestrial RSA.</p> <p><b>Beyond Regional</b> – Effect extends beyond the Terrestrial RSA.</p>
Duration	Length of time over which the residual effect is expected to persist.	<p><b>Short-term</b> – Less than 3 years (i.e., effect happens during Construction only).</p> <p><b>Medium-term</b> – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning).</p> <p><b>Long-term</b> – More than 38 years (i.e., effect extends beyond Post-Decommissioning).</p>
Frequency	How often the residual effect is expected to occur.	<p><b>Infrequent</b> – Effect occurs several times at sporadic intervals.</p> <p><b>Frequent</b> – Effect occurs many times on a regular basis.</p> <p><b>Continuous</b> – Effect occurs continuously.</p>

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Residual Effect Characteristic	Definition	Rating
Reversibility	Whether or not the residual effect can be reversed once the activity causing the residual effect ceases.	<b>Fully Reversible</b> – A residual effect that diminishes to baseline conditions. <b>Partially Reversible</b> – A residual effect that partially diminishes to baseline conditions. <b>Irreversible</b> – A residual effect that will not diminish to baseline conditions.
Context	The extent to which the VC or KI has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	<b>Low</b> – VC/KI has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. No listed species present. <b>Moderate</b> – VC/KI has moderate resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or an intermediate level of historic or ongoing anthropogenic or natural disturbance with the capacity to assimilate more change. Presence of listed species <b>High</b> – VC/KI has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance. Presence of SARA-listed species
Likelihood	Likelihood that the residual effect will occur including consideration of the likelihood that the mitigation will be successful.	<b>Likely</b> – A moderate to high probability that the residual effect will occur. <b>Unlikely</b> – A low probability that the residual effect will occur.

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**Table 7: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Surface Water Quality**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	The Project (specifically the discharge of effluent to the natural environment) will cause a change in the concentration of constituents, as measured as a mass of a chemical per unit volume in water (e.g., mg/L). Surface water quality in the local receiving environment will be adversely affected by effluent discharge to the aquatic environment, thereby providing a pathway to adversely affect surface waters. However, no discharge is planned to wetlands outside of Whitefish Lake.
Magnitude	Low	The magnitude of the residual effect is predicted to be low as constituents that may be introduced as part of Project activities are expected to remain below criteria for the protection of aquatic life and human health.
Geographic Extent	Local	The geographic extent of the residual effect is predicted to be confined to the immediate waterbody adjacent to the Project (i.e., Whitefish Lake). The estimated mixing zone is less than 5 m, implementing an effluent discharge configuration that promotes mixing.
Duration	Long-term	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuous	For the purposes of this EIS, a conservative scenario was identified, with effluent discharge being considered as continuous during Operation and Decommissioning.
Reversibility	Fully reversible	Surface water quality is expected to return to pre-development levels following Post-Decommissioning as Project-related sources will cease to operate.
Context	Low	Wetland health is expected to be resilient to changes in surface water quality in the context of this assessment, as COPC meet protective criteria even at the extreme low water scenario. Therefore, under applicable mitigative measures and average flow conditions, the contextual resilience of the aquatic system to respond to change is considered to be great.
Likelihood	Likely	A high probability exists that a change in water quality from background conditions will occur, but be restricted to Whitefish Lake and not other surrounding wetland features.



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**Table 8: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Area Extent**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Impacts to wetlands in the LSA from physical disturbance or overprinting are expected to be minor in nature and relegated to wetlands located at stream crossings for access roads and the hydro-line corridor. In both cases the approach to design will be one of avoidance and minimal disturbance with clear span bridges and minimal clearing required for hydro-line installation where avoidance of open water areas can be met.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Less than 0.1% of Wetlands within the Terrestrial RSA are predicted to be directly affected as a result of Project Construction, and up to 1.5% may be indirectly affected during all Project phases.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically to wetlands located at stream crossings for access roads and the hydro-line corridor
Duration	Long-term	Once natural drainage patterns are re-established following Operation, the structure and function of Wetlands altered as a result of indirect Project effects are expected to re-establish after Post-Decommissioning (more than 38 years).
Frequency	Frequent	While direct affects to specific Wetlands will occur over a short time period during Construction, Wetland alteration by indirect effects is anticipated to occur frequently throughout Construction, Operation, and Decommissioning, and infrequently during Post-Decommissioning.
Reversibility	Partially Reversible	Wetland effects are predicted to be partially reversible during Decommissioning once natural hydrologic conditions are reinstated. Alterations to wetland extent, structure and/or function as a result of indirect Project effects during all Project phases are predicted to be reversible over time once natural hydrologic conditions are reinstated and edge effects, dust, water quality changes, and invasive plant propagule pressure are reduced at the end of Decommissioning.
Context	Moderate	Wetlands can exhibit low resilience and high susceptibility to disturbance; however, disturbance is common within the Terrestrial RSA, and existing Wetlands have been historically disturbed by access roads and exploration activities.
Likelihood	Likely	The infrastructure associated with the bridges and the hydro-line are likely to affect the localized area for which they span in a limited way.

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**Table 9: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Surface Water Quantity (Hydrology)**

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Water quantity (flow and level) will be reduced in LA-5 as a result of the overprinting of its reporting drainage area by mine infrastructure and through site water balance. Water taking has an additional potential to reduce water levels in LA-5 and associated wetlands.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Under all scenarios, the Project-related change in hydrology (flows or levels) compared to baseline conditions is less than 5% of baseline conditions, and generally less than 3%.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically the lakes and wetlands within proximity to the Project site (i.e., LA-5, LA-6, and LA-1).
Duration	Moderate	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuously	Although the mine is unlikely to require water taking on a continuous basis, this has been assessed as a bounding scenario and, as such, must be considered as a continuous effect.
Reversibility	Fully reversible	Surface water hydrology is expected to return to pre-development levels following Post-Decommissioning.
Context	Moderate	Surface water flow regimes are variable, and it is this variability that provides for morphological form to be maintained and for ecological reliance (i.e., wetlands, fish habitat). Some change to environmental flows is tolerated by wetland biota.
Likelihood	Low	Due to the localized nature and low magnitude of the effect on surface water hydrology, the likelihood of an effect is considered to be very low; therefore, the likelihood of an effect on Wetlands is expected to be low.

## 6.2 Significance and Confidence

The residual effect of change in the areal extent of the Wetlands VC as a result of the Project is not expected to result in a change to the wetlands KI that will alter its integrity within the Terrestrial RSA to the point where it is not sustainable or unavailable to contribute to ecological functions.

The threshold for significance for the Wetlands VC relates to predicted changes in the concentrations of water quality parameters, where changes could result in exceedances of

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relevant water quality benchmarks that are protective of aquatic biota in waterbodies that receive mine-affected drainage. The threshold for significance for Wetlands also includes predicted changes in surface water flows greater than baseline environmental flows and direct habitat loss.

The significance of the residual effects on the Wetlands VC has been deemed **not significant**. Following mitigation, the residual effects are not expected to cause a change in Wetland habitat (or associated KIs) to the extent that they might alter the ecological integrity of the VC in the LSA beyond an acceptable level.

The predicted confidence with respect to the Wetlands VC is high as the mobilization of suspended materials can be readily mitigated, making the effects prediction relative to this effect pathway easily understood.

Confidence in the assessment of predicted effects on water levels or flow is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that the water withdrawal and discharge scenarios presented herein represent the bounding case, and hydrogeological modelling projections are not changed (Section 8.1 of the EIS).

Potential effects on water quality as a result of Project discharges to local receiving environments were assessed by way of numerical modeling. The in-lake wetlands will be subject to the same processes by which constituents are expected to accumulate in all lake sediments. That is sediments are in dynamic equilibrium with the water with the relationship between the two defined by the Kd (partition coefficient). The Kds used in the EIS are not habitat specific; they are derived from years of water and sediment data collected in the Athabasca Basin. The Kds would include a variety of habitats (e.g., nearshore vegetated littoral zones, depositional habitats) from which water and sediment quality data have been collected. These predictions are generally considered conservative in nature because the assumptions on which they are based are conservative. For example:

- The assessment is based on a continuous (year-round) discharge at an expected average effluent rate of 0.0101 m<sup>3</sup>/s (36.5 m<sup>3</sup>/hr) throughout Construction, Operation, and Decommissioning, despite the likelihood that effluent discharge will not be continuous and will only discharge when site water balance requires, based on water storage capabilities.
- The constituents in effluent discharge have been estimated conservatively. Presented discharge concentrations provided herein include contingency factors of one to three times.

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- Baseline water quality is defined by the 95th percentile concentrations of individual constituents. Such an assumption is conservative as it constrains the assimilative capacity associated with the receiving environment. By definition, the assimilative capacity of a receiving environment is equal to the incremental difference between the existing baseline condition and the assessment benchmark (i.e., water quality criterion) on which the evaluation is based. Use of the 95th percentile concentration, rather than a measure of central tendency (i.e., 50th percentile, geomean), means that the incremental change in a given constituent concentration that can be assimilated by the receiving environment (whereby use of the receiving environment is protected) is relatively small in magnitude.

Due to the conservative nature of the assumptions on which the numerical assumptions are based, a high degree of confidence can be assumed.

### 6.3 Summary of Project Related Residual Adverse Effects

The results of the characterizations for these residual effects are summarized in Table 10. The residual effects of the Project on the Wetland KIs were predicted to be **not significant**. Thus, the residual effects of the Project on the Wetlands VC are predicted to be **not significant**.

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**Table 10: Summary of Project-related Residual Effects**

Valued Component	Residual Effect	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance
Wetlands	Change in Water Quality	C, O, D	A	L	L	LT	C	FR	L	L	NS
	Change in Water Level or Flow	C, O, D	A	L	L	MT	C	FR	L	L	NS
	Change in the Areal Extent of Wetlands	C, O, D	A	L	L	LT	F	PR	M	L	NS

<sup>1</sup> Direction: Adverse (A), Positive (P)  
Magnitude: Low (L), Moderate (M), High (H)  
Geographic Extent: Local (L), Regional (R), Beyond Regional (BR)  
Duration: Short-term (ST), Medium-term (MT), Long-term (LT)  
Frequency: Infrequent (IF), Frequent (F), Continuous (C)  
Reversibility: Fully Reversible (FR), Partially Reversible (PR), Irreversible (IR)  
Context: Low (L), Moderate (M), High (H)  
Likelihood: Unlikely (U), Likely (L)  
Significance: Not-Significant (NS), Significant (S)  
Level of Confidence: High (H), Moderate (M), Low (L)

## 7.0 Cumulative Effects

The cumulative effects are discussed in detail in Section 9.2.7 of the EIS and are not re-examined herein.

## 8.0 Summary

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction. Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the

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Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA.

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and hydro-line connections are proposed.

Avoidance through design as well as mitigation measures to control sedimentation to wetland features during construction, operation and decommissioning phases. Water quantity and quality are not expected to cause impacts to wetlands as the change in surface water feature levels and flow are nearly negligible and water will not be discharged to wetlands save for Whitefish Lake, for which effluent will not be released unless meeting criteria for the protection of aquatic life.

Residual effects on the Wetlands VC resulting from the Project were identified and assessed as **not significant**. Existing provincial legislation (Environmental Management and Protection Act [Government of Saskatchewan 2010] and the Water Security Agency Act [Government of Saskatchewan 2019b]) requires written approval (i.e., Aquatic Habitat Protection Permits) prior to any works within a wetland.

To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction of the operation to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.

## 9.0 References

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**Appendix A   Orientation for CNSC Round 4 IR reviewers:  
Whitefish Lake (middle basin) inflow to McGowan Lake inflow**

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During a June 14, 2024 meeting to discuss Round 3 IR-101, the Federal-Indigenous Review Team indicated the wetlands of interest are those located within the nearshore environments of Whitefish Lake (Upper, Mid and Lower) as these lakes will directly receive treated effluent during operation.

The purpose of this appendix is to facilitate the CNSC's review of Denison's Round 4 response to IR-101 by summarizing information on the in-lake wetlands of interest.

While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of interest are littoral / nearshore zones in the lake and connecting channels. These in-lake wetland areas of interest are not cut-off from or isolated from the main basin of the lake. As such, it can be assumed that the lake environment is likely to be as depositional as the nearshore environment. The lakes of interests are very shallow (on average 1.5 m in depth) and therefore deposition may be as likely in the "offshore" environment as the nearshore.

This appendix provides a summary of four general areas (see marked up wetland map image below with areas circled and numbered in purple) from the inflow to Whitefish Lake (middle basin) to the inflow to McGowan Lake. An excerpt from Section 8's Figure 8.2-4 is also provided to orient the reviewer to the water quality, biota, and sediment sampling locations within these areas (refer to EIS Section 8 for details). The four areas shown in the wetland image are reviewed in the balance of this appendix with photographs and text / descriptive excerpts from the EIS to provide a general site orientation to the reviewers.

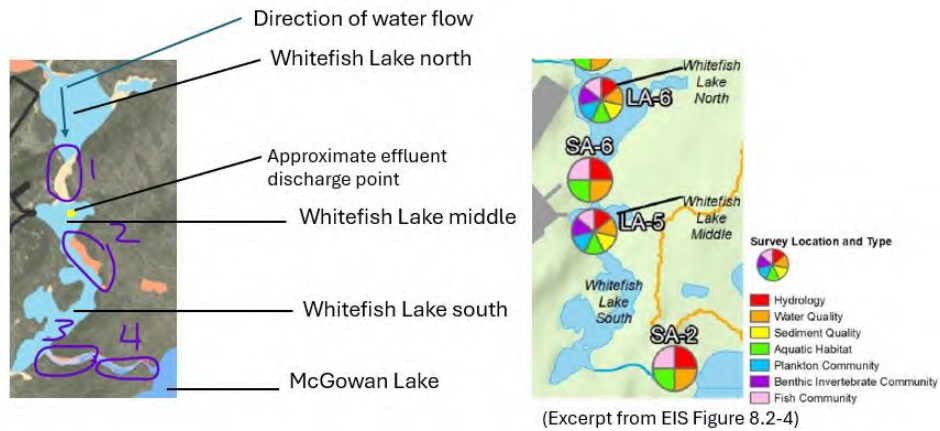
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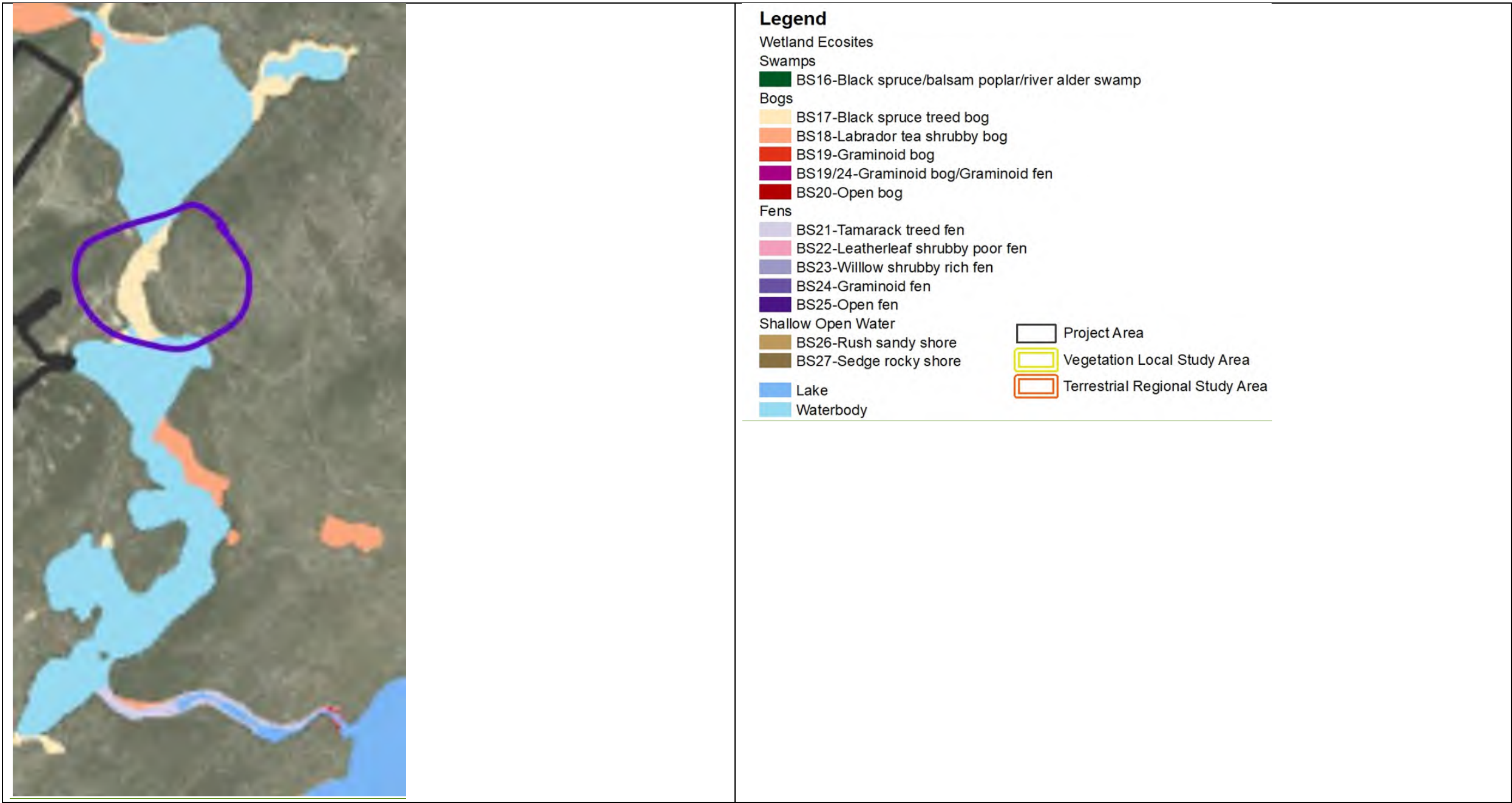


(Excerpt from EIS Figure 8.2-4)

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<p>Notes from Appendix 8-B, Appendix F (2019):</p> <p>SA-6 (Outflow from LA-6) SA-6 is the outflow from LA-6 and is equipped with a stage recording datalogger. The sensor and sensor housing at this location were replaced in August. Stage and discharge data for SA-6 are presented in Table 6 and the rating curve is shown as Figure 6. The cross-section is shown in Photo 11 for the July field program and Photo 12 is from the August field program.</p>	<p>Photo 11: SA-6 - July Field Program</p> 	<p>Photo 12: SA-6 - August Field Program</p> 
<p>Notes from Appendix 8-D (2016)</p> <p>4.6 SA-6 Station SA-6 is situated on the connecting channel between the north and south basins of Whitefish Lake, LA-6 (upstream) and LA-5 (downstream), respectively (see Figure 1-8). At this location the watercourse is 3rd order.</p> <p>4.6.3 Aquatic Habitat The surveyed reach (390 m) included the entire length of stream between the two lake basins. Mean wetted channel width, water depth and water velocity were 14 m, 0.7 m and 0.2 m/s, respectively. The banks were stable and the channel was meandering (see Appendix C, Photo 11). The stream gradient was low and stream morphology was primarily runs (75%) and pools (20%), with some flats (5%). The canopy was partly open. Instream cover was diverse, afforded by deep pools, aquatic macrophytes, boulders, logs and trees, and undercut banks. Substrates were comprised of 85% sand, 10% boulder and 2% silt. Observed aquatic vegetation included sedges, pondweed and horsetail (see Appendix C, Photo 12). Moderate algae growth and slight sediment were observed overlying the substrate and no barriers to fish migration were observed. The surrounding terrain was 50% upland and 50% lowland forest and observed riparian vegetation included jack pine, black spruce, sweet gale, and Labrador tea. Snails (Gastropoda), mayfly nymphs (Hexagenia sp.) and dragonfly nymphs were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.</p> <p>4.6.4 Fish Community A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. Within a 150-m stretch of the reach, 1,531 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 24 fish from species. Twelve YOY and 3 adult Spottail Shiner, 4 YOY and 2 juvenile Burbot, 2 adult Ninespine Stickleback and 1 YOY Longnose Sucker were captured. The CPUE was 0.94 fish/minute of electrofishing. Three adult White Sucker, 1 adult Walleye, and 3 juvenile and 3 adult Northern Pike were captured by gillnet during the spring 2017 survey. In addition, 6 adult Northern Pike and 2 adult White Sucker were observed. The list of fish species identified during baseline surveys was reviewed by Bobby John, and is considered inclusive and comprehensive (Denison, 2020).</p>		

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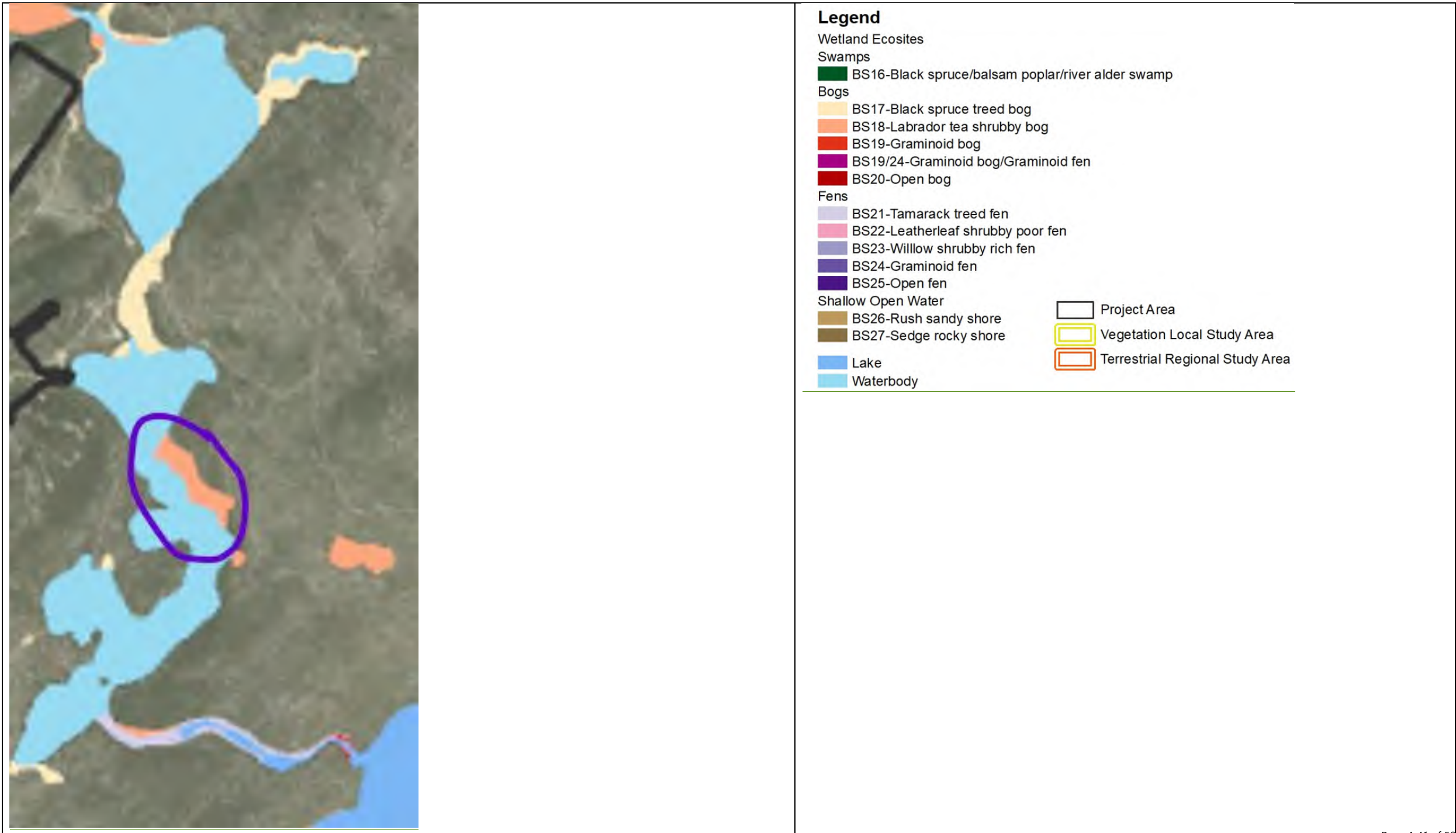
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 <p>Photo 11: Stream station SA-6 looking downstream (12 September 2016). This drainage area A station is situated on the connecting channel between lakes LA-6 (upstream) and LA-5 (downstream).</p>	 <p>Photo 12: Stream station SA-6 looking downstream (12 September 2016). Suitable spawning habitat for Northern Pike occurred near the inlet to lake LA-5, and adult pike were observed in the vicinity during the May 2017 spawning survey.</p>	 <p>SA-6 facing upstream, March 2018.</p>
<p>Notes from Appendix 8-B, Appendix D (2011):</p> <p>SA-6 Streamflow monitoring Station SA-6 drains from LA-6 and is upstream of SA-2. The stream section at this monitoring site is characterized by a sandy substrate, slow, deep, and laminar flow, and vertical banks. Although the right bank is well defined, high, and vegetated with trees, sand, and moss, the left bank is low lying with muskeg, shrubs and black spruce. The cross-section has a width of approximately 14 m. SA-6 produces a very good stage-discharge relationship and hydrograph.</p>	 <p>Photo 6: SA-6 looking upstream. Photo taken May 13, 2011.</p>	

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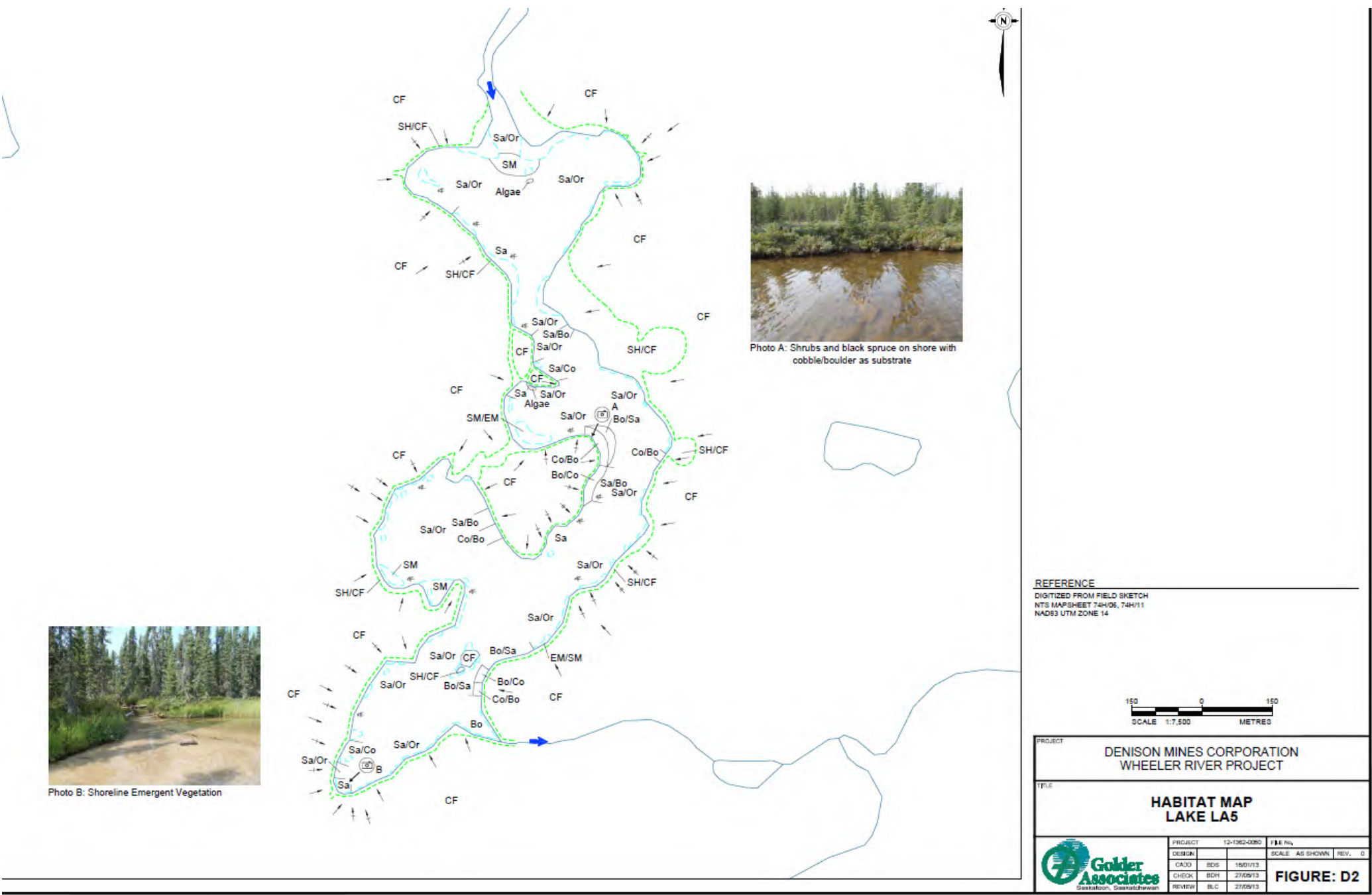
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<p>Area of interest in Whitefish Lake, August 16, 2024</p>		
<p>Appendix 8-D:</p> <p>LA-5: 3.5.4 Aquatic Habitat</p> <p>An aquatic habitat assessment was undertaken by Golder in August 2012 (Appendix F). Shoreline vegetation at LA-5 consisted mainly of shrubs and black spruce with upland jack pine forest. The typical substrate observed for LA-5 was sand and organic matter. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar, confirming the earlier survey data.</p>		

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Legend - Lakes, Wetlands, Ponds

Substrate Types	
Cl	Clay
Sl	Silt
Sa	Sand
Gr	Gravel
Co	Cobble
Bo	Boulder
Bd	Bedrock
Or	Organic

Bank/Upland Vegetation Types	
BA	Bare Ground
OT	Open Tundra
MU	Muskeg/Bog
DF	Deciduous Forest
CF	Coniferous Forest
MW	Mixedwood Forest
GS	Grassland
GF	Grass/Forbs
GF/SH	Grass/Forbs/Shrubs
SE	Sedge
SH	Shrubs
EM	Emergent Vegetation
MO	Moss
OR	Organic

Habitat Features	
XXXX	BD Beaver Dam
—	MD Man-Made Dam
▲	BL Beaver Lodge
●	BG Boulder Garden
—/—	Bridge
—/—	Culvert
#	DP Debris Pile
—	EM Emergent Vegetation
→	Flow Direction
—	ISC Instream Cover
—	IV Instream Vegetation
—	INV Inundated Vegetation
#	LWD Large Woody Debris
—	LE Ledge
—	LJ Log Jam
—	LS Landslide
—	MIL Multiple Island
—	OHV Overhanging Vegetation
—	OHC Overhead Cover
—	RW Root Wad
●	Sand Bar
—	SIL Singular Island
#	SWD Small Woody Debris
—	SM Submergent Vegetation
—	UCB Undercut Bank
—	USB Unstable Bank

Bank Slope	
→	Shallow Slope (0-5%)
→+	Intermediate Slope (6-30%)
→+	Steep Slope (31-70%)
→+	Very Steep Slope (>70%)

Bank Instability Ratings	
A	Aggrading
E	Eroding
S	Slumping
G	Gully/ing

Capture Methods	
—	BP Electrofishing - Backpack
—	EF Electrofishing - Boat
—	GN Gill Net
—	SN Seine
—	FF Fish Fence
—	MT Minnow Trap
▲	AN Angling
—	HN/TN Hoop Net/Trap Net

Sample Type Symbols	
●	Water
●	Sediment
●	Benthic
●	Fish

General	
Ⓢ	Photo Location/Direction
/	Habitat Type Divider
→	Fish Bearing/Potential Bearing Watercourse
—	Width
○	Depth

Site  
Summary  
Symbol

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH
Fish Species

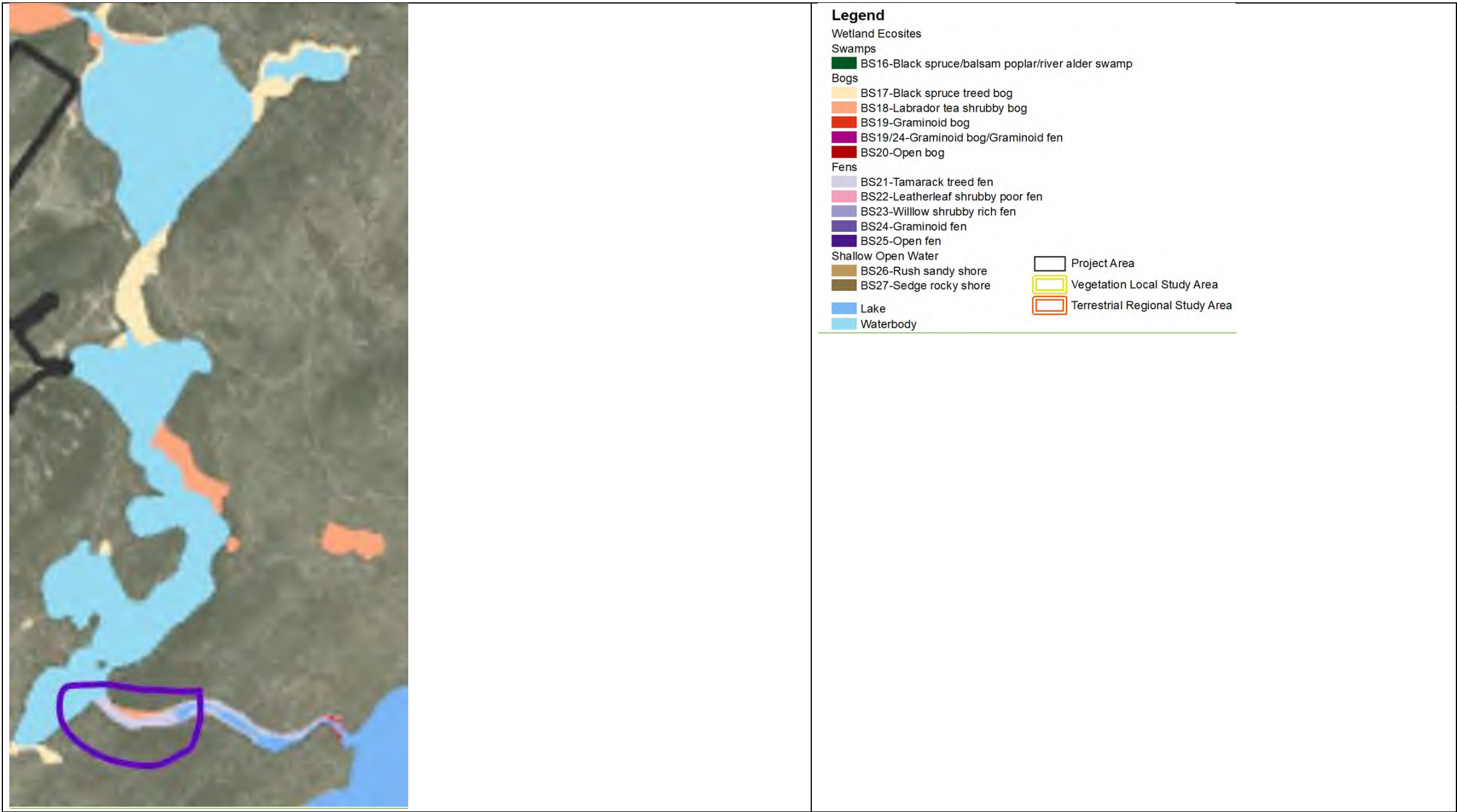
Notes:  
ha = hectares  
m = metres  
mg/L = milligrams per litre  
µS/cm = microsiemens per centimetre  
Max depth was the depth recorded at sampling locations.



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Area of interest at outlet of Whitefish Lake, August 16 2024:

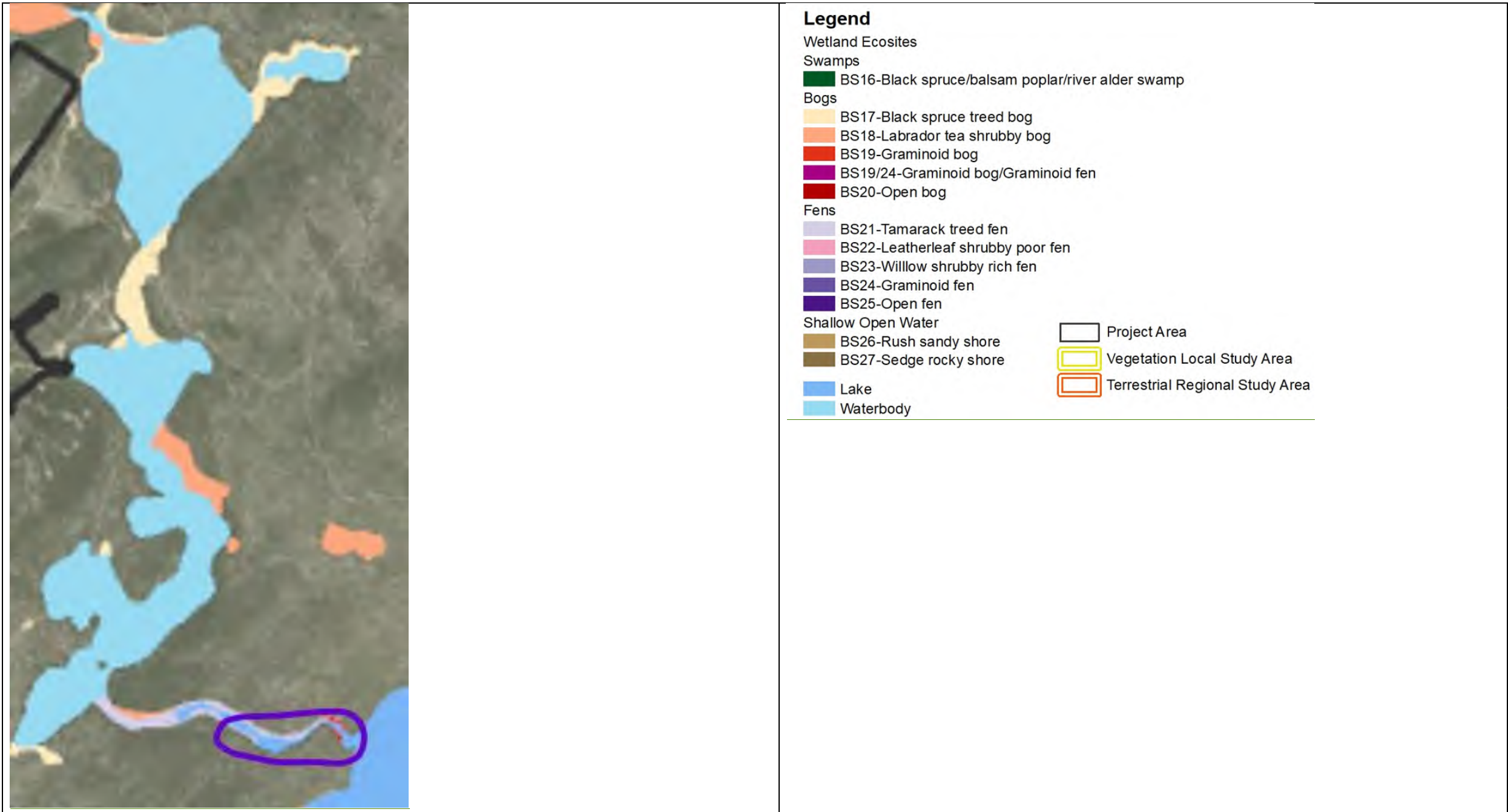
This area has stable banks and the substrate primarily composed of sand and detritus. The surrounding terrestrial vegetation was Black Spruce, Blue Spruce, and Jack Pine. The aquatic vegetation was Bur-reed and Potamogeton.



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<p>Notes from Appendix 8-B, Appendix F (2019):</p> <p>SA-2 (Northwest Flow into McGowan Lake) Station SA-2 is located to the northwest of McGowan Lake. A datalogger is not installed at this location. During the 2019 monitoring program it was learned that the cross-section had been moved in 2016 creating a discrepancy in water levels. The old cross-section was identified during the August field program and sufficient data are available to correct the July 2019 measurement (Table 2 and Figure 2). The original cross-section will be used for measurements in future field monitoring programs. Photo 3 is taken of the cross-section used during the July field program while Photo 4 is the original cross-section used in August.</p>	<p>Photo 3: SA-2 - July Field Program</p> 	<p>Photo 4: SA-2 - August Field Program</p> 
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<p>Notes from Appendix 8-D (2016):</p> <p>4.2 SA-2 Stream station SA-2 is situated within the Icelder River watershed, on the northwest tributary of McGowan Lake (LA-1), immediately upstream of the lake, approximately 800 m downstream of Whitefish Lake (LA-6) (see Figure 1-8). At this location the stream is 3rd order.</p> <p>Aquatic Habitat Mean wetted channel width, water depth and water velocity for the 285 m long surveyed reach were 9 m, 0.35 m and 1 m/s, respectively. The stream banks were stable and the channel was meandering with some braiding (see Appendix C, Photo 3). Within the surveyed reach, the stream gradient was mainly high to moderate. The stream morphology was mostly riffles (90%), with minor runs (5%) and pools (5%). The canopy was dense to partly open. Instream cover was primarily afforded by boulders and undercut banks, with minor contributions from logs and trees, deep pools and aquatic macrophytes. Substrates were comprised of 45% boulder, 40% cobble and 5% gravel, with trace amounts of sand and silt. Aquatic vegetation included sedges and horsetail (<i>Equisetum</i> sp.). Algal growth was moderate and no sediment were observed overlying the substrate. No barriers to fish migration were observed in the reach. The surrounding terrain was 90% upland and 10% lowland forest and observed riparian vegetation included jack pine, black spruce, alder (<i>Alnus</i> sp.), sweet gale, Labrador tea (<i>Ledum groenlandicum</i>) and willow. Stonefly nymphs and caddisfly larvae (<i>Trichoptera</i>) were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.</p> <p>4.2.4 Fish Community A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. During the fall 2016 survey, 1,271 seconds of electrofishing effort was expended within a 285-m reach, resulting in the capture of 97 fish from 6 species. Slimy Sculpin were the most abundant species encountered, with 16 YOY, 19 juveniles and 35 adults collected. One YOY, 7 juvenile and 5 adult Lake Chub, 2 YOY and 5 juvenile Burbot, 2 YOY and 1 juvenile Northern Pike, 1 juvenile and 1 adult Arctic Grayling and 2 juvenile White Sucker were also captured. In addition, Walleye was observed but not captured. CPUE was 4.58 fish/minute of electrofishing. Eighteen adult White Suckers were captured by gillnet at this location during the spring 2017 survey. The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.</p>
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Photo 3: Stream station SA-2 looking upstream (16 September 2016). This drainage area A station is situated on the northwest tributary of lake LA-1, immediately upstream of the lake, approximately 800 m downstream of lake LA-6.



Photo 4: Stream station SA-2 looking downstream (16 September 2016). Use of the reach by White Sucker and Walleye for spawning was observed during the May 2017 spawning survey.



SA-2 facing upstream, March 2018.



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Notes from Appendix 8-B, Appendix D (2011):

SA-2  
Streamflow monitoring station SA-2 flows into the northwest end of LA-1. The monitoring station at SA-2 is located several meters downstream of the transition between an upstream meandering channel and a downstream riffle section. The monitoring site has a cross-section width of approximately 11 m, is relatively shallow with high velocity flow. The substrate is primarily composed of boulders and cobble, with well-defined and stable vertical banks vegetated with shrubs and trees. SA-2 produces a fair stage-discharge relationship; however the slope is nearly linear, so it may overestimate low and high flows. Further measurements at extreme flows would help verify the accuracy of this rating curve.



Photo 2: SA-2 looking downstream. Photo taken July 30, 2011.



IR-107

- Department: CNSC, ECCC
- Project Effects Link: Aquatic environment
- Reference to EIS, appendices, or supporting documentation: Section 8.2.3.3, Existing Surface Water Quality

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, October 11, 2024)
IR-107	-	<p><b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.</p> <p><b>Rationale:</b> The amount of data available for baseline water quality characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.</p> <p>To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.</p> <p>As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the "baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity"</p> <p>In addition, the "applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed."</p>	<p>Please clarify what data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline</p>	<p>Surface water quality was sampled through 2016, 2018, and 2019 on a monthly basis which is generally consistent with federal requirements for assessing potential impacts through EA. Hydrological assessment has occurred from 2011 to 2019. Mean Annual Discharge (MAD) (m³/s) as measured at the Water Survey Canada (WSC) Wheeler River Watershed Station (06DA005) during 2016, 2018 and 2019 was 17.07, 17.34 and 19.23, respectively, all of which were slightly above the 43 year (1977 to 2019) average of 16.82. The MAD in 2016 and 2018 can be considered near average, with 2019 being considered an average-high flow year, but well below the maximum observed for the timeseries (27.62 m³/s). Since this period, there have been no land use changes within the area that would constitute a major change in water quality.</p> <p>Baseline water quality samples were collected during years of average to average-high flows in the Wheeler River system and therefore representative of background conditions for assessment of potential impacts in the EIS. Additional conservatism was included in the impact assessment by using the 95<sup>th</sup> percentile values for baseline parameter concentrations when modelling potential effluent effects. As such, the surface water quality data collected are suitable for the intended purpose of assessing potential impacts and the additional conservativisms that were included as part of the assessment were precautionary.</p> <p>Given the above, Denison feels strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>Denison commits to the collection of additional surface water quality baseline data prior to project development starting to ensure updated baseline information is available for identification of any changes that might influence estimates of Project impacts. These data will be used to support permitting and licensing through updates to the ERA.</p>	<p>This response has not been accepted.</p> <p>From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions.</p> <p>CNSC and ECCC staff have the following expectations:</p> <ol style="list-style-type: none"><li>1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices.</li><li>2. Confirm which federal requirements were used when assessing potential impacts through EA.</li><li>3. Confirm which data quality objectives were used to establish the baseline, provide references if available</li><li>4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.</li></ol>	<p>The response to this IR is provided in Attachment IR-107 (below).</p>	<p>Before this IR is accepted, the Proponent is requested to provide the statistical correlation analysis to confirm that data is correlated.</p> <p>Additionally, the four expectations set out in the rationale for status have not been adequately responded to. The Proponent should incorporate the following information into the EIS and ERA:</p> <ol style="list-style-type: none"><li>1. Provide raw baseline data (perhaps in an appendix).</li><li>2. Provide summary statistics for baseline datasets, which at a minimum should include: mean, standard deviation, 95th percentiles, minimum, maximum, and number of samples. Present summary statistics by season (i.e., freshet, summer, fall and under-ice), and include comparisons to relevant water quality guidelines.</li><li>3. Identify potential gaps in baseline datasets, and indicate how data gaps will be addressed. Describe the planned baseline monitoring to be conducted including, but not limited to, addressing any data gaps.</li><li>4. Demonstrate that the combined existing baseline data and planned baseline monitoring will yield dataset(s) that provide robust water quality baseline characterization of seasonal conditions (i.e., freshet, summer, fall, under-ice during winter), including a range of flow conditions.</li></ol> <p>The Proponent should also incorporate the additional baseline data collected into the analysis and conclusions of the finalized EIS and ERA.</p> <p>Concerning the other aspects of the IR, these responses are accepted based on Denison's commitment to conduct periodic sampling prior to construction to strengthen existing environmental data. CNSC staff will review this information to ensure EA predictions remain valid and recommend collecting samples in the fall to spring timeframe, as samples from these seasons is sparse in the current dataset.</p>	<p>Information specific to the statistical correlation or consistency in data between waterbodies during baseline investigations is provided in Attachment IR-107-R3 (below).</p> <p>Additionally, the four expectations outlined by ECCC are discussed herein.</p> <ol style="list-style-type: none"><li>1. All raw baseline data was provided in Appendix A-1 of Appendix 8-D of the EIS.</li><li>2. Appendix A-1 of Appendix 8-D included the following: mean, SD, 75<sup>th</sup> percentile, 95<sup>th</sup> percentile, minimum, maximum, sample size (n) and screening against criteria by date.</li><li>3. Denison and its SME does not consider that there are data gaps per se, as it concerns the data used for the purpose of the EIS. Denison and its SME feel strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects. The data are spatially robust (in that they cover various sampling nodes in potentially affected watersheds that at this time are all subject to the same land use (or lack thereof) and samples have been collected during multiple seasons. Denison is in agreement that regular water quality data collection should be instituted and commits (Commitment 8-48 to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). Sampling will be conducted monthly during the open water period and twice under ice. Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data</li><li>4. As noted above, information specific to the statistical correlation or consistency in data between waterbodies during baseline investigations is provided in Attachment IR-107-R3 (below).</li></ol> <p>Given the above (as well as the information provided in Attachment IR-107-R3), Denison and its SME do not feel additional analyses with additional baseline data are needed at this time, as suggested by ECCC, to inform EIS conclusions. Nevertheless, Denison will commit to update the analysis and predictions incorporating any new data collected during pre-construction baseline and licensing for operations, but there is no expectation that there would be any change to the EIS conclusions (see IRs 113, 114 and 115 for more detail in his regard).</p>	<p>Denison has addressed item 1 in the IR Round 3 requests, but has not adequately addressed items 2, 3 and 4.</p> <p>In Appendix A-1 of Appendix 8-D Denison has provided summary statistics; however, these summary statistics are for the pooled dataset and not for individual waterbodies and watercourses. Summary statistics should be provided for each individual waterbody/watercourse so that within and between-lake variation can be identified. Denison has not acknowledged or discussed current gaps and limitations in the baseline data and studies and has not demonstrated how the current baseline data is sufficiently robust to characterize natural variation. It is not clear how Denison meets the requirements of the Generic Guidelines for the Preparation of an Environmental Impact Statement – Pursuant to the Canadian Environmental Assessment Act, 2012 (referred to as “The Guidelines” from this point forward). In The Guidelines Section 8.1 Baseline Environment, it states:</p> <p>“The EIS will include a description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions, and the variability in these components, processes, and interactions over time scales appropriate to the EIS. In characterizing the environmental effects of the project, the proponent will consider the current baseline environment and environmental trends within the project area.”</p> <p>Denison currently has only conducted three water quality sampling events with one sample each in LA-5, on August 8<sup>th</sup>, 2012, April 1<sup>st</sup>, 2014, and September 10<sup>th</sup>, 2016. Not only is most of the data over 10 years old, but sampling was also only conducted in two seasons. It is not possible to adequately characterize environmental processes, trends and natural variation with the current dataset, and pooling data from multiple lakes further reduces the understanding of these factors.</p> <p>The correlation analysis that Denison provided in their supplemental information Round 3 response did not contain a statistical analysis comparing baseline data between sampled lakes in the LSA and RSA, therefore no determination could be made regarding the similarities between waterbodies. A comparison of mean percent differences between pooled datasets does not conclude that there is no significant difference without supporting statistical tests. Additionally, at no point was LA-5 the primary receiving waterbody compared individually to other waterbodies, LA-5 data continued to be pooled with data from other lakes to form the Key Assessed Lakes pooled dataset, which was then compared to the full LSA dataset. Pooling data, use of reference lake data with exposure lake data in pooled datasets, and use of the geometric mean are all uncertainties and data limitations that should be acknowledged and addressed as minimizing the ability to detect natural variation, including seasonal variation, within-lake</p>	<p><i>Note: Denison and the CNSC had a number of meetings and discussions on this Round 4 IR between Sept. 16, 2024 and October 9, 2024. The response provided here is focused on the central questions coming out of these discussions.</i></p> <p>Routine surface water quality sampling has started at the Wheeler River Project site. Denison made the commitment to collect additional pre-operational surface water quality data in commitment 8-48 and this work has been initiated. The list of surface water quality sampling stations, sample frequency, and analyte list is included in Attachment IR-107 (Round 4).</p> <p>For the CNSC's consideration, a comparison of June, July, August, and September 2024 water samples collected at Whitefish Lake (LA-5) is provided in Attachment IR-107 (Round 4) Table 1. As shown in the table, the results collected in 2024 are within the range (minimum to maximum) of pooled results for both the full LSA dataset and key assessed lakes. The majority of minor differences between recently collected samples and pooled datasets are related to differences in analytical detection limits. We note that a low-level trace metal analysis was used in 2024 and this resulted in lower detection limits for some parameters compared to previous results.</p> <p>We note that pooling of data to establish a background is not an uncommon approach. For example, such an approach is contemplated by Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives (CCME 2003). This procedure acknowledges the use of "regional" data to derive background concentrations assuming the sites from which data are used "... are generally located nearby the site under consideration but have not been adversely affected by human activities." This description is accurate for the Wheeler River Project aquatic LSA which is in an unimpacted, remote area of Saskatchewan's boreal forest.</p> <p>We refer the reviewer to Appendix 10-A, Appendix A Section 3.2 for consideration of modelled average water baseline concentrations of COPCs and a comparison to measured values. The plots show trends over time for selected COPCs and the generally good agreement between the measured and modelled concentrations.</p> <p>Based on the data presented and methodology provided in relevant guidance, the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservativisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>As shown in Attachment IR-107 (Round 4) Table 2, surface water quality sampling will be conducted monthly during the open water period and twice</p>



								<p>variation at sampling sub-stations, year-to-year variation and between-lake variation. The requests below will serve to satisfy the principles of the Precautionary Approach and address these deficiencies.</p> <p>In order to resolve this IR, Denison are expected to:</p> <ol style="list-style-type: none"><li>1. Meet the requirements of the CNSC's guiding principles for protection of the environment REGDOG 2.9.1 Section 2.1 that "the licensee's license application shall demonstrate (through performance assessments, monitoring or other assessments) that their environmental protection measures are assessed against performance indicators and targets that are based on sound science", Denison should provide a statistical analysis including a power analysis comparing LA-5 baseline water quality data individually to other waterbody water quality data to determine if there is a statistically significant difference between water quality at various sites in the LSA. Denison should provide the methodology they will use to conduct the statistical analysis and power analysis for CNSC review and acceptance prior to completing the analysis. Pending the results of the statistical analysis:<ol style="list-style-type: none"><li>a. If the statistical analysis demonstrates that there is not enough statistical power to detect a significant difference between waterbodies, or that there is enough power and a significant difference between LA-5 and other waterbodies in the LSA, Denison will be required to provide additional baseline data to update the modelling during the EA process and update risk and significance conclusions as needed.</li><li>b. If the statistical analysis demonstrates that there is enough statistical power to detect a significant difference and that there is no statistical difference between LA-5 and the other waterbodies in the LSA, then Denison will not be required to provide further baseline data for the purposes of the EA, however Denison will still be expected to conduct further baseline characterization as per their commitments to collect more baseline data. Denison is also expected to still satisfy the other requirements in this IR.</li></ol></li><li>2. If currently available, incorporate any existing new data (post-2019) into the baseline dataset and update the analysis for submission in the finalized</li></ol>	<p>under ice. Per CNSC licensing requirements, the new water quality data along with updated effluent quality data will be integrated into the environmental risk assessment used to support Denison's application for a CNSC licence to operate and prior to effluent release to Whitefish Lake.</p>
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									<div>EIS. Modelling should incorporate:<ul style="list-style-type: none"><li>a. Near-field modelling (LA-5) should utilize the 95th percentile values of data measured at LA-5 (i.e., not the pooled dataset); and</li><li>b. Far-field modelling of the downstream environment should utilize the 95th percentile values of the pooled dataset.</li><li>c. Water quality predictions should be updated accordingly.</li></ul></div> <div>3. Provide a commitment that, prior to the detailed design phase/ licensing to construct, the Proponent will:<ul style="list-style-type: none"><li>a. Conduct additional baseline monitoring to yield dataset(s) that provide robust water quality baseline characterization of seasonal conditions (i.e., freshet, summer, fall, under-ice during winter), including data collection for a range of flow conditions, at the receiver (LA-5) and downstream monitoring locations. At a minimum, data collection should prioritize collecting baseline water quality data for the immediate receiving environment (LA-5);</li><li>b. Update the baseline water quality characterization of seasonal conditions for LA-5 using the 95th percentile values of data measured at LA-5 (i.e., not the pooled dataset) and downstream environment using the 95th percentile values of location-specific data instead of pooled data.</li><li>c. Update the water quality modelling and predictions of risk as needed.</li></ul></div>	
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## **Attachment IR-107 (included in Round 2 submission)**

### **Denison's Response:**

The water quality sampling for baseline was conducted over several years from 2011 to 2019. In years 2015 and 2017 sampling did not occur. Sampling occurred during the open water period and most consistently in May, June, August, September and October. The reviewer is correct in that sampling did not occur on a monthly basis at each of the sampling locations over all years. The table below provides a summary of the periodicity of sampling as it occurred over the described period at each station.

Station ID	2011		2012			2013		2014		2016	2018		2019		Total
	May	Jun	May	Aug	Oct	Aug	Oct	Mar	Apr	Sep	Mar	Jul	Jul	Aug	
Lakes															
LA-1		1		1				1		1	1	1			6
LA-2		1						1		1					3
LA-3		1						1		1					3
LA-4								1		1					2
LA-5				1					1	1					3
LA-6				1				1		1	1	1			5
LA-7				1				1		3					5
LA-8										1					1
LA-9										1					1
LAB-1				1				1		1					3
LAB-2										1					1
LB-1										1					1
LB-2									1	1					2
LB-3				1					1	2					4
LA-1											1	1			2
Sub-Total	0	3	0	6	0	0	0	7	3	17	3	3	0	0	42
Streams															
SA-1	1	1	1	1	1	1	1	1					1	1	10
SA-2	1	1	1	1	1	1	1	1					1	1	10
SA-3	1	1	1	1	1	1	1	1					1	1	10
SA-4	1	1	1	1	1	1	1	1					1	1	10
SA-5	1	1	1	1	1	1	1	1					1	1	10
SA-6	1		1	1	1	1	1		1				1	1	9
SB-1	1	1	1	1	1	1	1	1							8
SB-2	1	1	1	1	1	1	1								7
SB-3	1	1	1	1	1	1	1	1							8
SB-4	1	1	1	1	1	1	1								7
SB-5	1		1	1	1	1	1	1							7
Sub-Total	11	9	11	11	11	11	11	8	1	0	0	0	6	6	96
Total	11	12	11	17	11	11	11	15	4	17	3	3	6	6	138

1. The table above identifies that monthly sampling was not completed at each station on an annual basis.
2. For the purposes of the EA, a statistical analysis was conducted to identify the correlation between the water quality data for LA-1, LA-5, LA-6, and McGowen Lake and the full dataset for the LSA. Datasets were highly correlated and therefore the full dataset for the LSA was used as background concentrations in the IMPACT model. This approach was taken to meet the criteria of REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use

of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”.

3. Samples were collected following applicable field protocols and analysis was conducted by CALA accredited laboratories. The conceptualization of sampling in this remote location loosely followed the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). However, due to the remote nature during the baseline sampling, monthly sampling was not deemed feasible.
4. There are no additional data to add to the analysis at this time for either the near-field or far-field water quality models. It is noted that some additional sampling occurred at Whitefish Lake offshore in the general, vicinity of the proposed discharge (diffuser) location in 2022 and continued in 2023. The concentration of constituents from samples collected in 2022 and 2023 were in the range of those measured previously and as a result no changes to the outcomes of the analyses presented in the Draft EIS and its supporting documents would be expected. Denison agrees that regular water quality data collection at a wider range of sampling stations should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). These data would be used to support the licensing process and contribute to the longer term data records for the site.

## **Attachment IR-107 (Round 3 submission)**

Water quality of the waterbodies within the local study area (LSA) of the Wheeler River Project was surveyed over the period 2011 through 2019 as part of the aquatic environment baseline studies. Generally, surface waters within the LSA are soft and have typically low levels of alkalinity, nutrients (nitrate and phosphorus), total dissolved solids, and total suspended solids. The pH of surface waters within the LSA is slightly acidic to neutral. The concentrations of metals and metalloids are similar throughout the study area. Radionuclide concentrations are low, with the majority of measurements lower than their respective laboratory detection limits.

To determine which dataset was more appropriate to be used as baseline concentrations in the IMPACT model for the purposes of the Environmental Assessment, a statistical analysis of water quality data was undertaken to identify the correlation between the water quality data for only the key assessed lakes (LA-1, LA-5, LA-6, LA-7, and Russell Lake) and the full dataset for all waterbodies surveyed within the LSA.

For the purposes of the Environmental Assessment, a statistical analysis was undertaken to identify the correlation between water quality data from the key assessed lakes (LA-1, LA-5, LA-6, LA-7 and Russell Lake) and from the full dataset for the local study area (LSA), to determine which dataset was more appropriate for use as background concentrations in the IMPACT model.

The following provides methods and results and a summary of findings of this analysis.

Water quality data for lakes and creeks in the LSA were obtained for multiple monitoring events from June 2011 to September 2019. The data consisted of measurements of chemical parameters including physical tests (e.g., major ions and metals concentrations), nutrient tests (e.g., ammonia), and radionuclides (e.g., Pb-210). Data were inputted into the Ecometrix database software Environmental Monitoring Modeling Application (EMMA) and contained indicators for when measurements were less than the reported detection limit (RDL). The parameters examined herein are those chemicals of potential concern (COPC) for purposes of the Environmental Assessment (Table 1).

For the comparison, summary statistics were generated for two datasets: the full dataset and a subset of the key assessed lakes and creeks that link the key assessed lakes. The summary statistics including the number of measured samples (N), the number of measured samples below the reported detection limit (N<RDL), the minimum, the 95th percentiles, the maximum, and the geometric mean and standard deviation were calculated for both datasets using EMMA. For measurements below RDL, the detection limit value was used when generating summary statistics. Finally, the percent difference between geometric mean values of the two datasets were calculated per COPC.

The mean percent difference of key assessed lakes relative to the full LSA dataset across all COPC's was 0% (n = 24) with a minimum absolute percent difference of 0% and an absolute maximum percent difference of 16%. There were 20/24 (83%) with an absolute maximum percent difference of 5% and 22/24 (92%) with an absolute maximum percent difference of 10% (Table 1).



These low percent differences indicated that the datasets are highly correlated and because the full dataset also contained more datapoints and waterbodies, the full dataset for all waterbodies surveyed within the LSA was deemed most appropriate to be used as baseline concentrations in the IMPACT model.

Table 1 Summary statistics and percent difference calculations for COPC water quality parameters in the full LSA dataset (shaded) and key assessed lakes (unshaded).

Category	Parameter	Units	N	N <RDL	N	N <RDL	Minimum	Minimum	95 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	Maximum	Maximum	Geometric Mean	Geometric Mean	Geometric SD	Geometric SD	Δ% (Geometric Mean)
Physical Tests	Specific Conductivity	µS/cm	156	0	100	0	8	8	26	26.2	47	47	17.31	17.095	1.3065	1.3474	-1
	Calcium	mg/L	142	0	86	0	1	1.1	2.	2.075	3.9	3.9	1.4077	1.4296	1.2471	1.2782	2
	Chloride	mg/L	142	7	86	1	<0.1	<0.1	0.7	0.6	0.9	0.7	<0.3223	<0.38561	1.7409	1.4232	16
	Magnesium	mg/L	142	1	86	0	<0.1	0.2	0.6	0.575	0.7	0.7	<0.39237	0.39888	1.2924	1.2429	2
	Sodium	mg/L	142	0	86	0	0.9	1.2	1.8	1.8	2.1	2.1	1.4632	1.5212	1.1545	1.1145	4
	Sulphate	mg/L	142	1	86	1	<0.2	<0.2	1.1	0.9	8.3	8.3	<0.68732	<0.67743	1.6206	1.7778	-1
	Arsenic	mg/L	142	53	86	33	<0.0001	<0.0001	0.0001	0.0001	0.0003	0.0002	<0.00010327	<0.00010081	1.1697	1.0776	-2
	Cadmium	mg/L	142	90	86	58	<1.00E-05	<1.00E-05	0.00003	0.00003	0.00007	0.00007	<0.000012007	<0.000012025	1.4949	1.5272	0
	Chromium	mg/L	142	142	86	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	1.	1.	0
	Cobalt	mg/L	142	138	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010098	<0.0001	1.0854	1.	-1
	Copper	mg/L	142	139	86	84	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0008	<0.00020394	<0.00020489	1.1522	1.181	0
	Lead	mg/L	142	135	86	83	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.0012	<0.0001055	<0.00010595	1.3574	1.385	0
	Molybdenum	mg/L	142	136	86	81	<0.0001	<0.0001	<0.0001	<0.000175	0.0013	0.0013	<0.00010684	<0.00011065	1.4246	1.5624	3
	Nickel	mg/L	142	101	86	79	<0.0001	<0.0001	<0.0003	<0.0001	0.0006	0.0004	<0.00011447	<0.00010376	1.4116	1.2247	-10
	Selenium	mg/L	142	140	86	85	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.00010049	<0.00010081	1.0599	1.0776	0
	Uranium	mg/L	142	141	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010049	<0.0001	1.0599	1.	0
	Vanadium	mg/L	142	110	86	78	<0.0001	<0.0001	<0.0002	<0.0001	0.0005	0.0003	<0.00010733	<0.00010129	1.2805	1.1258	-6
	Zinc	mg/L	142	95	86	58	<0.0005	<0.0005	<0.00278	<0.00235	0.02	0.02	<0.00068059	<0.00069751	1.8847	1.9699	2
Nutrients	Ammonia as N	mg/L	142	104	86	59	<0.01	<0.01	<0.0595	<0.05	1.2	0.91	<0.014626	<0.014875	2.2367	2.1715	2
	Nitrate	mg/L	103	70	63	45	<0.04	<0.04	<0.436	<0.35	0.66	0.6	<0.067313	<0.0661	2.4855	2.4298	-2
Radionuclides	Lead-210	Bq/L	142	136	86	81	<0.02	<0.02	<0.02	<0.02	0.05	0.05	<0.020402	<0.020502	1.1181	1.1306	0
	Polonium-210	Bq/L	142	112	86	75	<0.005	<0.005	<0.008	<0.007	0.02	0.01	<0.0053637	<0.0051995	1.2182	1.1453	-3
	Radium-226	Bq/L	142	98	86	59	<0.005	<0.005	<0.00995	<0.00975	0.01	0.01	<0.0055717	<0.0055727	1.2272	1.2315	0
	Thorium-230	Bq/L	142	138	86	82	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.010098	<0.010163	1.0854	1.1108	1
	Full LSA dataset																
	Key assessed lakes dataset																

Notes: N is number of lakes/creek sampling locations; SD is standard deviation.

**Attachment IR-107 (Round 4 submission):**

Attachment IR-107 (Round 4 submission):

Attachment IR-107 (Round 4) Table 1: Summary statistics and percent difference calculations for COPC water quality parameters in the full LSA dataset (shaded) and key assessed lakes (unshaded) (from IR-107 Round 3) and updated at Round 4 to include water quality results from water samples collected at Whitefish Lake (LA-5) in June, July, August, and September 2024.

Category	Parameter	Units	N	N <RDL	N	N <RDL	Minimum	Minimum	95 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	Maximum	Maximum	Geometric Mean	Geometric Mean	Geometric SD	Geometric SD	Δ% (Geometric Mean)	Whitefish Lake (LA-5) June 22, 2024		Whitefish Lake (LA-5) July 18, 2024		Whitefish Lake (LA-5) August 16, 2024		Whitefish Lake (LA-5) September 10, 2024	
																		Result	Within range of previous samples	Result	Within range of previous samples	Result	Within range of previous samples	Result	Within range of previous samples
Physical Tests	Specific Conductivity	µS/cm	156	0	100	0	8	8	26	26.2	47	47	17.31	17.095	1.3065	1.3474	-1	20	Yes	15	Yes	16	Yes	14	Y
	Calcium	mg/L	142	0	86	0	1	1.1	2.	2.075	3.9	3.9	1.4077	1.4296	1.2471	1.2782	2	1.12	Yes	1.3	Yes	1.3	Yes	1.3	Y
	Chloride	mg/L	142	7	86	1	<0.1	<0.1	0.7	0.6	0.9	0.7	<0.3223	<0.38561	1.7409	1.4232	16	<1.0	Higher than max <sup>1</sup>	<1.0	Higher than max <sub>1</sub>	<1.0	Higher than max <sup>1</sup>	<1.0	Higher than max <sub>1</sub>
	Magnesium	mg/L	142	1	86	0	<0.1	0.2	0.6	0.575	0.7	0.7	<0.39237	0.39888	1.2924	1.2429	2	0.32	Yes	0.4	Yes	0.4	Yes	0.4	Y
	Sodium	mg/L	142	0	86	0	0.9	1.2	1.8	1.8	2.1	2.1	1.4632	1.5212	1.1545	1.1145	4	1.37	Yes	1.6	Yes	1.6	Yes	1.6	Y
	Sulphate	mg/L	142	1	86	1	<0.2	<0.2	1.1	0.9	8.3	8.3	<0.68732	<0.67743	1.6206	1.7778	-1	9.2	Higher than max but an order of magnitude below long-term benchmark (EIS Table 8.2-2). Additionally, compared to the pooled max, this result is within the range of method variability	0.5	Yes	0.4	Yes	0.5	Y
	Arsenic	mg/L	142	53	86	33	<0.0001	<0.0001	0.0001	0.0001	0.0003	0.0002	<0.00010327	<0.00010081	1.1697	1.0776	-2	0.000094	Lower than min	0.00011	Yes	0.00014	Yes	0.0001	Y
	Cadmium	mg/L	142	90	86	58	<1.00E-05	<1.00E-05	0.00003	0.00003	0.00007	0.00007	<0.000012007	<0.000012025	1.4949	1.5272	0	0.000005	Lower than min	<0.00002	Lower than min	0.000003	Lower than min	0.000002	Lower than min
	Chromium	mg/L	142	142	86	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	1.	1.	0	0.0002	Lower than min	0.00009	Lower than min	0.00064	Higher than max but below long-term benchmark (EIS Table 8.2-2). The concentration of dissolved Cr in the same sample was 0.0001 mg/L, suggesting an issue with particulates	0.0001	Lower than min
	Cobalt	mg/L	142	138	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010098	<0.0001	1.0854	1.	-1	0.00001	Lower than min	0.000011	Lower than min	0.000035	Lower than min	0.000014	Lower than min
	Copper	mg/L	142	139	86	84	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0008	<0.00020394	<0.00020489	1.1522	1.181	0	0.0001	Lower than min	<0.00007	Lower than min	<0.00007	Lower than min	<0.00007	Lower than min
	Lead	mg/L	142	135	86	83	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.0012	<0.0001055	<0.00010595	1.3574	1.385	0	<0.00002	Lower than min	<0.00001	Lower than min	0.00002	Lower than min	<0.00001	Lower than min
	Molybdenum	mg/L	142	136	86	81	<0.0001	<0.0001	<0.0001	<0.000175	0.0013	0.0013	<0.00010684	<0.00011065	1.4246	1.5624	3	< 0.00005	Lower than min	0.00002	Lower than min	0.00002	Lower than min	0.00002	Lower than min
	Nickel	mg/L	142	101	86	79	<0.0001	<0.0001	<0.0003	<0.0001	0.0006	0.0004	<0.00011447	<0.00010376	1.4116	1.2247	-10	0.00019	Yes	0.00005	Lower than min	0.00009	Lower than min	0.00006	Lower than min
	Selenium	mg/L	142	140	86	85	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.00010049	<0.00010081	1.0599	1.0776	0	< 0.00004	Lower than min	0.00002	Lower than min	0.00003	Lower than min	<0.00002	Lower than min
	Uranium	mg/L	142	141	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010049	<0.0001	1.0599	1.	0	<0.000005	Lower than min	0.000005	Lower than min	0.000005	Lower than min	0.000016	Lower than min
	Vanadium	mg/L	142	110	86	78	<0.0001	<0.0001	<0.0002	<0.0001	0.0005	0.0003	<0.00010733	<0.00010129	1.2805	1.1258	-6	<0.0002	Yes	<0.0001	Yes	<0.0001	Yes	<0.0001	Y
	Zinc	mg/L	142	95	86	58	<0.0005	<0.0005	<0.00278	<0.00235	0.02	0.02	<0.00068059	<0.00069751	1.8847	1.9699	2	<0.001	Yes	0.0003	Lower than min	0.0005	Yes	0.0004	Lower than min
Nutrients	Ammonia as N	mg/L	142	104	86	59	<0.01	<0.01	<0.0595	<0.05	1.2	0.91	<0.014626	<0.014875	2.2367	2.1715	2	<0.05	Yes	<0.01	Yes	<0.01	Yes	<0.01	Y
	Nitrate	mg/L	103	70	63	45	<0.04	<0.04	<0.436	<0.35	0.66	0.6	<0.067313	<0.0661	2.4855	2.4298	-2	<0.10	Yes	<0.04	Yes	<0.04	Yes	<0.04	Y
Radionuclides	Lead-210	Bq/L	142	136	86	81	<0.02	<0.02	<0.02	<0.02	0.05	0.05	<0.020402	<0.020502	1.1181	1.1306	0	<1	Higher than max <sup>1</sup>	<0.02	Yes	<0.02	Yes	<0.02	Y
	Polonium-210	Bq/L	142	112	86	75	<0.005	<0.005	<0.008	<0.007	0.02	0.01	<0.0053637	<0.0051995	1.2182	1.1453	-3	<0.010	Yes	<0.005	Yes	0.007	Yes	0.008	Y
	Radium-226	Bq/L	142	98	86	59	<0.005	<0.005	<0.00995	<0.00975	0.01	0.01	<0.0055717	<0.0055727	1.2272	1.2315	0	<0.010	Yes	<0.005	Yes	<0.005	Yes	0.005	Y
	Thorium-230	Bq/L	142	138	86	82	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.010098	<0.010163	1.0854	1.1108	1	<0.010	Yes	0.01	Yes	<0.01	Yes	<0.01	Y

	Full LSA dataset
	Key assessed lakes dataset

**Notes:** N is number of lakes/creek sampling locations; SD is standard deviation.  
Analysis of 2024 samples included low-level trace metal analysis, resulting in lower detection limits for some parameters compared to previous results.  
<sup>1</sup> These 2024 results were higher than pooled maximum value because of a higher detection limit.

Attachment IR-107 (Round 4) Table 2: Wheeler River Project sampling locations, frequencies, and parameters for the pre-operational surface water monitoring program

Station ID	Description	Sampling frequency	Water quality and water chemistry parameters
SA4	LA6 inlet tributary	Monthly during the open water period and twice under ice.	Field water quality measurements (dissolved oxygen, pH, conductivity, temperature) and water chemistry laboratory analysis (the following analytes are currently included in surface water quality monitoring: Bicarbonate; Carbonate; Chloride; Chloride, dissolved; Hydroxide; P. alkalinity; pH; Specific conductivity; Sum of ions; Total alkalinity; Total hardness; Ammonia as nitrogen; Nitrate; Total Kjeldahl nitrogen; Mercury; Methylmercury; Organic carbon; Organic carbon, dissolved; Fluoride; Total dissolved solids; Lead-210; Polonium-210; Radium-226; Thorium-228; Thorium-230; Thorium-232; Calcium; Calcium, dissolved; Magnesium; Magnesium, dissolved; Potassium; Potassium, dissolved; Sodium; Sulfate; Sulfate, dissolved; Aluminum; Aluminum, dissolved; Antimony; Antimony, dissolved; Arsenic; Arsenic, dissolved; Barium; Barium, dissolved; Beryllium; Beryllium, dissolved; Bismuth; Bismuth, dissolved; Boron; Boron, dissolved; Cadmium; Cadmium, dissolved; Chromium; Chromium, dissolved; Cobalt; Cobalt, dissolved; Copper; Copper, dissolved; Iron; Iron, dissolved; Lead; Lead, dissolved; Lithium; Lithium, dissolved; Manganese; Manganese, dissolved; Molybdenum; Molybdenum, dissolved; Nickel; Nickel, dissolved; Rubidium; Rubidium, dissolved; Selenium; Selenium, dissolved; Silicon, soluble; Silicon, soluble, dissolved; Silver; Silver, dissolved; Strontium; Strontium, dissolved; Sulfur; Sulfur, dissolved; Thallium; Thallium, dissolved; Tin; Tin, dissolved; Titanium; Titanium, dissolved; Uranium; Uranium, dissolved; Vanadium; Vanadium, dissolved; Zinc; Zinc, dissolved; Zirconium; Zirconium, dissolved; Phosphorus; Phosphorus, dissolved. Note that metal analysis (both total and dissolved) are being done using a low-level analytical techniques)
SA5	LA6 inlet tributary		
LA6	Whitefish Lake (north)		
LA5	Whitefish Lake (south)		
LA1	McGowan Lake		
LAB1	Russell Lake		



IR- 114

- Department: ECCC, CNSC
- Project Effects Link Change to an environmental component due to hazardous contaminants
- Reference to EIS, appendices, or supporting documentation: Section 8.2.4.2.3 and Section 8.2.4.2.4

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 5, 2024)	IR (ROUND 4, Sept. 6, 2024)	Denison Response (ROUND 4, October 15 2024)
IR-114	-	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>	<p>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</p> <p>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p> <p>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large- bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</p> <p>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</p>	<p>See response in Attachment IR-114.</p>	<p>This response has not been accepted.</p> <p>The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER.</p> <p>The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations.</p> <p>All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds.</p> <p>Please:</p> <p>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</p> <p>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO3) in effluent and the receiving environment.</p> <p>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</p> <p>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p>	<p>Please see Attachment IR-114. Briefly, Tables 8.2-9, 8.2-10 and 8.2-13 have been updated in the revised Draft EIS as requested.</p>	<p>In response to the FIRT’s previous review, Denison provided responses to the following outstanding requests from ECCC:</p> <p>1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus.</p> <p>2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO3) in effluent and the receiving environment.</p> <p>3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe.</p> <p>4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</p> <p>The Proponent has resolved item two and four of the above, but items one and three require additional follow up.</p> <p>Regarding item one, further corrections to Table 8.2-13 are necessary:</p> <ul style="list-style-type: none"><li>• There are several inconsistencies in the footnotes:<ul style="list-style-type: none"><li>◦ numbers 2 &amp; 3 are missing in the footnotes at the bottom;</li><li>◦ there is no reference to footnote 2 in the table; and</li><li>◦ The asterisk “*” , which is sometimes used to qualify the source of screening concentration, is not defined.</li></ul></li><li>• Screening criteria are missing for aluminum and iron, and should be sourced from CCME or SEQG rather than the MDMER as listed in the table.</li><li>• Uranium-234 and uranium-238 are missing from the table, even though they have been identified as contaminants of potential concern.</li><li>• Proposed screening criteria for cobalt, copper, manganese, nickel, phosphorous and un-ionized ammonia are inadequate, see comment in IR-108 &amp; IR-108-R1.</li></ul>	<p>Item 1 – further corrections to Table 8.2-13 have been made (please see updated Table 8.2-13 in Attachment IR-114-R3) as follows:</p> <ul style="list-style-type: none"><li>• Footnotes were restructured and are provided in Attachment IR-114-R3 for each of the tables that were updated.</li><li>• Screening criteria were added for aluminum and iron, and sourced from CCME or SEQG.</li><li>• Uranium-234 and uranium-238 were added to the table.</li><li>• Proposed screening criteria for cobalt, copper, manganese, nickel, phosphorous and un-ionized ammonia were changed as applicable and are consistent with other tables as associated with IR-108 &amp; IR-108-R1.</li><li>• Un-ionized ammonia is updated to only be provided in one line. The first line provided previously was associated with a miscalculation of the un-ionized ammonia value and was the unionized ammonia-N value. The values provided as part of Attachment IR-114-R3 should be considered correct for unionized ammonia for comparison against the guideline.</li><li>• The column with screening values now is consistent across all tables that are presented as part of Section 8 and in Attachments for IRs 108/108-R1, 114 and 115.</li><li>• Table 8.2-14 was updated with corrections to screening criteria necessary for this IR as well as for IR-108 and IR-115 (please see Attachment IR-114-R3).</li><li>• Table 8.2-10 was updated to include the source for the short-term screening criteria value for arsenic (please see Attachment IR-114-R3 for updated Table 8.2-10).</li></ul>	<p>In a supplementary submission provided on July 5th, Denison provided corrections to some tables. However, errors and conflicting information remain within and between tables.</p> <p>In order to resolve this IR, Denison are expected to correct the following issues:</p> <p>1) Provide the following updates to Tables 8.2-8, 8.2-10, 8.2-13, and 8.2-14 to correct the errors outlined. Additionally, in Table 8.2-13 MDMER Schedule 4, the maximum authorized effluent concentration limits are not appropriate for use as short-term benchmark water quality guidelines. The Schedule 4 limits are only applicable to effluent and represent concentrations in effluent that cannot be exceeded at end-of-pipe, not to receiving environment surface water concentrations, and are not a reliable indicator of acutely lethal concentrations of constituents in receiving environment surface water.</p> <ul style="list-style-type: none"><li>• Tables 8.2-8 and 8.2-10: A) Temperature: long-term screening criteria is “ambient temp” and should be updated to “narrative”, as has been used in updated Tables 8.2-2. The narrative is already included in the footnotes of Table 8.2-8 and 8.2-10, so the tables should be updated as well.</li><li>• Table 8.2-13: A) Cadmium: both short-and long-term benchmarks are erroneous and should be corrected to values found in updated Table 8.2-2. B) Chloride: long-term benchmark is erroneous and should be corrected to value found in updated Table 8.2-2. C) Iron, Lead-210, and Uranium-234 &amp; -238: long-term benchmarks are missing and should be the same values found in updated Table 8.2-2 or Table 8.2-8. Alkalinity and nitrate have been added to the table as requested, however predicted maximum concentrations are only presented for Whitefish Lake Middle and South. The proponent should describe why there are no estimates for these parameters in other lakes, and how they intend to fill these gaps.</li></ul> <p>•Table 8.2-14:</p> <p>A.The removal of constituents of potential concern from future centuries review need to be justified by the proponent. Otherwise, all parameters included in Table 8.2-13 should also be included in Table 8.2-14. Presently alkalinity, nitrate, uranium-234 &amp; -238 are missing.</p> <p>B.Uranium: the long-term screening concentration is erroneous and should be corrected to the value found in all other tables.</p> <p>•Footnotes:</p> <p>A.The footnotes for each table should reflect what is in the table.</p> <p>B.All tables: acronyms used in the references that need explanations in the footnotes include: “CCME”, “HC”, “BC MOE”, “FEQG” and “MDMER”.</p> <p>C.All tables: explanations in the footnotes for acronyms that were not used in the tables: “SSWQO”, “TKN”, and “TOC”.</p>	<p>1) The updates were completed as requested. In Table 8.2-13 MDMER Schedule 4 maximum authorized effluent limits were removed and tables updated.</p> <p>Tables 8.2-8 and 8.2-10</p> <p>A) Table were updated to include “narrative” rather than “ambient temp” as requested.</p> <p>Table 8.2-13:</p> <p>A) Cadmium values were checked and were correct, however, chloride values were incorrect and had the cadmium footnote associated with them. This was corrected.</p> <p>B) Chloride long term benchmark was corrected to the value found in Table 8.2-2.</p> <p>C) Iron, Lead-210 and Uranium-234 and Uranium-238 long-term benchmarks were missing but have been added as per the values consistent with Table 8.2-2 and 8.2-8.</p> <p>D) Alkalinity and nitrate were not collected for other locations during baseline assessments. It is intended that these constituents will be added to the pre-construction water sampling suite of parameters to ensure consistency and completeness for additional analysis conducted for licencing.</p> <p>Table 8.2-14</p> <p>A) <b>Nitrate:</b> Nitrate was not included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) as it is not considered a COPC associated with the ISR mining process for this project. Nitrate concentrations were below laboratory reported detection limits in the metallurgical testing, where tested, as shown in Table F-2 of Appendix 7C of the EIS. Further, nitrate concentrations are, with one exception for a groundwater monitoring well in overburden (GWR-036), below or very close to the laboratory reported detection limit, as shown in Table D-2 of Appendix 7C of the Final EIS. Baseline nitrate concentrations are low ( &lt; 0.5 mg/L) in surface water bodies assessed for the</p>



Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 5, 2024)	IR (ROUND 4, Sept. 6, 2024)	Denison Response (ROUND 4, October 15 2024)
							<ul style="list-style-type: none"> <li>Alkalinity and nitrate have been added to the table as requested, however predicted maximum concentrations are only presented for Whitefish Lake Middle and South. The proponent should describe why there are no estimates for these parameters in other lakes, and how they intend to fill these gaps.</li> <li>Un-ionized ammonia appears in two separate lines in the table with concentrations differing by 3-4 orders of magnitude and different screening values. A single line entry with accurate values should be retained. The Proponent should provide an explanation for the error in order to give the reviewer confidence that the correct values are retained.</li> <li>The column with screening values does not always use the most conservative value from Table 8.2-8. See comment IR-115 for request to provide justifications.</li> </ul> <p>Table 8.2-14 should be updated with corrections to screening criteria necessary for this IR as well as for IR-108 and IR-115. Additional follow up for Table 8.2-10 can be found under IR-108 and IR-108-R1.</p> <p>In the Proponent’s response to item three of the IR, Table 8.2-10 is missing the source for the short-term screening criteria value for arsenic. The Proponent should update Table 8.2-10 to include the source for the short-term screening criteria value for arsenic.</p>		<p>Removing these would increase clarity. D. Footnote “*” should be removed. It explains how ammonia concentration is calculated and is not referred to in Tables 8.2-8, 8.2-10 &amp; 8.2-13. In Table 8.2-14 it is associated by cadmium, which does not make sense. E. Footnote (4) should be removed. It states the short-term screening criterion for chloride limit is “<i>Based on water hardness &gt;0 to &lt;17 mg/L</i>”. This appears erroneous since neither the CCME guideline nor the SEQG is hardness based. F. Tables 8.2-13 &amp; 8.2-14 do not refer to the footnotes “TDS”, “narrative”, (4) and (7), and removing them would help clarity.</p> <p>2) CNSC/ECCC staff agree that the minor baseline exceedances of copper concentrations in water do not constitute the use of a guideline that is a magnitude of order greater than the copper FEQG. The copper FEQG guideline is the most restrictive guideline and based on current science and site-specific conditions, whereas the CCME guideline is quite dated and does not incorporate the use of site-specific environmental modifying factors. As there are background concentrations of copper that do exceed the copper FEQG, there is the potential that biota may already be stressed due to these exceedances. However, there is not currently enough baseline characterization data within the immediate receiving environment to conclude the level of risk to receptors and if there are consistent exceedances of water quality guidelines. Following the principles of the Precautionary Approach, to be conservative Denison are expected to:</p> <p>A) Update the screening criteria used for the EIS and ERA (and all relevant tables) to utilize the more stringent FEQG guideline of 0.0002 mg/L as calculated using the currently available baseline data.</p> <p>B) Update the ERA effects assessment for copper to utilize the FEQG with regards to selected Toxicity Reference Values (TRVs) and risk characterization to receptors.</p> <p>C) Collect further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water and sediment quality and any potential exceedances of baseline water quality guidelines.</p>	<p>project, as reported in Table 8.2.2 of Chapter 8 of the final EIS. Nitrate concentrations are thus expected to remain at baseline levels in future centuries. A note has been added to Table 8.2-14 to indicate that nitrate is not a COPC in the future centuries and as such is expected to remain at baseline levels.</p> <p><b>Alkalinity:</b> was included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) but not included in the future centuries assessment in IMPACT. Using the output from the geochemical reactive transport model (i.e., the mass flux of alkalinity, reported as “C” in Table 4-4 of Appendix 7C of the Final EIS), the approach and input parameters used in the IMPACT model (described in Appendix A to Appendix 10-A of the Final EIS), and assuming that alkalinity (as bicarbonate ion primarily at the circumneutral pH value Whitefish Lake) does not interact with the sediments, maximum alkalinity values in Whitefish Lake (LA-5) were calculated to be 8.1 mg/L as CaCO3 versus the mean baseline value of 7.7 mg/L as CaCO3 (Table 8.2-2 of Chapter 8 of the Final EIS). This value has been included in Table 8-2.14, is within the range of baseline alkalinity values observed in that lake (3-15 mg/L as CaCO3 in Whitefish Lake South (LA-5)) and represents a 5.2 % increase from mean baseline concentrations. The alkalinity in the future centuries was not calculated for the other lakes as changes with respect to baseline conditions will be negligible (i.e., not outside of the range of values in each lake observed at baseline). <b>U-234 and U-238:</b> Uranium was modelled in the future centuries scenario and U-234 and U-238 (Bq/L) were calculated. The results have been added to Table 8.2-14.</p> <p>B) Uranium long-term screening value was</p>

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 5, 2024)	IR (ROUND 4, Sept. 6, 2024)	Denison Response (ROUND 4, October 15 2024)
										<p>updated to be consistent with all other tables</p> <p>Footnotes:</p> <p>A) Footnotes for each table have been updated</p> <p>B) All table acronyms have been explained as applicable.</p> <p>C) Acronyms that were not used in a table were removed from the footnotes</p> <p>D) “*” has been removed from the document where explaining ammonia concentration calculation.</p> <p>E) Confirmed that this statement was correct. Footnote 4 was removed from all tables, and all footnote numbering adjusted to reflect changes.</p> <p>F) TDS and “Narrative” footnotes were removed. Footnote 7 was missing in the table, so was added. Footnote 4 removed from all tables.</p> <p>2)</p> <p>A) The screening criteria used for the EIS and ERA (and all relevant tables) has been updated to utilize the more stringent FEQG guideline of 0.0002 mg/L. See Attachment IR-114 Round 4.</p> <p>B) The TRVs have been re-evaluated using the FEQG Biotic Ligand Model. See Attachment IR-114 Round 4.</p> <p>C) Denison is committed to collection of further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water (refer to response to Round 4 IR-107 for water quality results from Whitefish Lake from June to September 2024) and sediment quality and any potential exceedances of water quality guidelines and this information will be further presented and analyzed as part of licencing.</p>

## **Attachment: IR-114 (included in Round 1 Submission)**

1) Please see updated Tables 8.2-9 and 8.2-10 from the draft EIS below. Water quality predictions for the well mixed portion of LA-5 for each of the three flow scenarios (described in Section 8.2.4.2.3 and Table 8.2-7 of the draft EIS) are provided in the updated Table 8.2-10 below. Predicted site discharge concentrations that exceed respective receiver WQOs are bolded. Chloride, sulphate, TDS, arsenic, cadmium, chromium, cobalt, copper, selenium, and uranium, thorium-230, radium-226, lead-210, and polonium-210 predicted discharge concentrations are above receiver WQOs. However, under all three flow scenarios, the predicted water quality for all constituents is below respective WQOs within the well mixed portion of LA-5, indicating that sufficient dilution is present within LA-5 to meet objectives. Updated Table 8.2-13 is provided below. Water quality predictions have been added for MDMER constituents listed under Schedule 4 and Schedule 5. There are no predicted exceedances of water quality guidelines for any of the COPCs during Construction, Operation, or Decommissioning

2) The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is a reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.

3) The table below (IR-114 Table 1) shows a summary of baseline concentrations of total mercury in surface water within the LSA. Sediment was not analyzed for mercury during previous baseline surveys. Baseline water quality in the LSA and RSA showed no indication of total mercury present above detectable limits and as such, the potential for methyl-mercury to be detected was unlikely. Generally, 60 to 95% of total mercury concentrations in fish muscle tissues are present in the form of methyl-mercury. Table 8.5-2 of Section 8.5 of the EIS provides a full summary of tissue constituent concentrations for key species from the Icelder River and Russell Lake. A conservative approach of assuming 95% of mercury in the tissues is present in the methylated form could be used for comparative purposes. These data supplemented with more current baseline data for water, sediment and fish tissues specific to total and methyl-mercury prior to the onset of site development will provide a robust database for comparative purposes during the subsequent development and operation on site.

4) Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in the ERA in Appendix 10-A. The

following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."

As baseline surface water did not identify measurable concentrations of total mercury in the LSA or RSA (See IR-114 Table 1 below) and deposition to large water bodies such as lakes is not likely to contribute to the methyl mercury concentration in the Wheeler River receiving waters, it is most reasonable to conclude that changes in total and methyl mercury can be adequately monitored in relation to sulphate inputs. Denison will undertake monitoring of total and methyl mercury as it relates to the discharge of sulphate to Whitefish Lake.

References: Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I

Table 8.2-9: Predicted Effluent Water Quality (Updated to include MDMER Constituents)

Constituent	Unit	Discharge Concentration
		(max predicted)
Chloride	mg/L	<b>600</b>
Sulphate (Hardness)	mg/L	<b>3915</b>
Sulphate	mg/L	<b>3915</b>
TDS	mg/L	<b>6420</b>
TSS	mg/L	6
Arsenic	mg/L	<b>0.006</b>
Cadmium	mg/L	<b>0.0018</b>
Chromium	mg/L	<b>0.025</b>
Cobalt	mg/L	<b>0.0030</b>
Copper	mg/L	<b>0.022</b>
Lead	mg/L	0.0003
Molybdenum	mg/L	2.5
Nickel	mg/L	0.014
Selenium	mg/L	<b>0.042</b>
Uranium	mg/L	<b>0.057</b>
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Mercury	mg/L	0.000001
Ammonia (as N)	mg/L	3.9
Un-ionized Ammonia*	mg/L	0.0078
Phosphorus	mg/L	N/A
Thorium-230	Bq/L	<b>0.9</b>
Radium-226	Bq/L	<b>0.15</b>
Lead-210	Bq/L	<b>0.419</b>
Polonium-210	Bq/L	<b>0.15</b>

Note: \* - Calculated value

Table 8.2-10: Near-field Receiving Water Quality Results (Updated to include MDMER Constituents)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed	LA-5 Well Mixed	LA-5 Well Mixed
					(7Q10)	(Monthly Low)	(Average)
Chloride	mg/L	120	SEQG/CCME	<b>600</b>	10.06	6.18	4.69
Sulphate (Hardness)	mg/L	429	BC MOE*	<b>3915</b>	63.83	38.51	28.76
Sulphate	mg/L	128	BC MOE	<b>3915</b>	63.83	38.51	28.76
TDS	mg/L	500	SEQG	<b>6420</b>	131.41	90.06	74.13
TSS	mg/L	15	Schd 4 - MDMER	6	3.9	3.9	3.9
Arsenic	mg/L	0.01	SEQG/CCME	<b>0.006</b>	0.00020	0.00016	0.00014
Cadmium	mg/L	0.0003	SEQG/CCME*	<b>0.0018</b>	0.00005	0.00004	0.00003
Chromium	mg/L	0.001	SEQG/CCME	<b>0.025</b>	0.00090	0.001	0.00068
Cobalt	mg/L	0.0003	FEQG	<b>0.0030</b>	0.00015	0.00013	0.00012
Copper	mg/L	0.004	SEQG/CCME*	<b>0.022</b>	0.00055	0.00041	0.00036
Lead	mg/L	0.005	CCME	0.0003	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.07	WHO	2.5	0.040	0.024	0.018
Nickel	mg/L	0.07	WHO	0.014	0.0003	0.0002	0.0002
Selenium	mg/L	0.001	SEQG/CCME	<b>0.042</b>	0.0008	0.001	0.0004
Uranium	mg/L	0.02	SEQG/CCME	<b>0.057</b>	0.0010	0.0006	0.0005
Vanadium	mg/L	0.12	FEQG	0.059	0.0011	0.0007	0.0005
Zinc	mg/L	0.1	FEQG**	0.042	0.0018	0.0015	0.0014
Mercury	mg/L	0.000026	SEQG/CCME	0.000001	0.00001	0.00001	0.00001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9	0.13	0.11	0.10
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078	0.00008	0.00006	0.00006
Phosphorus	mg/L	0.015	BC MOE	N/A	0.01	0.01	0.01
Thorium-230	Bq/L	0.6	HC	<b>0.9</b>	0.024	0.019	0.016
Radium-226	Bq/L	0.11	SEQG	<b>0.15</b>	0.008	0.007	0.007
Lead-210	Bq/L	0.2	HC	<b>0.419</b>	0.026	0.024	0.023
Polonium-210	Bq/L	0.1	HC	<b>0.15</b>	0.007	0.006	0.006
Notes							
(1) <b>Bolded values</b> are those that exceed the screening concentrations							
Un-ionized ammonia calculated value							
* Hardness induced guideline, assuming hardness >250 mg/L							
** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L							

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated to include available MDMER Constituents)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	6.14	6.11	4.20	4.16	3.26	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.01	SEQG/CCME
Cadmium	mg/L	0.000024	0.000023	0.000040	0.000039	0.000033	0.000033	0.000030	0.0003	SEQG/CCME*
Chromium	mg/L	0.000530	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*
Lead	mg/L	0.000124	0.000114	0.000118	0.000130	0.000114	0.000114	0.000116	0.005	CCME
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.0240	0.0158	0.0156	0.0118	0.07	WHO
Nickel	mg/L	0.00039	0.00038	0.00051	0.00050	0.00046	0.00046	0.00044	0.07	WHO
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.00020	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG
Zinc	mg/L	0.00070	0.00069	0.00106	0.00103	0.00090	0.00090	0.00084	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.03950	0.03368	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.01430	0.6	HC
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Notes										
(1) Bolded values are those that exceed the screening concentrations										
* Hardness induced guideline, assuming hardness >250 mg/L										
** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L										
Un-ionized ammonia represented by calculated values										



IR-114 Table 1: Total and Dissolved Mercury Concentrations in the LSA and RSA

Parameter	Total Mercury, Dissolved	Total Mercury
Units	mg/L	mg/L
Total Count	40	59
Count (<RDL)	39	46
Minimum	<1.00E-05	<1.00E-07
5th Percentile	<1.00E-05	<8.20E-07
50th Percentile	<1.00E-05	<1.00E-05
95th Percentile	<1.00E-05	<1.00E-05
Maximum	<1.00E-05	<1.00E-05
Arithmetic Mean	<1.00E-05	<7.63E-06
StdDev	2.76E-12	3.70E-06
Std Error	0	4.81E-07
Geometric Mean	<1.00E-05	<5.38E-06
Geometric StdDev	1.	3.281

Notes:

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.
2. The reporting locations are: "LA-1", "LA-1-Bottom", "LA-5", "LA-6", "LAB-1", "LAB-2", "SA-1", "SA-2", "SA-3", "SA-6".

Attachment IR-114 (included in Round 2 submission)

The requested tables have been updated to include water quality thresholds derived from receiving environment parameters (background) as well as effluent induced concentrations for completeness. Please see the tables below and updated in Section 8 of the EIS.

Table 8.2-9: Predicted Effluent Water Quality

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
General Chemistry, Nutrients and Anions		
Alkalinity	mg/L	12.4
Ammonia (as N)	mg/L	3.9
Un-Ionized Ammonia	mg/L	4.74
Hardness	mg/L (as CaCO3)	250
Conductivity	µS/cm	21.7
Nitrate	mg/L	0.249
pH	pH Unit	7
Phosphorus	mg/L	N/A
Sulphate	mg/L	2600
TDS	mg/L	6420
Temperature	deg C	16.5
TSS	mg/L	6
Chloride	mg/L	600
Metals		
Aluminum	mg/L	0.051
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.0027
Copper	mg/L	0.02
Cyanide	mg/L	NA
Iron	mg/L	0.0039
Lead	mg/L	0.0003
Manganese	mg/L	0.03
Mercury	mg/L	0.00001
Molybdenum	mg/L	2.5
Nickel	mg/L	0.0138
Selenium	mg/L	0.042
Strontium	mg/L	1.68
Thallium	mg/L	0.0006
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Radiological		
Lead-210	Bq/L	0.42
Polonium-210	Bq/L	0.15
Radium-226	Bq/L	0.15
Thorium-230	Bq/L	0.9
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7

Table 8.2-10: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced >250 mg/L)]	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced >250 mg/L)]	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(4)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	6.98	6.98	SEQG/CCME	(4)	4.74	0.08	0.05	0.03
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)	0.03	0.0103	0.0102	0.0101
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	(12)	2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)	600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(5)	0.051	0.0	0.0	0.0
Arsenic	mg/L	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--	0.006	0.000	0.000	0.000
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME		0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.000295	0.00149	FEQG	(10)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--	0.02	0.001	0.000	0.000
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	0.0	0.0	0.0
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	(8)	0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	0.0138	0.00	0.00	0.00
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	205	2.5	FEQG	(11)	1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	(13)	0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

Notes:

- (1) Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmp.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.
- (2) Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).
- (3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO<sub>3</sub> equivalents in mg/L.
- (4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)
- (5) Based on a pH of >6.5.
- (6) Based on water hardness >0 to <17 mg/L.
- (7) Based on water hardness >0 to <82 mg/L.
- (8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L
- (9) Guideline is based on dissolved zinc.
- (10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.
- (11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.
- (12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)
- (13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is  $(e^{[0.979123[\ln(\text{hardness})]-8.64497}]) * 1000$  (SEQQ via AEP 1996b)

(20) Based on benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L (CaCO<sub>3</sub>) (251 mg/L)

(22) MDMA Schedule 4 - maximum authorized monthly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Alkalinity <sup>(1)</sup>	mg/L	NE	NE	12.4	12.4	NE	NE	NE	--	--	
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614		MDMER Sched 5	(5)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368	5.74	SEQG/CCME	(4)
Un-ionized Ammonia	mg/L	0.01770	0.01770	0.06331	0.06310	0.04813	0.04780	0.04075	6.98	SEQG/CCME	(4)
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	0.0003	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	120	SEQG/CCME	(6)
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME	
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG	(10)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425		MDMER Sched 5	
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116	0.005	CCME	(8)
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC	
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.64	SEQG/CCME	(3)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118	0.07	WHO	(16)
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044	0.07	WHO	(16)
Nitrate <sup>(1)</sup>	mg/L	NE	NE	0.249	0.249	NE	NE	NE	3	SEQG	
Phosphorus <sup>(1)</sup>	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.02 - 0.035	CCME	(17)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE	(12)
Thallium	mg/L	9.97E-05	9.96E-05	1.04E-04	1.04E-04	1.03E-04	1.03E-04	1.02E-04	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143	0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	background + 5 mg/L	CCME	
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1	MDMER Sched 4	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME	
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG	(13)
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.007	FEQG	(9)

Notes

Notes

Estimates of mercury concentration are based on 50% of the detection limit in both background and effluent.

(1) Estimated from near-field model

NE = No estimate for this lake for this parameter

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmf.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

Hardness dependent WQOs are for very soft water (hardness <25 mg CaCO<sub>3</sub>/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf)

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/summary-table-EN-2020-02-11.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf)

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

**Attachment IR-114 (Round 3 submission)**

Updated tables as requested by ECCC for the following:

- Table 8.2-8;
- Table 8.2-10;
- Table 8.2-13; and,
- Table 8.2-14.



Table Error! No text of specified style in document.-1: Summary of Background Water Quality Screening Criteria

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
General Chemistry, Nutrients and Anions									
Alkalinity	mg/L	--	--	--	--	--	--	--	
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(2)
Un-Ionized Ammonia	mg/L	--	--	--	--	0.019	0.019	SEQG/CCME	
Hardness	mg/L	--	--	--	--	--	--	--	--
Conductivity	µS/cm	--	--	--	--	--	--	--	--
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--
Phosphorus	mg/L	--	--	--	--	0.004-0.01	0.004-0.01	CCME	(10)
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	
TDS	mg/L	--	--	--	--	500	500	SEQG	--
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--
TSS	mg/L	15	15	MDMER Schedule 4	(11)	background + 5 mg/L	background + 5 mg/L	CCME	--
Chloride	mg/L	640	640	SEQG/CCME	(4)	120	120	SEQG/CCME	
Metals									
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(1)
Arsenic	mg/L	0.1	0.1	MDMER Schedule 4		0.005	0.005	SEQG/CCME	--
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(3)	0.00004	0.00034	SEQG/CCME	--
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME	(5)
Cobalt	mg/L	--	--	--	--	0.00078	0.00149	FEQG	(15)(16)
Copper	mg/L	0.0009	0.00004	SEQG	(6)	0.002	0.004	CCME	(7)
Cyanide	mg/L	--	--	--	--	--	--	--	--
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	
Manganese	mg/L	0.501	15	CCME	(8)	0.21	0.64	SEQG/CCME	(9)
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--
Molybdenum	mg/L	--	--	--	--	0.073	0.073	CCME	
Nickel	mg/L	--	--	--	--	0.025	0.025	CCME	
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--
Strontium	mg/L	--	--	--	--	2.5	2.5	FEQG	
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	
Zinc	mg/L	0.008	0.204	CCME	(12)(13)	0.013	0.058	CCME	(14)
Radiological									
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crm.p.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

- \* A pH of 7 and a temperature of 15°C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).
- (1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is (e<sup>(0.979123[ln(hardness)]-8.64497)</sup>)\*1000 (SEQQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L

(16) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt. Based on equation and hardness of 250 mg/L for equation of FWQG =  $\exp\{((0.414[\ln(\text{hardness})] - 1.887)\}$ .

Table 8.2-10: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(2)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	0.019	0.019	SEQG/CCME		0.0129	0.0004	0.0003	0.0003
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.004-0.01	0.004-0.01	CCME	(10)	0.01	0.005	0.005	0.005
Sulphate	mg/L	--	--	--	--	128	429	BC MOE		2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(11)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(4)	120	120	SEQG/CCME		600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(1)	0.051	0.01	0.01	0.01
Arsenic	mg/L	0.1	0.1	MDMER Schedule 4		0.005	0.005	SEQG/CCME	--	0.006	0.0002	0.0002	0.0001
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(3)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME	(5)	0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.00078	0.00149	FEQG	(15)(16)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(6)	0.002	0.004	CCME	(7)	0.02	0.001	0.0004	0.0004
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	--	--	--
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME		0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(8)	0.21	0.64	SEQG/CCME	(9)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.073	0.073	CCME		2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.025	0.025	CCME		0.0138	0.0003	0.0002	0.0002
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	2.5	2.5	FEQG		1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG		0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(12)(13)	0.013	0.058	CCME	(14)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crmf.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

\* A pH of 7 and a temperature of 15°C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is (e<sup>[0.979123[ln(hardness)]]-8.64497]</sup>)\*1000 (SEGQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

- (13) Short term guideline is based on Benchmark =  $\exp(0.833[\ln(\text{hardness mg}\cdot\text{L}^{-1})] + 0.240[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 0.526)$ . (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.
- (14) Long term guideline is based on CWQG =  $\exp(0.947[\ln(\text{hardness mg}\cdot\text{L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg}\cdot\text{L}^{-1})] + 4.625)$ . (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.
- (15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L
- (16) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt. Based on equation and hardness of 250 mg/L for equation of FWQG =  $\exp\{(0.414[\ln(\text{hardness})] - 1.887)\}$ .

**Table Error! No text of specified style in document.-2: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water**

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Short-term Benchmark			Long-term Benchmark		
									Value	Reference	Notes	Value	Reference	Notes
Alkalinity	mg/L	NE	NE	12.4	12.4	NE	NE	NE						
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614				0.1	SEQG/CCME	(1)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368				5.74	SEQG/CCME	(2)
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199				0.019	SEQG/CCME	
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.1	MDMER Schedule 4	(11)	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	29	CCME		1.5	SEQG/CCME	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	640	SEQG/CCME	(3)	0.00004	SEQG/CCME	
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006				0.001	SEQG/CCME	(5)
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114				0.00078	FEQG	(15)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.0009	SEQG	(6)	0.002	CCME	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425						
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116				0.001	SEQG/CCME	
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064						
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.501	CCME	(8)	0.21	SEQG/CCME	(9)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053				0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118				0.07	CCME	
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044				0.025	CCME	
Nitrate	mg/L	NE	NE	0.249	0.249	NE	NE	NE	550	CCME		3	SEQG	
Phosphorus	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01				0.004 - 0.01	CCME	(10)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062				0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061				0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002				0.001	CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88				128	BC MOE	
Thallium	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143				0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	15	MDMER Schedule 4	(11)	background +5 mg/L	CCME	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.033	CCME		0.015	SEQG/CCME	
Uranium-234	Bq/L	0.000385	0.000377	0.00705	0.00672	0.00415	4.11E-03	3.09E-03						
Uranium-238	Bq/L	0.000385	0.000377	0.00705	0.00672	0.00415	4.11E-03	3.09E-03						
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027				0.12	FEQG	
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.008	CCME	(12)(13)	0.013	CCME	(14)

**Notes:**  
All parameters listed as total concentrations unless otherwise specified  
Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crm.p.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations  
Bold numbers indicate exceedance of long-term criteria  
Bold and italicized indicate exceedance of short-term criteria and long-term criteria.  
SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.  
CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.  
SSWQO – Saskatchewan Surface Water Quality Objectives.  
DOC – Dissolved organic carbon.  
TDS – Total dissolved solids.  
TKN – Total Kjeldahl Nitrogen.  
TOC – Total organic carbon.  
TSS – Total suspended solids.  
Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.  
\* A pH of 7 and a temperature of 15°C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).  
(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.  
(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>).  
(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).  
(4) Based on water hardness >0 to <17 mg/L.  
(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality  
(6) Based on hardness of 5.26 mg/L (Short-term equation is (e<sup>[0.979123[ln(hardness)]-8.64497]</sup>)\*1000 (SEQG via AEP 1996b)  
(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)  
(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).  
(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.  
(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L  
(11) MDMER Schedule 4 - maximum authorized monthly mean concentration  
(12) Guideline is based on dissolved zinc.  
(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.  
(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.  
(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L.

**Table Error! No text of specified style in document.-3: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water During Future Centuries**

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Long-term Screening Concentration	Source of Screening Concentration	Notes
Aluminum	mg/L	0.01358	0.01358	0.01388	0.01373	0.0136	0.0136	0.01359	0.1	SEQG/CCME	(1)
Ammonia (as N)	mg/L	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	5.74	SEQG/CCME	(2)
Un-ionized Ammonia	mg/L	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.019	CCME	
Arsenic	mg/L	0.000103	0.000103	0.000107	0.000107	0.000105	0.000105	0.000104	0.005	SEQG/CCME	
Cadmium	mg/L	0.0000232	0.0000232	0.0000233	0.0000233	0.0000233	0.0000233	0.0000232	0.00004	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	0.41	0.41	0.39	0.39	0.38	120	SEQG/CCME	
Chromium	mg/L	0.00052	0.00052	0.00053	0.00053	0.00052	0.00052	0.00052	0.001	SEQG/CCME	
Cobalt	mg/L	0.0001	0.0001	0.00011	0.00011	0.00011	0.0001	0.0001	0.00078	FEQG	(15)
Copper	mg/L	0.00062	0.00062	0.00063	0.00063	0.00062	0.00062	0.00062	0.002	CCME	
Iron	mg/L	0.12126	0.12126	0.12756	0.12672	0.12408	0.12405	0.12308	0.3	SEQG/CCME	
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.001	SEQG/CCME	
Lead-210	Bq/L	0.00527	0.00527	0.00605	0.00592	0.00557	0.00556	0.00545	0.2	HC	
Manganese	mg/L	0.01206	0.01206	0.01419	0.01413	0.01355	0.01353	0.01317	0.21	SEQG/CCME	(9)
Mercury	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000026	CCME	
Molybdenum	mg/L	0.00011	0.00011	0.00012	0.00012	0.00011	0.00011	0.00011	0.07	CCME	
Nickel	mg/L	0.00038	0.00038	0.00041	0.00041	0.0004	0.0004	0.00039	0.025	CCME	
Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.004 - 0.01	CCME	
Polonium-210	Bq/L	0.00536	0.00536	0.00615	0.00602	0.00566	0.00564	0.00553	0.1	HC	
Radium-226	Bq/L	0.00557	0.00557	0.00639	0.00637	0.00615	0.00614	0.006	0.11	SEQG	
Selenium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	0.72	0.72	0.71	0.71	0.71	128	BC MOE	
Thallium	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.0101	0.0101	0.01036	0.01036	0.0103	0.0103	0.01025	0.6	HC	
TSS	mg/L	3.0	2.0	2.6	2.6	2.5	2.2	4.0	background +5 mg/L	CCME	
Uranium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00003	0.00003	0.00003	0.02	SEQG/CCME	
Vanadium	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.12	FEQG	
Zinc	mg/L	0.00068	0.00068	0.00074	0.00074	0.00072	0.00072	0.00071	0.013	CCME	(14)

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (<https://envrbrportal.crm.p.saskatchewan.ca/seqg-search/>), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

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DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

\* A pH of 7 and a temperature of 15°C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (<https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is (e<sup>(0.979123[ln(hardness)]-8.64497)</sup>)\*1000 (SEGQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg-L-1)] + 0.240[ln(DOC mg-L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg-L-1)] - 0.815[pH] + 0.398[ln(DOC mg-L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L.



## Attachment IR-114 (Round 4)

Part 2 of IR-114 (Round 4) requested that Denison use the copper Federal Environmental Quality Guideline (FEQG). The copper FEQG guideline is the most restrictive guideline and based on current science and incorporates the use of site-specific environmental modifying factors.

A)

Baseline conditions for the Wheeler River include a background hardness of 5.26 mg/L, DOC of 2.24 mg/L, and pH of 6.61 (95th percentile of LA-5 and LA-6). Using ECCC's Biotic Ligand Model for copper, the calculated HC<sub>5</sub> is below 0.0002 mg/L, however, 0.0002 mg/L is considered by the FEQG to be the lowest concentration routinely measured and therefore replaces the calculated HC<sub>5</sub> value for this water chemistry. Therefore, at baseline conditions the FEQG is 0.0002 mg/L.

Table 3-1, Table 3-3, and Table 3-5 of the ERA (Appendix 10-A) were updated to include the copper FEQG of 0.0002 mg/L as the screening criterion. Likewise, Tables 8.2-2, 8.2-3, 8.2-10, 8.2-13 and 8.2-14 in Section 8 of the EIS were updated to include the copper FEQG of 0.0002 mg/L as the screening criteria.

B)

As identified in Section 5.3.1.1 of the ERA (Appendix 10-A), toxicity reference values (TRVs) for copper were obtained from the USEPA Ecotoxicology Database (ECOTOX) for aquatic organisms. The selected TRVs were 20% Effect Concentrations (i.e., EC<sub>20</sub> values), which are concentrations at which only 20% of the test organisms respond. The TRVs are shown in Table IR-114-1 below. Where the TRVs derived from ECOTOX were lower than the CCME guideline the CCME guideline was selected.

**Table IR-114-1: Copper Toxicity Reference Values Used for Aquatic Organisms in the ERA**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
<b>Copper</b>	Forage fish	0.002	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=237)	ECOTOX
	Predator fish	0.003	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=89)	ECOTOX
	Zooplankton	0.002	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=117)	ECOTOX; CCME
	Benthic invertebrates	0.002	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=264)	ECOTOX; CCME
	Phytoplankton	0.0092	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=101)	ECOTOX
	Aquatic plants	0.038	mg/L	5th percentile of estimated chronic EC <sub>20</sub> distribution (n=28)	ECOTOX

As requested in IR-114, the TRVs have been re-evaluated using the FEQG and the BLM. The BLM was run based on baseline site-specific conditions. The test species and concentrations identified as used to generate the BLM were evaluated to develop TRVs for the applicable biotic groups. The most restrictive effect concentration for each biotic group was identified. The test endpoint was either an EC<sub>10</sub> or an IC<sub>10</sub>. Based on the protocol identified in Table 5-11 of the ERA, the EC<sub>10</sub> (or IC<sub>10</sub>) was multiplied by 2 to obtain an EC<sub>20</sub>, which was then utilized as the TRV. A summary of the TRVs for baseline conditions is identified in Table IR-114-2.

Considering that while the facility is in operation it is expected that hardness will increase to approximately 250 mg/L and pH will increase to approximately 7, the BLM was re-run under updated site conditions and the TRVs were re-evaluated based on the test species and concentrations used to generate the BLM. The copper TRVs under site conditions are presented in Table IR-114-3.

**Table IR-114-2: Copper Toxicity Reference Values from Baseline Conditions BLM**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
<b>Copper</b>	Forage fish	0.0052	mg/L	Fathead minnow, growth (IC <sub>10</sub> = 0.0026 mg/L)	FEQG BLM
	Predator fish	0.0008	mg/L	White sturgeon, growth (EC <sub>10</sub> = 0.0004 mg/L)	FEQG BLM
	Zooplankton	0.0009	mg/L	Daphnia magna, reproduction (EC <sub>10</sub> = 0.0004 mg/L)	FEQG BLM
	Benthic invertebrates	0.0004	mg/L	Pond snail, growth (EC <sub>10</sub> = 0.0002 mg/L)	FEQG BLM
	Phytoplankton	0.0091	mg/L	Rotifer, intrinsic (EC <sub>10</sub> = 0.0046 mg/L)	FEQG BLM

	Aquatic plants	0.0212	mg/L	Duckweed, root length (EC <sub>10</sub> = 0.01 mg/L)	FEQG BLM
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Notes:

BLM based on hardness of 5.26 mg/L, DOC of 2.24 mg/L, pH of 6.61, temperature of 13°C.

TRV is an EC<sub>20</sub>, adjusted from an EC<sub>10</sub> or IC<sub>10</sub>.

**Table IR-114-3: Copper Toxicity Reference Values from Site Conditions BLM**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
<b>Copper</b>	Forage fish	0.025	mg/L	Fathead minnow, growth (IC <sub>10</sub> = 0.012 mg/L)	FEQG BLM
	Predator fish	0.005	mg/L	White sturgeon, growth (EC <sub>10</sub> = 0.002 mg/L)	FEQG BLM
	Zooplankton	0.005	mg/L	Daphnia magna, reproduction (EC <sub>10</sub> = 0.003 mg/L)	FEQG BLM
	Benthic invertebrates	0.003	mg/L	Pond snail, growth (EC <sub>10</sub> = 0.001 mg/L)	FEQG BLM
	Phytoplankton	0.040	mg/L	Rotifer, intrinsic (EC <sub>10</sub> = 0.02 mg/L)	FEQG BLM
	Aquatic plants	0.014	mg/L	Duckweed, root length (EC <sub>10</sub> = 0.007 mg/L)	FEQG BLM

Notes:

BLM based on hardness of 250 mg/L, DOC of 2.24 mg/L, pH of 7, temperature of 13°C.

TRV is an EC<sub>20</sub>, adjusted from an EC<sub>10</sub> or IC<sub>10</sub>.

The hazard quotients (HQs) for aquatic organisms were re-evaluated using both sets of TRVs, baseline conditions and site conditions during operation where hardness and pH are increased (Table IR-114-4). Consistent with Section 5.4.1 of the ERA (Appendix 10-A) an HQ less than or equal to 1 suggests low risk to the ecological receptor, and an HQ above 1 needs further investigation to determine if adverse effects are possible. Conservatively using baseline conditions, HQs for all aquatic organisms are less than 1 with the exception of predator fish in Whitefish Lake, and benthic invertebrates at all locations where HQs are slightly above 1. As such, further consideration was given to changes in site conditions when the facility is in operation. Using more realistic site conditions for hardness and pH, HQs for all aquatic organisms are less than 1 at all locations, indicating no adverse effects to aquatic organisms from facility related copper. It is relevant to consider all aspects of the receiving environment and this includes induced hardness since the scenario being evaluated only occurs during periods of effluent discharge. This approach is used in other jurisdictions (e.g., water licences in northern Canada issued through local water boards) and therefore the concept of induced hardness is not unique.

The copper predictions in the ERA are considered conservative based on the following assumptions:

- Baseline concentrations of copper are predominantly below the detection limit, indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The effluent predictions in the ERA are based on available information from test studies at the time the ERA was prepared. Denison will be refining the effluent quality through the BATEA assessment and licensing process.
- Based on the effluent quality and quantity released to Whitefish Lake, the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ. This is a conservative assumption.
- Once the facility is operational, site conditions will change which includes increased hardness and pH; therefore, the predicated HQs under baseline conditions are considered conservative and overestimate risk.

Denison is in the process of collecting additional baseline water quality data which will be used in future ERA iterations to reconsider the baseline copper concentration in the Wheeler River. The ERA is a living document that will continue to be updated at defined intervals and will integrate new data when it is available. Denison has also committed to an ongoing environmental monitoring program which will be used to determine if there are any adverse effects to aquatic organisms from copper and other constituents of potential concern.

**Table IR-114-4: Re-Evaluated Hazard Quotients for Copper in Aquatic Organisms**

Location	Maximum Copper Concentration in Water (mg/L)	Hazard Quotients (unitless) – Baseline Conditions						Hazard Quotients (unitless) – Site Operation Conditions					
		Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phytoplankton	Aquatic Plants	Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phytoplankton	Aquatic Plants
Kratchkowsky Lake (reference) <sup>1</sup>	6.22E-04	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03
Whitefish Lake North	6.20E-04	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03	0.03	0.14	0.12	0.25	0.02	0.05
Whitefish Lake Middle	8.22E-04	0.16	<b>1.06</b>	0.93	<b>1.97</b>	0.09	0.04	0.03	0.18	0.16	0.33	0.02	0.06
Whitefish Lake South	8.17E-04	0.16	<b>1.05</b>	0.92	<b>1.96</b>	0.09	0.04	0.03	0.18	0.16	0.32	0.02	0.06
McGowan Lake	7.50E-04	0.14	0.97	0.85	<b>1.80</b>	0.08	0.04	0.03	0.16	0.14	0.30	0.02	0.05
Icelander River	7.49E-04	0.14	0.97	0.84	<b>1.80</b>	0.08	0.04	0.03	0.16	0.14	0.30	0.02	0.05
Russell Lake Inlet	7.17E-04	0.14	0.92	0.81	<b>1.72</b>	0.08	0.03	0.03	0.16	0.14	0.28	0.02	0.05

Note:

Bold and shaded value indicates hazard quotient greater than 1.

<sup>1</sup> Kratchkowsky Lake is a reference lake located upstream of the effluent discharge point, and as such, the site operation conditions were the same as baseline conditions.

IR-126

- Department: ECCC
- Project Effects Link: Aquatic species
- Reference to EIS, appendices, or supporting documentation: Section 8.5.3, Appendix 10-A (ERA), Section 5.3.1.1.8

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 6 2024)	Denison Response (ROUND 4 October 15, 2024)																																															
IR- 126	-	<p><b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.</p> <p><b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.</p>	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	Denison is aware of the ECCC Federal Environmental Quality Guideline for selenium in fish. The ECCC FEQG is for fish tissue egg-ovary and whole-body. Denison selected the US EPA guideline over the ECCC guideline since US EPA provides guidelines for fish tissue muscle as well. The fish assessed in the ERA were large-bodied fish including northern pike and white sucker. A fish tissue muscle TRV is appropriate for assessment of large-bodied fish; therefore, the US EPA selenium fish tissue muscle benchmark was preferred over the whole body value from ECCC.	<p>ECCC acknowledges that the Proponent prefers the use of the US EPA guidelines due to the ability to perform fish tissue muscle TRV, however, Environmental Effects Monitoring (EEM) would require a study on fish tissue selenium whole-body or egg-ovary concentrations. The current baseline data will not be comparable to future EEM studies using fish tissue muscle concentrations of selenium and US EPA guideline methodology. There is currently EEM guidance under development for conducting selenium fish tissue sampling in fish populations that will utilize the FEQG which applies to fish tissue egg-ovary and whole-body concentrations of selenium. Additionally, the Proponent has made a commitment to utilize the most stringent guidelines available.</p> <p>Based on the Project’s proposed effluent concentrations of selenium, fish tissue sampling will be required as part of the EEM monitoring for the Project. The ECCC FEQG is the guideline applied to these studies, and the current use of this guideline will facilitate the comparison to future monitoring studies.</p> <p>Furthermore, the Proponent has not provided sufficient explanation in their response for the use of the less stringent US EPA guideline compared to the more conservative FEQG.</p> <p>The Proponent should explain their use of the US EPA guidelines over the ECCC FEQG or update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA as needed using ECCC’s FEQG.</p> <p>As noted in IR-126, please update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10- A (ERA) in Section 10) as needed using ECCC’s FEQG. If the FEQG will not be used, provide further rationalization for the use of the US EPA guidelines when creating the study on fish tissue selenium concentration in the EEM.</p>	<p>The EIS assessed selenium in fish in terms of muscle tissue because the available baseline data were for muscle tissue. Since the review comment highlights the EEM program and the fish tissue selenium study component more specifically we note that the MDMER (2023) allows use of muscle tissue in the EEM study of selenium in fish (see Schedule 5, 12(1)(e)(iv). It is further noted that Denison has committed to a pre-operational EEM study and will conduct that study in accordance with the regulation and available federal guidance. The pre-operational EEM study will include a study respecting selenium in fish tissue.</p> <p>Regarding the EIS, Denison and its SME stand by the current assessment approach, using muscle tissue. Nevertheless, to address the reviewer’s concern, we have calculated whole-body concentrations from the predicted selenium in muscle (Table B.5 of the revised draft EIS Appendix 10-A), using EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. No change to the EIS is warranted.</p> <table><tr><th>Fish Species</th><th>Lake</th><th>Muscle ug/g fw</th><th>Muscle ug/g dw</th><th>Whole ug/g dw</th></tr><tr><td rowspan="5">N. Pike</td><td>Ref</td><td>1.89E-01</td><td>7.56E-01</td><td>5.95E-01</td></tr><tr><td>WL North</td><td>1.86E-01</td><td>7.44E-01</td><td>5.86E-01</td></tr><tr><td>WL Mid</td><td>1.57E+00</td><td>6.28E+00</td><td>4.94E+00</td></tr><tr><td>WL South</td><td>1.51E+00</td><td>6.04E+00</td><td>4.76E+00</td></tr><tr><td>McGowan Russell</td><td>1.02E+00</td><td>4.08E+00</td><td>3.21E+00</td></tr><tr><td rowspan="5">W. Sucker</td><td>Ref</td><td>1.46E-01</td><td>5.84E-01</td><td>4.60E-01</td></tr><tr><td>WL North</td><td>1.43E-01</td><td>5.72E-01</td><td>4.50E-01</td></tr><tr><td>WL Mid</td><td>1.74E+00</td><td>6.96E+00</td><td>5.48E+00</td></tr><tr><td>WL South</td><td>1.66E+00</td><td>6.64E+00</td><td>5.23E+00</td></tr><tr><td>McGowan Russell</td><td>1.06E+00</td><td>4.24E+00</td><td>3.34E+00</td></tr></table> <p>Notes: dry wt = fresh wt / (1-0.75) [EPA (2021)] whole = muscle / 1.27 [EPA (2021)]</p> <p>References:</p> <p>MDMER. 2023. Metal and Diamond Mining Effluent Regulations. SOR/2002-222. Last amended June 9, 2023. Minister of Justice. EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency. ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</p>	Fish Species	Lake	Muscle ug/g fw	Muscle ug/g dw	Whole ug/g dw	N. Pike	Ref	1.89E-01	7.56E-01	5.95E-01	WL North	1.86E-01	7.44E-01	5.86E-01	WL Mid	1.57E+00	6.28E+00	4.94E+00	WL South	1.51E+00	6.04E+00	4.76E+00	McGowan Russell	1.02E+00	4.08E+00	3.21E+00	W. Sucker	Ref	1.46E-01	5.84E-01	4.60E-01	WL North	1.43E-01	5.72E-01	4.50E-01	WL Mid	1.74E+00	6.96E+00	5.48E+00	WL South	1.66E+00	6.64E+00	5.23E+00	McGowan Russell	1.06E+00	4.24E+00	3.34E+00	<p>The Proponent did not compare their predictions for fish tissue selenium to the FEQGs in the ERA as requested. Furthermore, in their response the Proponent does not use available species-specific moisture content and conversion factors available for northern pike and lake whitefish when converting muscle selenium concentrations to whole-body selenium concentrations. This means that the Proponent’s prediction likely underestimates the selenium tissue concentrations in the fish. Consequently, the hazard quotients reported are lower than expected.</p> <p>Additionally, the method used by the Proponent to predict selenium concentrations in northern pike and lake whitefish does not appear to include dietary uptake and bioaccumulation of selenium, only direct contact with pore water and overlying water is considered (Table 5-5 in Appendix 10A; Section 2.2.2 of Appendix A to Appendix 10-A). Selenium uptake through the aquatic food web has been shown to result in bioaccumulation of selenium in aquatic-dependent wildlife and resulting in reproductive impairments and malformations (ECCC 2022). Dietary sources of selenium would typically be expected to be the main contribution to tissue concentrations of selenium compared to selenium uptake from water. In most situations, the conversion of inorganic selenium to organic selenium through uptake from water into periphyton/algae is the rate limiting step of selenium bioaccumulation into higher level organisms including benthic invertebrates and fish. This step is affected by many environmental parameters (e.g. temperature, substrate, lentic/lotic environment). Considering that the effluent discharge contains 42 ug/L selenium, consideration of dietary selenium is warranted.</p> <p>The Proponent should update the final EIS with the following information:</p> <div><div>1. Update the ERA with the assessment of selenium concentrations in fish tissue to include a comparison of selenium fish tissue concentrations to ECCC FEQG guidelines for either fish whole body tissue (6.7 ug/g dry weight) or fish egg/ovary tissue (14.7 ug/g dry weight) using species-specific moisture content and muscle : whole body and/or egg-ovary : muscle conversion factors (see Tables B-1b, Table B-3, Table B-4, and Table B-5 in US EPA (2021)).</div><div>2. Update the ERA for the assessment of selenium concentrations in fish tissue using a method that considers dietary uptake and bioaccumulation in order to determine predicted fish tissue</div></div>	<ol style="list-style-type: none"><li>1. The Round 2 IR response provided a comparison against the ECCC FEQG by converting the muscle tissue concentrations to whole-body tissue concentrations using generic conversion values. The dry weight to fresh weight conversion factor used was 0.25. Based on Denison’s measured dry weight content in fish (northern pike and white sucker) the dry weight content ranged from 0.24 to 0.26 which is consistent with literature values; therefore, there is minimal difference in the moisture content. The species specific conversion factors for whole body and egg ovary for northern pike and white sucker from US EPA (2021) have been used to calculate the whole body and egg ovary tissue concentrations. (see Table in Attachment IR-126 Round 3 below for results). All predicted tissue concentrations for northern pike and white sucker in all lakes are below the FEQG.</li><li>2. The ERA utilizes a bioaccumulation factor (BAF) model from water to tissue to conservatively reflect all the multi-media contributions to uptake. The BAFs are provided in Appendix A to the ERA in Section 3.6.1. The selenium BAF for northern pike is a non-linear BAF where BAF = 949x<sup>0.827</sup> (x is in units of µg/L). The selenium BAF for white sucker is 4425 L/kg (the rounded value shown in Figure IR-126-1 is 4400 L/kg). Both BAFs are based on publicly available regional data from other uranium mine sites in northern Saskatchewan (see Appendix A to Appendix 10-A, Section 3.6.1). Additional information on the derivation of the BAFs is provided below in Attachment IR-126 Round 3.</li><li>3. The fish tissue selenium concentrations represent the maximum concentration over the Project phases. This is the most conservative result.</li></ol> <p>References:</p> <p>US EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.</p> <p>ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</p>	<p>Following a supplementary submission by Denison on July 2nd, it has been determined that item one and two of this IR have been resolved, but item three remains outstanding.</p> <p>Denison has not provided the information requested to address Item 3 of the Round 3 IR. Including the estimates of error for the predicted selenium concentrations in fish is necessary as the maximum predictions for Northern Pike in Whitefish Lake North and Middle are within 1-2 ug/g dw of the Egg/Ovary FEQG guideline of 14.7 ug/g dw.</p> <p>In order to resolve this IR, Denison are expected to:</p> <ol style="list-style-type: none"><li>1) Provide an estimate of error associated with the Northern Pike BAF.</li><li>2) Include this estimate of error for the results in Table -IR-126-2 and consider this in the effects assessment.</li></ol>	<ol style="list-style-type: none"><li>1. An estimate of the error associated with the Northern Pike BAF is included in Attachment IR-126 Round 4.</li><li>2. An estimate of the whole body and egg-ovary concentrations using the range of uncertainty (low to high) is included in Attachment IR-126 Round 4.</li></ol> <p>Denison will include the information on selenium BAF sensitivity analysis from this IR response in a new section in the final EIS of Appendix 10-A, Section 6.2.3.</p>
Fish Species	Lake	Muscle ug/g fw	Muscle ug/g dw	Whole ug/g dw																																																					
N. Pike	Ref	1.89E-01	7.56E-01	5.95E-01																																																					
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Original IR#	Follow- Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 6 2024)	Denison Response (ROUND 4 October 15, 2024)
							<p>concentrations of selenium in northern pike and lake whitefish. This is recommended to be done over all Project phases for both the Expected Case and sensitivity scenarios.</p> <p>Provide predicted fish tissue selenium concentrations that include the range of variability of data used to develop the tissue selenium predictions. Only one output value without a confidence interval is provided for each location and species (see Table B.5 in Appendix B of Appendix 10-A).</p>			

## Attachment IR-126 Round 3

The whole-body concentrations were recalculated from the predicted selenium in muscle tissue concentrations (Table B.5 of the revised draft EIS Appendix 10-A), using site-specific moisture content and the species-specific US EPA (2021) conversion factors. The values used for moisture content and conversion factors for muscle to whole body and egg-ovary to whole body are shown in Table IR-126-1 below. The resulting whole-body concentrations (Table IR-126-2) do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. Note that selenium was identified as a COPC in the risk assessment and a full quantitative risk assessment was completed including calculation of hazard quotients. No change to the EIS is warranted based on the results shown in the Table below. The calculations do not change the conclusions of the EIS of no significant adverse effect. Selenium is included as part of the environmental monitoring program throughout all phases of the Project.

**Table IR-126-1: Moisture Content and Conversion Factors used for Selenium Calculations**

<b>Fish Species</b>	<b>Moisture Content (Aquatic Baseline Studies, Table A-17)</b>	<b>Muscle:Whole Body (Table B-4, B-5, US EPA 2021)</b>	<b>Egg-Ovary:Muscle (Table B-3, US EPA 2021)</b>
Northern Pike	77.98	1.27	1.88
White Sucker	76.55	1.34	1

**Table IR-126-2: Calculated Whole Body and Egg-Ovary**

<b>FEQG (µg/g dw)</b>				<b>6.7</b>	<b>14.7</b>
<b>Fish Species</b>	<b>Lake</b>	<b>Muscle µg/g fw</b>	<b>Muscle µg/g dw</b>	<b>Whole Body µg/g dw</b>	<b>Egg-Ovary µg/g dw</b>
<b>Northern Pike</b>	Ref	1.89E-01	8.58E-01	0.68	1.61
	Whitefish Lake North	1.86E-01	8.45E-01	0.67	1.59
	Whitefish Lake Middle	1.57E+00	7.13E+00	5.61	13.40
	Whitefish Lake South	1.51E+00	6.86E+00	5.40	12.89
	McGowan Lake	1.02E+00	4.63E+00	3.65	8.71
	Russell Lake	8.12E-01	3.69E+00	2.90	6.93
<b>White Sucker</b>	Ref	1.46E-01	6.23E-01	0.46	0.62
	Whitefish Lake North	1.43E-01	6.10E-01	0.46	0.61
	Whitefish Lake Middle	1.74E+00	7.42E+00	5.54	7.42
	Whitefish Lake South	1.66E+00	7.08E+00	5.28	7.08
	McGowan Lake	1.06E+00	4.52E+00	3.37	4.52
	Russell Lake	8.06E-01	3.44E+00	2.57	3.44



Selenium bioaccumulation factors (BAFs) were derived using regional data. Using measured fish tissue data and measured water concentrations to develop the BAF incorporates the selenium bioaccumulation through the food chain and would represent the transfer (enrichment function and trophic transfer) as shown in the figure below.

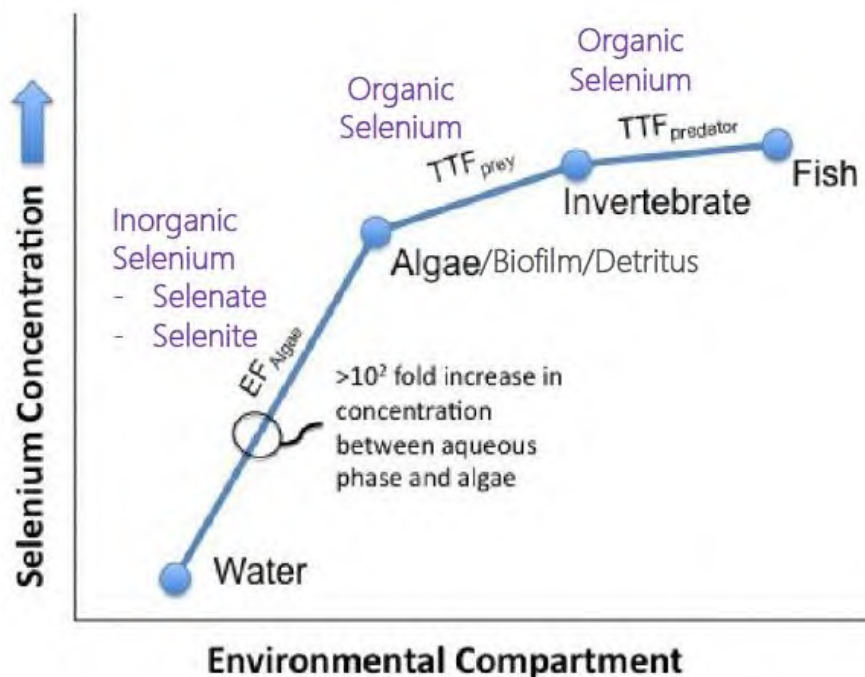


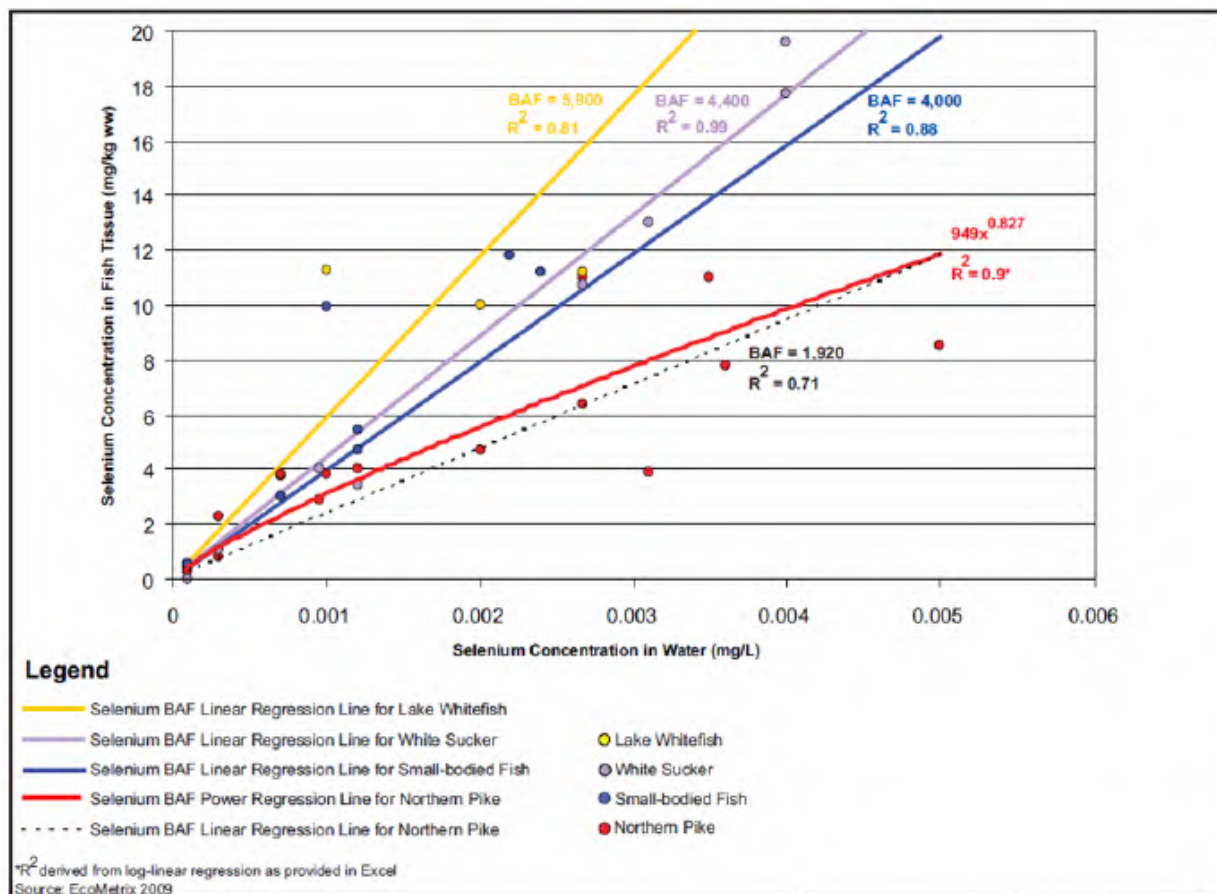
Image adapted from Chapman *et al.* (2009)

Large- and small-bodied fish were considered separately because selenium concentrations are based on different tissue analyses for these two groups: wet weight muscle and wet weight whole body, respectively. Tissue data were available for northern pike, cisco, lake trout, longnose sucker, lake whitefish, white sucker, lake chub and spottail shiner. The data comparisons resulted in the following conclusions:

- The same BAF can be applied to a fish species at different lakes;
- The BAF values for longnose sucker, cisco and lake trout were not significantly different from those for northern pike, therefore data from these species were combined to derive a BAF for northern pike;
- The BAF values for lake whitefish and white sucker were significantly different ( $p < 0.05$ ) from that for northern pike; and
- The BAF values for lake chub and spottail shiner were not significantly different ( $p > 0.05$ ) from each other, therefore data for these two species were combined to derive a BAF for small-bodied fish.

Most of the data from fish species evaluated demonstrated a linear relationship between fish tissue and water concentrations. The linear regression line was shown to underestimate selenium in northern pike tissue at low water concentrations. Therefore, a non-linear relationship was adopted for northern pike, where the  $BAF = 949x^{0.827}$  ( $x$  is in units of  $\mu\text{g/L}$ ). As shown in the figure, the

linear (dotted line) and power function (solid red curve) are quite similar except where the water concentrations were less than 0.001 mg/L. The  $R^2$  values for the linear and power function are similar but the better fit at the lower water concentration values provided a basis for selecting the power function as the preferred model for the northern pike. Correlation analyses of the tissue and water concentration data for selenium indicated that a significant relationship ( $p < 0.05$ ) existed between the water and tissue concentrations in northern pike, white suckers, lake whitefish and small-bodied fish.



**Figure IR-126-1: Development of Regional Fish BAFs for Selenium in Saskatchewan**

#### References:

Chapman PM, Adams WJ, Brooks ML, Delos CG, Luoma SN, Maher WA, Ohlendorf HM, Presser TS and Shaw DP. 2009. Ecological Assessment of Selenium in the Aquatic Environment. SETAC Pellston Workshop, February 22-28, 2009, Pensacola, FL, USA.

EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.

## Attachment IR-126 Round 4

As identified in Attachment IR-126 Round 3, selenium bioaccumulation factors (BAFs) were derived using regional data. Using measured fish tissue data and measured water concentrations to develop the BAF incorporates the selenium bioaccumulation through the food chain. For northern pike, a non-linear relationship was adopted where the  $BAF = 949x^{0.827}$  ( $x$  is the water concentration in units of  $\mu\text{g/L}$ ).

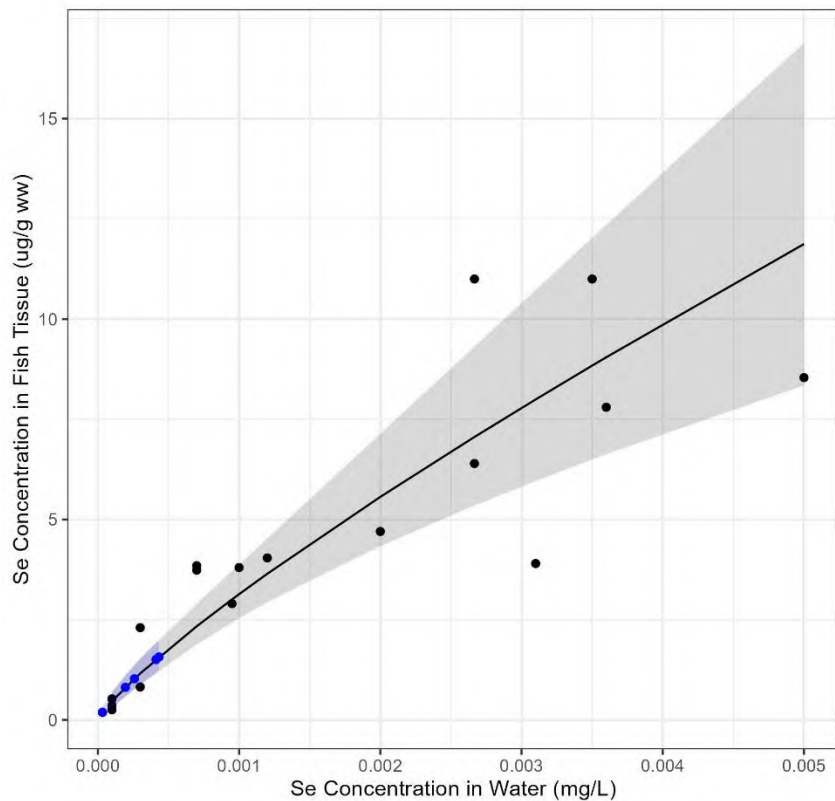
The whole-body concentrations were calculated from the predicted range of selenium in muscle tissue concentrations, using site-specific moisture content and the species-specific US EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are  $8.5 \mu\text{g/g dw}$  and  $6.7 \mu\text{g/g dw}$ , respectively, and therefore the conclusions of the risk assessment are unchanged. Note that selenium was identified as a COPC in the risk assessment and a full quantitative risk assessment was completed including calculation of hazard quotients.

To evaluate the range of uncertainty in the northern pike BAF, a power-regression (log-log) of the water and fish tissue selenium data was used to generate the expected relationship between selenium in water and selenium in tissue. The model was a good fit to the data ( $R^2 = 0.88$ ). The regression equation ( $y = ax^b$ ) was:

$$Se_{[\text{tissue}; \mu\text{g/g ww}]} = a \times Se_{[\text{water}; \text{mg/L}]}^b,$$

where the 95% confidence interval for ' $a$ ' was 295–3060 and for ' $b$ ' was 0.66–0.99.

The predicted mean response and confidence ribbon for those values are shown in Figure IR-126-1 and Table IR-126-1. Analysis was completed in *R* v. 4.4.4 using base functions (e.g., *lm()*) and associated *predict()*. Plots were generated using *ggplot* v. 3.5.5.



Note: Blue dots are Wheeler River predictions, black dots are regional data

**Figure IR-126-1: Predicted Mean Response and Confidence Ribbon – Selenium in Fish**

**Table IR-126-1: Predicted Mean Lower and Upper Fish Tissue Selenium Concentrations**

Fish Species	Lake	Water Concentration LA-5 mg/L	Fish Muscle Tissue (Mean Value) µg/g fw	Fish Muscle Tissue (Low Value) µg/g fw	Fish Muscle Tissue (Upper Value) µg/g fw
Northern Pike	Reference	3.35E-05	1.89E-01	1.06E-01	3.36E-01
	Whitefish Lake North	3.28E-05	1.86E-01	1.04E-01	3.31E-01
	Whitefish Lake Middle	4.33E-04	1.57E+00	1.23E+00	2.00E+00
	Whitefish Lake South	4.12E-04	1.51E+00	1.18E+00	1.93E+00
	McGowan Lake	2.59E-04	1.02E+00	7.65E-01	1.37E+00
	Russell Lake	1.95E-04	8.12E-01	5.85E-01	1.12E+00

Using the range of the uncertainty in the northern pike BAF (from Table IR-126-1), fish muscle tissue selenium concentrations were calculated for the various lakes, using site-specific moisture content and the species-specific US EPA (2021) conversion factors (see Table IR-126-2).

For reference, as indicated previously the whole body tissue and egg-ovary concentrations do not exceed the ECCC (2022) guidelines for the mean BAF. The resulting whole-body tissue and egg-

ovary concentrations do not exceed the ECCC (2022) guidelines for the BAF lower range of uncertainty. At the upper range of the BAF, the egg-ovary concentration in Whitefish Lake exceeds the whole body guideline of 6.7 µg/g dw and the egg-ovary guideline of 14.7 µg/g dw from ECCC (2022). At all other lakes the predicted whole body and egg-ovary concentrations are below the selenium guidelines (see Table IR-126-3).

The results of the EIS are interpreted based on the expected mean BAF. Based on the expected selenium BAF, no significant adverse effects are predicted to northern pike from exposure to selenium. The uncertainty results requested by the CNSC provide a range (lower and upper) around the risk; however, there are numerous conservative assumptions in the overall assessment that would indicate the expected BAF is sufficiently conservative. The effluent quality in the EIS provides a bounding assessment and a conservative representation of risk; however, Denison plans to continue to refine effluent quality predictions as part of the BATEA assessment and licensing process. Additionally, selenium is included as part of the environmental monitoring program throughout all phases of the Project. Continued monitoring will provide the ability for adaptive management throughout the life of the mine, which is commensurate with the level of risk associated with the upper bound BAF.

**Table IR-126-2: Calculated Whole Body and Egg-Ovary Selenium Concentrations – Expected Mean BAF**

Fish Species	Lake	FEQG (µg/g dw)		6.7	14.7
		Muscle µg/g fw	Muscle µg/g dw <sup>(a)</sup>	Whole Body µg/g dw <sup>(b)</sup>	Egg-Ovary µg/g dw <sup>(c)</sup>
Northern Pike	Ref	1.89E-01	8.58E-01	0.68	1.61
	Whitefish Lake North	1.86E-01	8.45E-01	0.67	1.59
	Whitefish Lake Middle	1.57E+00	7.13E+00	5.61	13.40
	Whitefish Lake South	1.51E+00	6.86E+00	5.40	12.89
	McGowan Lake	1.02E+00	4.63E+00	3.65	8.71
	Russell Lake	8.12E-01	3.69E+00	2.90	6.93

Notes:

(a) The site-specific moisture content for northern pike of 77.98% was used to convert from fresh weight to dry weight.

(b) A Muscle:Whole Body ratio of 1.27 was used for northern pike from Table B-4, B-5, US EPA 2021

(c) An Egg-Ovary:Muscle ratio of 1.88 was used for northern pike from Table B-3, US EPA 2021



**Table IR-126-3: Calculated Whole Body and Egg-Ovary Selenium Concentrations – Range of Uncertainty**

Fish Species	Lake	Water Concentration LA-5 mg/L	FEQG (µg/g dw)				6.7	6.7	14.7	14.7
			Fish Muscle Tissue (Lower Value) µg/g fw	Fish Muscle Tissue (Upper Value) µg/g fw	Fish Muscle Tissue (Lower Value) µg/g dw	Fish Muscle Tissue (Upper Value) µg/g dw	Whole Body (Lower Value) <sup>(b)</sup> µg/g dw	Whole Body (Upper Value) <sup>(b)</sup> µg/g dw	Egg-Ovary (Lower Value) <sup>(c)</sup> µg/g dw	Egg-Ovary (Upper Value) <sup>(c)</sup> µg/g dw
Northern Pike	Reference	3.35E-05	1.06E-01	3.36E-01	4.82E-01	1.53E+00	0.38	1.20	0.91	2.87
	Whitefish Lake North	3.28E-05	1.04E-01	3.31E-01	4.72E-01	1.50E+00	0.37	1.18	0.89	2.83
	Whitefish Lake Middle	4.33E-04	1.23E+00	2.00E+00	5.59E+00	9.07E+00	4.40	<b>7.14</b>	10.51	<b>17.06</b>
	Whitefish Lake South	4.12E-04	1.18E+00	1.93E+00	5.35E+00	8.74E+00	4.21	<b>6.88</b>	10.05	<b>16.44</b>
	McGowan Lake	2.59E-04	7.65E-01	1.37E+00	3.48E+00	6.24E+00	2.74	4.91	6.54	11.73
	Russell Lake	1.95E-04	5.85E-01	1.12E+00	2.66E+00	5.10E+00	2.09	4.02	5.00	9.59

Notes:

(a) The site-specific moisture content for northern pike of 77.98% was used to convert from fresh weight to dry weight.

(b) A Muscle:Whole Body ratio of 1.27 was used for northern pike from Table B-4, B-5, US EPA 2021

(c) An Egg-Ovary:Muscle ratio of 1.88 was used for northern pike from Table B-3, US EPA 2021

**Bold** indicates exceedance of the selenium guideline.

#### References:

Environment and Climate Change Canada (ECCC). 2022. Federal Environmental Quality Guidelines Selenium. August.

US EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.

IR-142, IR-159, IR-167 -R1

- Department: ECCC
- Project Effects Link: Migratory birds
- Reference to EIS, appendices, or supporting documentation: Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 8, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Sept. 27 2024)
IR-142		<p><b>Context:</b> The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens.</p> <p>In Section 9.3.3.2.1, the Proponent states: “Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success.”</p> <p>In Section 9.3.6, the Proponent states: “In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction.”</p> <p>The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost (Table 9.3-20).</p> <p><b>Rationale:</b> As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens.</p> <p>Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features</p>	<p>1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges.</p> <p>2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project.</p> <p>3. Assess the need for pre-construction/pre-clearing surveys to identify any wolverine denning sites.</p> <p>4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.</p>	<p>1. While wolverine were not observed during baseline studies for the Project, it is assumed that the Project (Project Area, LSA) may overlap with wolverine home ranges. As described in the EIS, wolverine occur in low densities across all forest stand and vegetation types but are generally absent from areas of human development and activities.</p> <p>2. No wolverine dens were identified during any of the baseline studies. It is not anticipated that wolverine denning sites will be lost and/or altered because there are no specific landscape features typically used by wolverine as potential denning sites located in the Project footprint. Further, much of the proposed Project footprint will be developed within previously disturbed areas, including roads and cutlines.</p> <p>3. Pre-construction surveys will be completed to identify all sensitive wildlife habitat features, including wolverine denning sites.</p> <p>4. Most of the Project footprint is already disturbed through previous exploration activities. The total expected direct habitat loss of 169.6 ha includes the already disturbed areas. In the Terrestrial RSA, 8.2% of available wolverine habitat may be altered or lost; this includes 0.5% that will be cleared within the Project Area during Construction, and an additional 7.7% that may be altered through indirect effects (sensory disturbance). The magnitude of this effect was characterized as being "moderate" and the residual effect is not expected to result in a change that will alter wolverine habitat integrity to the point where it would not be able to sustain the regional populations of wolverine. This considers that no wolverine were observed during the baseline investigations, the small Project footprint, and the typically large size of a wolverine home range.</p>	<p>The information provided by the Proponent is complete, however, a follow up IR regarding survey methods for all pre-construction and pre-clearing surveys is required. See follow-up IR-142-159-167.</p>	n/a	n/a	n/a	n/a	n/a
IR-159		<p>Context and Rationale: Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p>	<p>Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.</p>	<p>The baseline data presented in the draft EIS are sufficient for the intended purpose – that is the data are sufficient, in conjunction with regionally available data, to identify potential project effects. The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site.</p> <p>As described in the EIS, pre-construction surveys will be conducted prior to the commencement of any vegetation clearing or soil disturbance. Avian species will also be routinely monitored throughout the life of the Project. Results from the surveys and monitoring activities are expected to inform the adaptive management process to update Project design and identify the need for additional mitigation measures, if required. Note: Section 9.4.3.3 of the draft EIS includes all available information from the HABISask database at the time of the assessment. While recent surveys from Environment and Climate Change Canada and the Saskatchewan Breeding Bird Atlas have expanded surveys into the northern boreal forest, these data are not yet publicly available or published to make inferences on population trends for</p>	<p>This response has not been accepted.</p> <p>The Proponent’s response indicated that their opinion is that the data presented in the draft EIS is sufficient and that no updates to the draft EIS are needed.</p> <p>However, a single year of baseline data from 2017 is insufficient to assess Project impacts during the follow-up and monitoring program. Although pre-construction surveys prior to clearing can give a very localized picture of the avian community, it does not provide a baseline within the Regional Study Area (RSA) of the bird community and will be of limited use for comparing construction and operational monitoring data to baseline conditions. Use of more recent data or supplemental data</p>	<p>Denison and its SME continue to be of the opinion that the data on which the effects assessment is based are sufficient and fit for purpose as it concerns the EA process. The effects assessment was not based on the 2017 field survey data alone. The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including IK. The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory songbird species were documented. A summary of the total number of individuals observed for each species across all plots is provided in Appendix 9-F of the revised Draft EIS. While the supplemental data do provide further context for the RSA, they would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA.</p> <p>The above does not preclude the implementation of further breeding bird surveys prior to site development and operations. Denison accepts the comment that additional, more recent information, as well as supplemental data as available, and will provide</p>	n/a (accepted)	n/a	n/a	n/a



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				migratory songbirds that could use the available habitat in the Terrestrial RSA.	can account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures.  See follow-up IR-142-159-167-R1	the basis for a more effective review of mitigation and follow-up measures as the Project moves forward. The details of such follow-up monitoring will be defined as part of the further consideration of planning related to follow up programs.  For clarification the pre-clearance wildlife sweeps are intended to identify sensitive wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects. The spatial scale of where these pre-construction sweeps would be completed could be expanded to include other areas beyond the Project Area but within the RSA.				
IR-167	-	<p><b>Context and Rationale:</b> The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: “Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered:</p> <ol style="list-style-type: none"> <li>Most migratory birds: <ul style="list-style-type: none"> <li>Nests are protected only when they are in use or when live eggs or chicks are present.</li> </ul> </li> <li>Migratory birds listed in MBR 2022 Schedule 1: <ul style="list-style-type: none"> <li>For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned.</li> </ul> </li> <li>Migratory birds listed under SARA: <ul style="list-style-type: none"> <li>For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.</li> </ul> </li> </ol>	<p>Provide the following information:</p> <ul style="list-style-type: none"> <li>details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR).</li> <li>the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR</li> </ul>	<p>Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.</p>	<p>Response is accepted, but also see AD-57 in the Advice to Proponent table and follow-up IR-142-159-167-R1.</p>	n/a	<p>Response is accepted, but also see AD-57 in the Advice to Proponent table and follow-up IR-142-159-167-R1.</p>	See response to IR-142-159-167-R1 below.	n/a	n/a
n/a	IR-142, IR-159, IR-167 - R1		n/a	n/a	<p>Provide survey methodology and timing for all preconstruction and pre-clearing surveys, including avian and species at risk surveys (caribou, wolverine).</p>	<p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se, but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be</p>	<p>The Proponent notes that:</p> <ul style="list-style-type: none"> <li>Site clearing and other works that involve disturbance of vegetation and/or soil will be completed in winter.</li> <li>Pre-disturbance wildlife sweeps would be conducted by qualified biologists at least seven days prior to any scheduled vegetation/land disturbance.</li> <li>Mitigation measures to avoid or minimize adverse effects on identified features are not species specific.</li> <li>The methods associated with these pre-construction and pre-clearing sweeps will be</li> </ul>	<p>The requested information on species at risk pre-clearance sweeps are summarized below in Attachment IR-142, IR-159, IR-167-R1 (Round 3).</p> <p>Denison and its SMEs believe we have provided sufficient information and analysis in the EIS, associated supporting documents and IR responses for the federal government to make a determination as to the effect of the Project on SAR, within the approved scope of the Project and CEAA 2012.</p> <p>Commensurate with the stage of the Project and EA process conceptual level detail for monitoring and follow-up programs (see EIS Appendix 16F) and a description of the programs fit into the overall environmental management system (EIS Section 2.9) have been provided. Further details regarding these programs</p>	<p>The Proponent notes that they will use visual searches for several bird SAR. This includes Bank Swallow, Barn Swallow, Common Nighthawk, and Horned Grebe. While visual observations are an appropriate method for detecting Barn and Bank Swallow nests, it is not suitable for detecting Common Nighthawk. The province of Saskatchewan provides appropriate protocols for detection of Common Nighthawk.</p> <p>The Proponent also notes that they will conduct call-playback or visual searches for Olive-sided Flycatcher and Short-eared Owl. While the call-playback surveys would be more likely to detect individuals in areas to be cleared, the visual searches are unlikely to be effective for these species. The Proponent should consider following the provincial detection survey protocols for Short-eared Owl and Olive-Sided Flycatcher.</p>	<p>1. To address this part of the Round 4 IR, the wildlife species at risk pre-clearance sweep methods and timing table (now included in the final EIS Appendix 9-D as Table 4-1) has been updated.</p> <p>In this table, the column “survey techniques” has been updated as follows:</p> <ul style="list-style-type: none"> <li>common nighthawk – “visual search” changed to “call-playback”</li> <li>short-eared owl – “call-playback or visual searches” changed to “call-playback.”</li> <li>olive-sided flycatcher – “call-playback or visual searches” changed to “call-playback.”</li> </ul> <p>A reference to the Saskatchewan SDSPs have been added to the last column of Table 4-1.</p> <p>Finally, a footnote has been added to the table: “Surveys will be completed by qualified professional biologists; in their capacity as professional biologists, they will refer to available guidance such as the Saskatchewan species detection survey protocols to develop details of the surveys (e.g.,</p>

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						<p>tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snow pack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.</p> <p><b>References:</b></p> <p>B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119</p> <p>Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.</p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	<p>tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snow pack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). If sensitive features are found, then they will be documented, and data collected would inform the development and implementation of appropriate mitigation measures.</p> <p>It is unclear what is meant by “surveys are not species-specific” but sweeps will be “tailored to the species at risk”. It is also unclear how mitigation measures will be developed and implemented in a seven-day period.</p> <p>In order for ECCC and CNSC to provide advice on potential effects to SAR based on the habitat potential mapping, the development of species-specific mitigation measures needs to be produced for review during this assessment process. The Proponent also needs to provide details on follow up and monitoring programs that are in place to confirm that the mitigation measures implemented are effective.</p> <p>In addition, ongoing monitoring is required for SAR. Denison is expected to describe the planned monitoring and follow-up programs for SAR. Denison must justify how the proposed methods are adequate to provide a baseline for each SAR, to verify that mitigation measures are effective, and to allow for statistically robust comparison to assess potential impacts on SAR over the lifecycle of the project.</p>	<p>have been provided in response to various IRs. Denison continues to refine the program level detail, and in parallel develop its plan level documentation to support CNSC licensing and provincial permitting. Any ongoing monitoring for SAR will be detailed in the Wheeler River Project’s Environmental Management Program documentation, including for example the Biodiversity Management Plan. We also note that ongoing SAR management is under Provincial jurisdiction. For reference, within the EIS, the EMS framework is described in Section 2.9, wildlife monitoring plans are provided in Section 9.3.8, avian monitoring plans are provided in 9.4.8, and a summary of general and species-specific mitigation measures is provided in Appendix 9-D. Briefly, wildlife and avian species will be routinely monitored throughout the life of the Project in accordance with the wildlife monitoring plans. An adaptive management process will be employed, after applicable consultations and approvals, where implemented mitigation measures are found to be unsuccessful.</p>	<p>In order to resolve this IR, Denison are expected to:</p> <ol style="list-style-type: none"> <li>1. Modify the Table in “Attachment IR-142, IR-159, IR-167-R1 (Round 3)” to incorporate appropriate protocols for detection of Common Nighthawk, Short-eared Owl, and Olive-Sided Flycatcher, as suggested by ECCC.</li> <li>2. Incorporate the Table into the EIS documentation, e.g., Appendix 9-D.</li> <li>3. Update any related commitments for pre-clearance / pre-disturbance surveys in their commitments register.</li> </ol>	<p>selecting the appropriate time of day for the survey).”</p> <p>2. The table is now available in the final EIS (Appendix 9-D Table 4-1).</p> <p>3. Existing commitment 9-3 has been updated and now reads (additions in <b>bold</b>): “To adequately address potential effects, regardless of the wildlife, seasonal or species-specific sensitivities, pre-disturbance wildlife clearance surveys (i.e., not species-specific surveys) will be completed prior to any work commencing. Results of the wildlife clearance surveys will be used to inform the design and delineation/establishment of suitable setback distances (i.e., specific to species, habitat, life-cycle sensitivities), work delays and/or other species-specific mitigation measures at that location, with discussions with ENV as appropriate. <b>The details on the methodology of species-specific pre-clearance sweep protocols and timing are provided in the Appendix 9-D of the final EIS.</b>”</p>



Attachment IR-142, IR-159, IR-167-R1 (Round 3)

Table 1: Species at Risk Survey Methods

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
Northern Leopard Frog	Not observed.	Appendix 9-D	From winter sites, adult frogs travel up to 1.6 km to breed.	Wetlands/ water/ riparian / wet/ moist/ scrublands/ bogs/ fens.	Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.	Pond setback; 10m (low); 200m (Mod) and 500m (High);	MOE (2017)
			They breed in the shallow, warm waters of a variety of wetlands including marshes, springs, flooded ditches, dugouts, borrow pits, beaver ponds, margins of lakes, and slow-moving waters of streams and rivers.		Auditory call surveys.	April 20 to June 10.		
			After breeding, adults and sub-adults may disperse up to 8 km from breeding ponds.		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
			Northern Leopard Frogs usually do not utilize areas that are heavily wooded		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
			They forage in the summer in riparian or upland habitats. These areas are moist habitats including meadows, pastures, scrublands, riparian corridors, and drainage or irrigation ditches.		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
Little Brown Myotis and Northern Bat	34 ultrasonic detections of little brown/northern myotis.	Appendix 9-D	The presence of large snags, tree cavities, is an important attribute in old growth forest stands that provides maternity roosts and day roosts for northern myotis and little brown bats. Building are also used.	Treed areas with the largest diameter and/or older trees. Focus on older forest, or areas with large snags in younger forest within the project footprint (majority is regenerating forest 1-5m).	Daytime visual search of trees and potential roost sites. Systematic meandering search of areas to be cleared during active bat season. Focus on searching for roost features (snags, cracks, stumps, cavities, bark peeling) and bat sign (e.g., guano).	May to Sept	Should a roosting bat be discovered the area will be afforded protection from clearing for 24 hours and re-surveyed. The area will only be cleared if no bats are discovered. A 100 m buffer will be given to nursery roots and 50 m to daily roosting bats. If many roosting bats are recorded compensation will be considered (e.g., bat houses).	COSEWIC (2013a); Resources Information Standards Committee (RISC) (2022)

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			Foraging habitat in proximity to roosting sites is also an important factor in roost selection.	Treed areas in proximity to clearings, wetlands and open water.		Year Round	Roost/Foraging site; 100m(low); 500m (Mod) and 500m (High);	MOE (2017)
Wolverine	Not observed.	Section 9.3	A wide variety of forested and vegetation associations are used by wolverine. Habitats must have an adequate year-round supply of food, mainly consisting of smaller prey such as rodents and Snowshoe Hares, and the carcasses of large ungulates, like Moose, Caribou, and Muskox.	All areas of project activity.	Winter den searches.	Snow cover months.	Setback of 250m when occupied and 100m when unoccupied.	COSEWIC (2014); Environmental Protection and Management Guideline (2024)
			Females den under snow-covered rocks, logs or within snow tunnels. Wolverines reproduce in areas where snow cover persists at least into April.					
Woodland Caribou	Observed.	Section 9.3	Woodland caribou may occupy all potential project areas but prefer forests greater than 40 year of age.	All areas of project activity.	Visual search to ensure no caribou are in the area. Ongoing vigilance.	Year Round	If caribou are in the area cease operations until they are clear of the area.	SME (2021)
Rusty Blackbird	Not observed.	Section 9.4	Rusty blackbird primarily nests in small conifers, predominantly spruce. In Canada, nests have also been found in Balsam Fir, Eastern White Cedar, Paper Birch, Balsam Poplar, Red Maple, Pin Cherry, emergent sedges, cattails, and on the ground on a beaver dam	All habitat with spruce, white birch and balsam poplar. Very limited suitable (spruce) habitat within project footprint.	Visual search for nests.	MBCA window	A 75 m buffer around coniferous bogs, fens and other wetlands suitable for Rusty blackbirds (Odsen and Pyper 2019).	Environment Canada. (2015); Odsen and Pyper (2019); Wildlife Division (2020)
			We only have spruce, birch and poplar at Wheeler.			May 1 to July 31	Nest setback of 0-50m (low activity); 150m (Mod activity) and 300m (High activity);	Manitoba Conservation (2021)
Yellow Rail	Not observed.	Section 9.4	Yellow rails inhabit shallow wetlands and other wet areas with grass-like vegetation.	Using available mapping conduct daytime Ecosite verification and stratify surveys in appropriate habitat only. Based on available mapping, no suitable habitat within project footprint.	Mid May to mid to late June. Triplicate nocturnal (23:00-03:00) call-playback surveys spaced at least 4 days apart. Or use Autonomous Recording Units throughout the breeding season.			Environment Canada (2012); SME (2014)
			They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes					
			These wetlands are generally dominated by short, fine-stemmed herbaceous vegetation, especially sedges (Carex spp.), as well as other graminoid vegetation of the families Cyperaceae, Poaceae, and Juncaceae. Vegetation structure (e.g. short, grass-like, and dense) is likely more important than its taxon					



Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			Breeding habitats may have up to 50 cm of standing water, but typically nesting sites are less than 15 cm deep			May 1 to July 15	Nest site setback; 100m(low); 150m (Mod) and 350m (High);	MOE (2017)
Bank Swallow	Not observed.	Appendix 9-D	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 m), natural and anthropogenic habitats, including: lake and ocean bluffs; stream and river banks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials.	Survey key habitat features identified as important.	Visual survey during timing window.	May 15 to July 31	Nesting Colony Setback; 50m (low); 150m (Mod) and 300m (High);	Manitoba Conservation (2021)
			Nest burrows are nearly always in a vertical or near-vertical bank (range: 76-105° slope;					COSEWIC (2013b)
			In some cases, Bank Swallows have nested in drain pipes and in structures designed and built specifically for nesting Bank Swallows					
Barn Swallow	Four visual/auditory detections.	Appendix 9-D	Nest on horizontal and vertical structures that include natural sites, such as cliffs and caves, as well as human-made structures, such as barns, bridges, and culverts . The nesting substrate must be rough, or have a ledge or projecting objects, such as bolts or light fixtures, to provide additional structural support to the nest.	Open areas in proximity to water. All buildings and man made structures.	Visual.	May 15 to Sept 30	Nest site setback; 50m (low); 100m (Mod) and 100m (High);	Manitoba Conservation (2021)
			Nesting sites must provide access to open areas with an abundant supply of aerial insects to feed on; features such as wetlands, waterbodies, watercourses, meadows, grazed grassland, and farmland are preferred . Proximity to a waterbody or moist area with a supply of wet mud is needed to facilitate nest construction.					COSEWIC (2021a)
Common Nighthawk	Two nests, five visuals and 76 auditory/visual detections.	Section 9.4	Nests are typically in open sites with dry, well-drained substrates that will not overheat and that have shade nearby for young to shelter from the sun and predators. Nest sites include forest clearings, bare patches in grassland, gravel pits, outcrops, road or rail sides, and, rarely, fenceposts.	All upland habitat.	Visual searches.	May 1 to Aug 31	Nest site setback; 0-50m (low); 150m (Mod) and 300m (High);	MOE (2017)
Horned Grebe	One observation.	Appendix 9-D	More than 90% of the Horned Grebes in North America breed in ponds and lakes in western and northern Canada.	Water bodies within the project area.	Visual searches.	May 1 to Sept 15	Nest site setback; 100m (low); 200m (Mod) and 400m (High);	Manitoba Conservation (2021)
								COSEWIC (2009)

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
Olive-sided Flycatcher	Fourteen observations.	Section 9.4	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees	All conifer and/treed upland areas.	Call-playback or visual searches.	May 1 to Aug 31	Nest setback; 100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Data gathered from points across Canada indicate that mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities					Environment Canada (2016)
			Olive-sided Flycatcher prefers post-burn areas or wetlands that create open habitats for the species to forage					
Short-eared Owl	Not observed.	Section 9.4	Nesting generally occurs in large open areas	Open upland and lowland areas with no trees and some shrub cover.	Call-playback or visual searches.	March 25 to Aug 1	100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Requires a minimum area of about 50-100 ha, consistent with the mean territory size of 82 ha reported in Manitoba.					COSEWIC (2021b)
			In the north, nests are primarily in tundra (Sinclair et al. 2003), and sometimes beside a small shrub that provides cover					

## References:

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- COSEWIC 2021. COSEWIC Assessment and Status Report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the status of Endangered Wildlife in Canada (COSEWIC). Threatened 2021
- Environment Canada. 2016. Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 52 pp.
- COSEWIC. 2014. COSEWIC assessment and status report on the Wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 76 pp.
- COSEWIC. 2013a. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp.
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Resources Information Standards Committee (RISC). 2022. Inventory Methods for Bats, Standards for Components of British Columbia's Biodiversity No. 20. Version 3.0. B.C. Ministry of Land, Water and Resource Stewardship, Ecosystems Branch, Victoria, B.C.

Saskatchewan Ministry of the Environment (SME) 2014. Yellow Rail Survey Protocol. Fish and Wildlife Branch Report No. 2014-14.0. 3211 Alberta Street, Regina, Saskatchewan. 8pp.

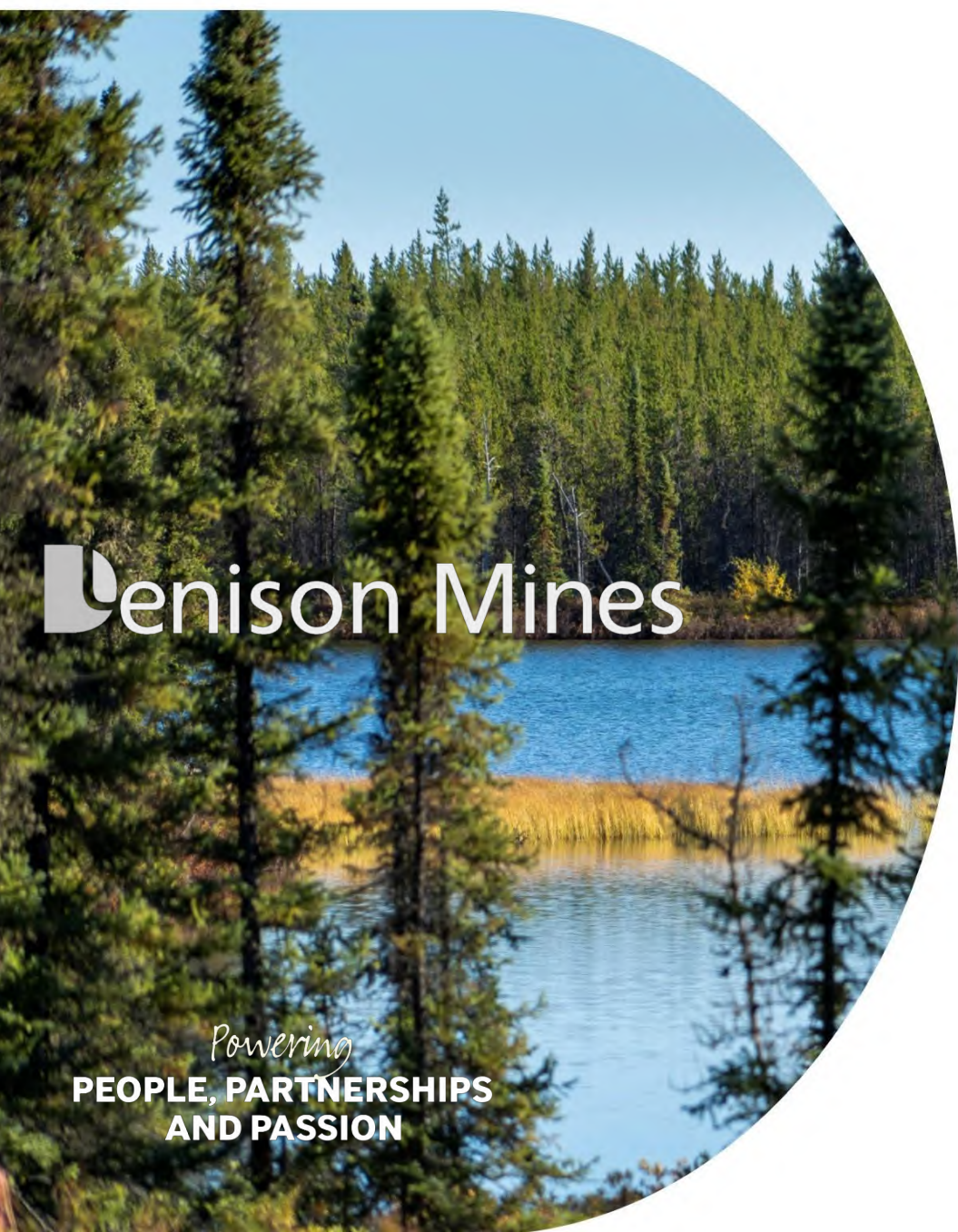
Wildlife Division. 2020. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Newfoundland and Labrador. Department of Fisheries, Forestry and Agriculture, Government of Newfoundland and Labrador, Corner Brook, Canada. v + 23 pp.

IR-170

- Department: ECCC
- Project Effects Link: Migratory birds
- Reference to EIS, appendices, or supporting documentation: Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 8, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Sept. 27 2024)
IR-170	-	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p>Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>1. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA; no updated table or map is considered to be required. In addition, further mapping is not expected to affect or change the findings and conclusions of the draft EIS.</p> <p>2. Common Nighthawk were observed in the Project study areas during the baseline studies and are considered to be present and breeding. Rocky outcrops were not reported during the baseline studies (see Section 9.2.3). Pre-clearing surveys will be conducted, set-back buffers implemented, and pre-clearing survey and monitoring results will be used for adaptive management purposes (see also response to IR-159). Species-specific mitigation appropriate for Common Nighthawk is largely related to loss and/or alteration of habitat (including both direct and indirect effects).</p>	<p>This response has not been accepted.</p> <p>Part 1 of the IR was addressed, however, part 2 has not been addressed. ECCC requires this information to properly assess potential the mitigations and adaptive management for Common Nighthawk.</p>	<p>Based on the baseline field survey observations (n=38) for common nighthawk, the majority of observations (n=20) were in association with anthropogenic (disturbed) ecosite types, while the remainder (n=10) were associated with the jack pine-blueberry/black spruce-blueberry/lich (BS3/BS7) ecosite.</p> <p>Updates to Figure 9.4-7, Figure 9.4-12 and Table 9.4-19 of the revised draft EIS have been completed to include all habitat (ecosite) types. See separate response to IR-170: Available Habitat for Common Nighthawk. Figure 9.4-12 in the revised draft EIS has been replaced in the EIS with a revised figure that includes all ecosite types.</p> <p>Mitigation measures that would pertain to common nighthawks are included in Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance, which state that site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, whenever practicable. The nesting season for the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs in Saskatchewan spans a period from March 15 to August 31. Further, in the event site clearing is necessary within this time frame, pre-clearance wildlife sweeps will be completed where common nighthawks are suspected of nesting; if an occupied nest is found, applicable activity restriction guidelines would be implemented (as per SK MOE 2017).</p> <p><b>References:</b></p> <p>Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).</p>	<p>Item one was accepted, but item two remains outstanding. In Section 9.4.5.2.1, the Proponent has not included species specific mitigations for all species at risk, including common nighthawk. The Proponent should include species specific mitigations for all species at risk, including common nighthawk, so that ECCC can provide advice on the extent of Project impacts to these species.</p> <p>Additionally, the Proponent indicates that prior to site clearing during the nesting season (period from March 15 to August 31), pre-clearing nest surveys will be conducted. ECCC does not typically recommend nest surveys as a pre-clearing activity (please refer to the Advice to the Proponent relating to IR-170). In some instances, surveying for breeding activity using non-invasive methods could be required to determine species presence, and for some migratory birds SAR it may be required to survey for nest trees (residences) prior to clearing as these have year-round protection through SARA and a permit may be required.</p> <p>Specifically, it is not adequate to group SAR together (e.g., all birds) due to the unique life history and habitat requirements of each individual SAR. Denison is expected to provide species-specific mitigation measures for each SAR separately.</p>	<p>See response to IR-142-159-167-R1.</p>	<p>Following the supplementary information provided by Denison on July 8th, CNSC staff determined that Denison has not provided the requested information on species-specific mitigation measures for each SAR. It is not adequate to group SAR together (e.g., all birds) due to the unique life history and habitat requirements of each individual SAR. Denison is expected to provide species-specific mitigation measures for each SAR separately.</p> <p>In order to resolve this IR, Denison are expected to:</p> <p>•Provide species-specific mitigation measures for each individual SAR. Denison may provide this information through revision of Section 3.3 and Table 4.1 in EIS Appendix 9-D.</p>	<p>The requested updates have been made in Appendix 9-D of the final EIS (October 2024).</p>





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# Denison Mines Corp.

## Appendix 9-D Wildlife Species At Risk

Appendix to final EIS, Section 9

Version 32

~~January 2024~~ October 2024

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## Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	<i>Species at Risk Act</i>
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component

# 1 Introduction

## 1.1 Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 1\_1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 1.2 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 1\_1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

**Table 1-1-1 Wildlife Species at Risk Listed by Environment and Climate Change Canada**

Common Name	Scientific Name	Discussed in the <a href="#">Draft Section 9 of the draft EIS</a>
Nine-spotted lady beetle	<i>Coccinella ovemnotata</i>	No
Transverse lady beetle	<i>Coccinella transversoguttata</i>	No
Yellow-banded bumble bee	<i>Bombus terricola</i>	No
Northern leopard frog	<i>Lithobates pipiens</i>	No
Little brown myotis	<i>Myotis lucifugus</i>	No
Northern myotis	<i>Myotis septentrionalis</i>	No
Wolverine	<i>Gulo gulo</i>	Yes
Woodland caribou	<i>Rangifer tarandus caribou</i>	Yes
Bank Swallow	<i>Riparia riparia</i>	No
Barn Swallow	<i>Hirundo rustica</i>	No
Common Nighthawk	<i>Chordeiles minor</i>	Yes
Horned Grebe	<i>Podiceps auritus</i>	No
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes



Common Name	Scientific Name	Discussed in the <a href="#">Draft-Section 9 of the draft EIS</a>
Rusty Blackbird	<i>Euphagus carolinus</i>	Yes
Short-eared Owl	<i>Asio flammeus</i>	Yes
Yellow Rail	<i>Coturnicops noveboracensis</i>	Yes

Of the 16 species listed in Table 1-1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

## 1.2 Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 1-2 and Table 1-3, which formed the basis for the subsequent VC-specific assessment.

**Table 1-2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project**

Valued Component	Rationale
<b>Biophysical Environment</b>	
<b>Terrestrial Environment</b>	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., <i>Species at Risk Act</i> [SARA; Government of Canada 2022], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], <i>The Wildlife Act, 1998</i> [Government of Saskatchewan 2020]).

Valued Component	Rationale
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], <i>Migratory Birds Convention Act 1994</i> [Government of Canada 2017], <i>Saskatchewan Activity Restriction Guidelines for Sensitive Species</i> [Government of Saskatchewan 2017], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).

**Table 1-3-3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project**

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.

Valued Component	Key Indicator	Measurable Parameter
	Yellow Rail	<p>Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities.</p> <p>The number of Yellow Rail mortalities directly or indirectly attributable to the Project.</p>

The five bird species identified in Table 1-3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

## 2 Supplemental Information

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As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 2-1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

Table 2-12-1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Arthropods						
Nine-spotted lady beetle	<i>Coccinella novemnotata</i>	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.1 for further details.	Local Study Area (LSA) is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	<i>Coccinella transversoguttata</i>	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.2 for further details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	<i>Bombus terricola</i>	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 2.1.3 for further details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Amphibians						
Northern leopard frog	<i>Lithobates pipiens</i>	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom; (2) breeding and larval waterbodies with shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date. Amphibian nocturnal call	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				marshes, moist upland meadows where grass height is less than 1 m. See Section 2.2.1 for further details.	and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs ( <i>Pseudacris maculata</i> ) were detected (Appendix 9-C).	
Bats						
Little brown myotis	<i>Myotis lucifugus</i>	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.1 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	<i>Myotis septentrionalis</i>	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.2 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA (Appendix 9-C).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.



Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Terrestrial Wildlife Species						
Wolverine	<i>Gulo gulo</i>	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	<i>Rangifer tarandus caribou</i>	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Avian Species						
Bank Swallow	<i>Riparia riparia</i>	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of open habitats. See Section 2.4.1 for further details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Barn Swallow	<i>Hirundo rustica</i>	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of	Documented during the breeding bird surveys as part of the baseline field	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 2.4.2 for further details.	program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	<i>Chordeiles minor</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	<i>Podiceps auritus</i>	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 2.4.3 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
Rusty Blackbird	<i>Euphagus carolinus</i>	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	<i>Asio flammeus</i>	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	<i>Coturnicops noveboracensis</i>	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

- 1 Schedule 1 under the *Species at Risk Act*.
- 2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

## 2.1 Arthropods

### 2.1.1 Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

### 2.1.2 Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



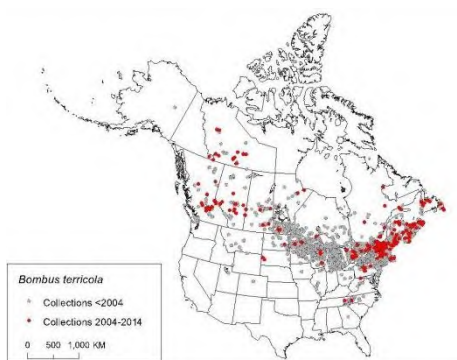
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section 2.1.1.

### 2.1.3 Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015). After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure)

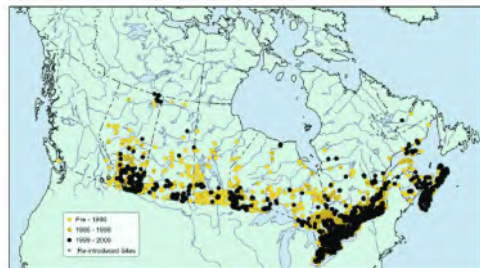
(Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015). The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

## 2.2 Amphibians

### 2.2.1 Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three distinct habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a,



NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

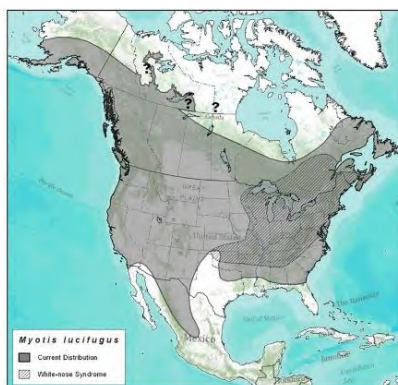
## 2.3 Bats

### 2.3.1 Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).



Source: COSEWIC (2013a).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease that causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

### 2.3.2 Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has



Source: COSEWIC (2013a).

been identified as the main threat for northern myotis populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

## 2.4 Avian Species

### 2.4.1 Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making

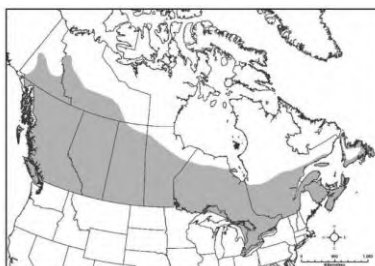


Source: COSEWIC (2013b).

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

#### 2.4.2 Barn Swallow

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021a). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021a). Historically, suitable nesting sites were likely provided by caves, cliff faces, rock ledges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021a). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021a). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021a). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021a).



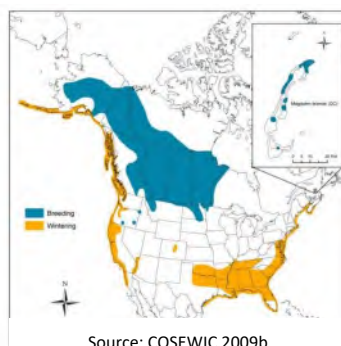
Source: COSEWIC (2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021a). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021a). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021a). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021a).

#### 2.4.3 Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC to Yukon across to the Magdalen Islands in Quebec and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation,



Source: COSEWIC 2009b

anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

## 3 Mitigation Measures

The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

### 3.1 Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;



- controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and
  - watering and traffic controls on roads.
- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
  - The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
  - Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
  - Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
  - A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
  - Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
  - Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
  - Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
  - The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.
  - All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

## 3.2 General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. ~~Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.~~

### 3.2.1 Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- **Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted a** by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.
- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., nests) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.

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### 3.2.2 Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.

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### 3.2.3 Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

### 3.2.4 Wildlife Deterrence and Prevention of Wildlife Entrapment

- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.
- Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.
- Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.

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- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

### 3.2.5 Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

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### 3.2.6 Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interaction.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.

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- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

### 3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR ~~that were not included or that were revised from what was described in the draft EIS are provided in bold text. These have been will be~~ added to ~~the~~ Section 9 of final EIS as applicable, with species-specific details provided here in the supporting appendix. For further information on methods and timing of SAR pre-clearance sweeps, refer to Section 4 of this appendix.

#### 3.3.1 Arthropod Species

##### 3.3.1.1 Nine-spotted lady beetle

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on nine-spotted lady beetle primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - o The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.

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- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on nine-spotted lady beetle.

#### 3.3.1.2 Transverse lady beetle

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on transverse lady beetle primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on transverse lady beetle.

#### 3.3.1.3.1.3 Yellow-banded bumble bee

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee.) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species yellow-banded bumble bee.

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### 3.3.2 Amphibian Species

#### 3.3.2.1 Northern leopard frog

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Pre-disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian-northern leopard frog breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).
- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., breeding and overwintering habitat) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.
- Locations of site-specific habitat features used by northern leopard frog amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Appropriate setback and buffer distances from wetland features where northern leopard frog amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.
- Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.

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### 3.3.3 Bat Species

#### 3.3.3.1 Little brown myotis

- Vegetation clearing activities will occur outside of little brown myotis roosting periods, when practical.
- Pre-disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as little brown myotis maternal roosting sites and hibernacula used by little brown myotis. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan).
- In the event a little brown myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for little brown myotis to leave but not the ability to re-enter the roosting site.

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- Locations of these site-specific habitat features used by little brown myotis will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

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### **3.3.3.3.2 Northern myotis**

- Vegetation clearing activities will occur outside of northern myotis roosting periods, when practical.
- Pre-disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as northern myotis maternal roosting sites and hibernacula used by northern myotisbat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan).~~If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017) (that will also be defined in the Wildlife Management Plan).~~
- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., roost/foraging site) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.
- In the event a northern myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for northern myotis bats to leave but not the ability to re-enter the roosting site.
- Locations of these site-specific habitat features used by northern myotisbats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

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### **3.3.4 Avian Species**

#### **3.3.4.1 Bank Swallow**

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the bank swallow nesting season, when practical. The breeding and nesting season for bank swallow in Saskatchewan typically spans a period from May 15 to July 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the bank swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of bank swallow nests.
- Active and/or suspected bank swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for bank swallow in Saskatchewan) in accordance with the level of

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the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

- Locations of nesting sites used by bank swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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#### 3.3.4.2 Barn Swallow

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the barn swallow nesting season, when practical. The breeding and nesting season for barn swallow in Saskatchewan typically spans a period from May 15 to September 30.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the barn swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of barn swallow nests.
- Active and/or suspected barn swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for barn swallow in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by barn swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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#### 3.3.4.3 Common Nighthawk

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the common nighthawk nesting season, when practical. The breeding and nesting season for common nighthawk in Saskatchewan typically spans a period from May 1 to August 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the common nighthawk breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of common nighthawk nests.
- Active and/or suspected common nighthawk breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

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#### 3.3.4.4 Horned Grebe

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the horned grebe nesting season, when practical. The breeding and

nesting season for horned grebe in Saskatchewan typically spans a period from May 1 to September 15.

- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the horned grebe breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of horned grebe nests.
- Active and/or suspected horned grebe nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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#### 3.3.4.5 Olive-sided Flycatcher

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the olive-sided flycatcher nesting season, when practical. The breeding and nesting season for olive-sided flycatcher in Saskatchewan typically spans a period from May 1 to August 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the olive-sided flycatcher breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of olive-sided flycatcher nests.
- Active and/or suspected olive-sided flycatcher nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

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#### 3.3.4.6 Rusty Blackbird

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the rusty blackbird nesting season, when practical. The breeding and nesting season for rusty blackbird in Saskatchewan typically spans a period from May 1 to July 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the rusty blackbird breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of rusty blackbird nests.
- Active and/or suspected rusty blackbird nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active

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(e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

#### 3.3.4.7 Short-eared Owl

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the short-eared owl nesting season, when practical. The breeding and nesting season for short-eared owl in Saskatchewan typically spans a period from March 25 to August 1.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the short-eared owl breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of short-eared owl nests.
- Active and/or suspected short-eared owl nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

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#### 3.3.4.8 Yellow Rail

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the yellow rail nesting season, when practical. The breeding and nesting season for yellow rail in Saskatchewan typically spans a period from May 1 to July 15.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the yellow rail breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of yellow rail nests.
- Active and/or suspected yellow rail nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in

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Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., nests) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.
- Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.
- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.



## 4 Pre-clearance SAR Survey Methods

[The methods and timing of proposed SAR pre-clearance sweep are provided in Table 4-1.](#)

Table 4-1 Wildlife Species at Risk Pre-clearance Sweep Methods and Timing

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
Northern Leopard Frog	Not observed.	Appendix 9-D	<a href="#">From winter sites, adult frogs travel up to 1.6 km to breed.</a>	Wetlands/ water/ riparian / wet/ moist/ scrublands/ bogs/ fens.	<a href="#">Visual searches for egg masses or frogs.</a>	<a href="#">Snow/ice-free early spring and spring season.</a>	<a href="#">Pond setback; 10m (low); 200m (Mod) and 500m (High);</a>	<a href="#">MOE (2017)</a>
			<a href="#">They breed in the shallow, warm waters of a variety of wetlands including marshes, springs, flooded ditches, dugouts, borrow pits, beaver ponds, margins of lakes, and slow-moving waters of streams and rivers.</a>		<a href="#">Auditory call surveys.</a>	<a href="#">April 20 to June 10.</a>		
			<a href="#">After breeding, adults and sub-adults may disperse up to 8 km from breeding ponds.</a>					
			<a href="#">Northern Leopard Frogs usually do not utilize areas that are heavily wooded</a>		<a href="#">Visual searches for egg masses or frogs.</a>	<a href="#">Snow/ice-free early spring and spring season.</a>		
			<a href="#">They forage in the summer in riparian or upland habitats. These areas are moist habitats including meadows, pastures, scrublands, riparian corridors, and drainage or irrigation ditches.</a>		<a href="#">Visual searches for egg masses or frogs.</a>	<a href="#">Snow/ice-free early spring and spring season.</a>		
<a href="#">Little Brown Myotis and Northern Bat</a>	<a href="#">34 ultrasonic detections of little brown/northern myotis.</a>	<a href="#">Appendix 9-D</a>	<a href="#">The presence of large snags, tree cavities, is an important attribute in old growth forest stands that provides maternity roosts and day roosts for northern myotis and little brown bats. Building are also used.</a>	<a href="#">Treed areas with the largest diameter and/or older trees. Focus on older forest, or areas with large snags in younger forest within the project footprint (majority is regenerating forest 1-5m).</a>	<a href="#">Daytime visual search of trees and potential roost sites. Systematic meandering search of areas to be cleared during active bat season. Focus on searching for roost features (snags, cracks, stumps, cavities, bark peeling) and bat sign (e.g., guano).</a>	<a href="#">May to Sept</a>	<a href="#">Should a roosting bat be discovered the area will be afforded protection from clearing for 24 hours and re-surveyed. The area will only be cleared if no bats are discovered. A 100 m buffer will be given to nursery roots and 50 m to daily roosting bats. If many roosting bats are recorded compensation will be considered (e.g., bat houses).</a>	<a href="#">COSEWIC (2013a); Resources Information Standards Committee (RISC) (2022)</a>

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			Foraging habitat in proximity to roosting sites is also an important factor in roost selection.	Treed areas in proximity to clearings, wetlands and open water.		Year Round	Roost/Foraging site; 100m(low); 500m (Mod) and 500m (High);	MOE (2017)
Wolverine	Not observed.	Section 9.3	A wide variety of forested and vegetation associations are used by wolverine. Habitats must have an adequate year-round supply of food, mainly consisting of smaller prey such as rodents and Snowshoe Hares, and the carcasses of large ungulates, like Moose, Caribou, and Muskox.	All areas of project activity.	Winter den searches.	Snow cover months.	Setback of 250m when occupied and 100m when unoccupied.	COSEWIC (2014); Environmental Protection and Management Guideline (2024)
			Females den under snow-covered rocks, logs or within snow tunnels. Wolverines reproduce in areas where snow cover persists at least into April.					
Woodland Caribou	Observed.	Section 9.3	Woodland caribou may occupy all potential project areas but prefer forests greater than 40 years of age.	All areas of project activity.	Visual search to ensure no caribou are in the area. Ongoing vigilance.	Year Round	If caribou are in the area cease operations until they are clear of the area.	SME (2021)
Rusty Blackbird	Not observed.	Section 9.4	Rusty blackbird primarily nests in small conifers, predominantly spruce. In Canada, nests have also been found in Balsam Fir, Eastern White Cedar, Paper Birch, Balsam Poplar, Red Maple, Pin Cherry, emergent sedges, cattails, and on the ground on a beaver dam	All habitat with spruce, white birch and balsam poplar. Very limited suitable (spruce) habitat within project footprint.	Visual search for nests.	MBCA window	A 75 m buffer around coniferous bogs, fens and other wetlands suitable for Rusty blackbirds (Odsen and Pyper 2019).	Environment Canada. (2015); Odsen and Pyper (2019); Wildlife Division (2020)
			We only have spruce, birch and poplar at Wheeler.			May 1 to July 31	Nest setback of 0-50m (low activity); 150m (Mod activity) and 300m (High activity);	
Yellow Rail	Not observed.	Section 9.4	Yellow rails inhabit shallow wetlands and other wet areas with grass-like vegetation.	Using available mapping conduct daytime Ecosite verification and stratify surveys in appropriate habitat only.	Mid May to mid to late June. Triplicate nocturnal (23:00-03:00) call-playback surveys spaced at least 4	-	-	Environment Canada (2012); SME (2014)  Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) <a href="https://publications.saskatchewan.ca/#/products/79508">https://publications.saskatchewan.ca/#/products/79508</a>
			They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes					

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			These wetlands are generally dominated by short, fine-stemmed herbaceous vegetation, especially sedges (Carex spp.), as well as other graminoid vegetation of the families Cyperaceae, Poaceae, and Juncaceae. Vegetation structure (e.g. short, grass-like, and dense) is likely more important than its taxon	Based on available mapping, no suitable habitat within project footprint.	days apart. Or use Autonomous Recording Units throughout the breeding season.			
			Breeding habitats may have up to 50 cm of standing water, but typically nesting sites are less than 15 cm deep			May 1 to July 15	Nest site setback; 100m(low); 150m (Mod) and 350m (High);	MOE (2017)
Bank Swallow	Not observed.	Appendix 9-D	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 m), natural and anthropogenic habitats, including: lake and ocean bluffs; stream and river banks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials.	Survey key habitat features identified as important.	Visual survey during timing window.	May 15 to July 31	Nesting Colony Setback; 50m (low); 150m (Mod) and 300m (High);	Manitoba Conservation (2021)
			Nest burrows are nearly always in a vertical or near-vertical bank (range: 76-105° slope;			-	-	COSEWIC (2013b)
			In some cases, Bank Swallows have nested in drain pipes and in structures designed and built specifically for nesting Bank Swallows					
Barn Swallow	Four visual/auditory detections.	Appendix 9-D	Nest on horizontal and vertical structures that include natural sites, such as cliffs and caves, as well as human-made structures, such as barns, bridges, and culverts . The nesting substrate must be rough, or have a ledge or projecting objects, such as bolts or light fixtures, to provide additional structural support to the nest.	Open areas in proximity to water. All buildings and man-made structures.	Visual.	May 15 to Sept 30	Nest site setback; 50m (low); 100m (Mod) and 100m (High);	Manitoba Conservation (2021)
			Nesting sites must provide access to open areas with an abundant supply of aerial insects to feed on; features such as wetlands, waterbodies, watercourses, meadows, grazed grassland, and farmland are preferred . Proximity to a waterbody or moist area with a supply of wet mud is needed to facilitate nest construction.			-	-	COSEWIC (2021a)

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique <sup>1</sup>	Timing	Action if Species Detected	Information Source
Common Nighthawk	Two nests, five visuals and 76 auditory/visual detections.	Section 9.4	Nests are typically in open sites with dry, well-drained substrates that will not overheat and that have shade nearby for young to shelter from the sun and predators. Nest sites include forest clearings, bare patches in grassland, gravel pits, outcrops, road or rail sides, and, rarely, fenceposts.	All upland habitat.	Call-playback.	May 1 to Aug 31	Nest site setback; 0-50m (low); 150m (Mod) and 300m (High);	MOE (2017)  Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) <a href="https://publications.saskatchewan.ca/api/v1/products/79502/formats/117104/download">https://publications.saskatchewan.ca/api/v1/products/79502/formats/117104/download</a>
Horned Grebe	One observation.	Appendix 9-D	More than 90% of the Horned Grebes in North America breed in ponds and lakes in western and northern Canada.	Water bodies within the project area.	Visual searches.	May 1 to Sept 15	Nest site setback; 100m (low); 200m (Mod) and 400m (High);	Manitoba Conservation (2021)
						-	-	COSEWIC (2009b)
						May 1 to Aug 31	Nest setback; 100m (low); 300m (Mod) and 500m (High);	MOE (2017)
Olive-sided Flycatcher	Fourteen observations.	Section 9.4	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees	All conifer and/treed upland areas.	Call-playback.	May 1 to Aug 31	Nest setback; 100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Data gathered from points across Canada indicate that mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities			-	-	Environment Canada (2016)
			Olive-sided Flycatcher prefers post-burn areas or wetlands that create open habitats for the species to forage			-	-	Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP)
Short-eared Owl	Not observed.	Section 9.4	Nesting generally occurs in large open areas	Open upland and lowland areas with no trees and some shrub cover.	Call-playback.	March 25 to Aug 1	100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Requires a minimum area of about 50-100 ha, consistent with the mean territory size of 82 ha reported in Manitoba.			-	-	COSEWIC (2021b)
			In the north, nests are primarily in tundra (Sinclair et al. 2003), and sometimes beside a small shrub that provides cover			-	-	Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) <a href="https://publications.saskatchewan.ca/api/v1/products/79506/formats/117101/download">https://publications.saskatchewan.ca/api/v1/products/79506/formats/117101/download</a>

<sup>1</sup> Surveys will be completed by qualified professional biologists; in their capacity as professional biologists, they will refer to available guidance such as the Saskatchewan species detection survey protocols to develop details of the surveys (e.g., selecting the appropriate time of day for the survey).

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## 45 Residual and Cumulative Effects Summary

The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 5-1. ~~Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.~~

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act* 2012) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 5-2.



Table 5-14.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Nine-spotted lady beetle <del>Transverse lady beetle</del> <del>Yellow-banded bumble-bee</del>	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	<ul style="list-style-type: none"><li>• Development of access roads and air strip.</li><li>• Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li><li>• Waste management (composting, domestic and industrial landfill operation, recycling).</li><li>• Water management (including treatment).</li><li>• Surface water withdrawal.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>• The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on <del>these species</del><b>nine-spotted lady beetle</b>, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following:<ul style="list-style-type: none"><li>- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li><li>- Much of the proposed Project Footprint will be developed within previously disturbed areas, including</li></ul></li></ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for <del>the nine-spotted lady beetle</del> <b>arthropod SAR</b> within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>• Water withdrawal from groundwater or surface water body.</li><li>• Management of surface water (including seepage and site runoff).</li><li>• Water release to groundwater and/or surface water body.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Air transportation for workers.</li></ul>	Operation			

<sup>1</sup>Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
		<a href="#">Nine-spotted lady beetle</a> Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Site water management, treatment, and release</li><li>Process water treatment and release.</li><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning	<ul style="list-style-type: none"><li>roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</li><li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li></ul>		
			<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on <a href="#">arthropod species</a><a href="#">nine-spotted lady beetle</a>.</li></ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of <a href="#">nine-spotted lady beetle</a> <a href="#">the arthropod SAR</a> to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
<a href="#">Terrestrial Environment</a>	<a href="#">Transverse lady beetle</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</a></li><li><a href="#">Waste management (composting, domestic and industrial landfill operation, recycling).</a></li><li><a href="#">Water management (including treatment).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Construction</a>	<ul style="list-style-type: none"><li><a href="#">The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on transverse lady beetle, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following:</a><ul style="list-style-type: none"><li><a href="#">The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</a></li><li><a href="#">Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing</a></li></ul></li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for transverse lady beetle within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Water withdrawal from groundwater or surface water body.</a></li><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to groundwater and/or surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>			
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release</a></li><li><a href="#">Process water treatment and release.</a></li></ul>	<a href="#">Decommissioning</a>			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>		<u>additional habitat disturbance.</u>  <u>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</u>		
		<u>Transverse lady beetle mortalities directly or indirectly attributable to the Project.</u>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<u>Construction</u>	<ul style="list-style-type: none"><li>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on transverse lady beetle.</li></ul>	<u>Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.</u>	<u>The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of transverse lady beetle to the point where they are not sustainable or available to contribute to ecological functions.</u>
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<u>Operation</u>			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	<u>Decommissioning</u>			
<u>Terrestrial Environment</u>	<u>Yellow-banded bumble bee</u>	<u>Amount of habitat that is altered or lost</u>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li></ul>	<u>Construction</u>	<ul style="list-style-type: none"><li>The proposed mitigation measures outlined in the EIS,</li></ul>	<u>Alteration and/or loss of habitat:</u>	<u>Not Significant: the predicted residual</u>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		<a href="#">relative to its availability in the Terrestrial Regional Study Area (RSA).</a>	<ul style="list-style-type: none"><li><a href="#">Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</a></li><li><a href="#">Waste management (composting, domestic and industrial landfill operation, recycling).</a></li><li><a href="#">Water management (including treatment).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>		<a href="#">particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on yellow-banded bumble bee, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following:</a> <ul style="list-style-type: none"><li><a href="#">The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</a></li><li><a href="#">Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing</a></li></ul>	<a href="#">predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.</a>	<a href="#">effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for yellow-banded bumble bee within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Water withdrawal from groundwater or surface water body.</a></li><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to groundwater and/or surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>			
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release</a></li><li><a href="#">Process water treatment and release.</a></li></ul>	<a href="#">Decommissioning</a>			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		<u>Yellow-banded bumble bee mortalities directly or indirectly attributable to the Project.</u>	<ul style="list-style-type: none"><li><u>Demolition and disposal of non-salvageable surface infrastructure and materials.</u></li><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Reclamation of disturbed areas.</u></li></ul>		<u>additional habitat disturbance.</u>  <u>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</u>  <ul style="list-style-type: none"><li><u>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on yellow-banded bumble bee.</u></li></ul>		
			<ul style="list-style-type: none"><li><u>Development of access roads and air strip.</u></li><li><u>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</u></li><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Air transportation for workers.</u></li></ul>	<u>Construction</u>		<u>Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.</u>	<u>The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of yellow-banded bumble bee to the point where they are not sustainable or available to contribute to ecological functions.</u>
			<ul style="list-style-type: none"><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Air transportation for workers.</u></li></ul>	<u>Operation</u>			
			<ul style="list-style-type: none"><li><u>Demolition and disposal of non-salvageable surface infrastructure and materials.</u></li><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Reclamation of disturbed areas.</u></li></ul>	<u>Decommissioning</u>			
<b>Terrestrial Environment</b>	Northern leopard frog	Amount of habitat that is altered or lost	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li></ul>	Construction	<ul style="list-style-type: none"><li>The proposed mitigation measures outlined in the EIS,</li></ul>	Alteration and/or loss of habitat:	Not Significant: the predicted residual

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
		relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"><li>• Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>• Water management (including treatment and site runoff).</li><li>• Surface water withdrawal.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li></ul>		particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: <ul style="list-style-type: none"><li>- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li><li>- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</li><li>- During Operation, progressive reclamation will be completed where possible, and the progress</li></ul>	predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>• Water withdrawal from groundwater or surface water body.</li><li>• Management of surface water (including seepage and site runoff).</li><li>• Water release to surface water body.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>• Site water management, treatment, and release.</li><li>• Process water treatment and release.</li><li>• Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>• On-site and off-site operation of vehicles and transport of materials.</li><li>• Reclamation of disturbed areas.</li></ul>	Decommissioning			
		<a href="#">Northern leopard frog</a> mortalities	<ul style="list-style-type: none"><li>• Development of access roads and air strip.</li></ul>	Construction		Change in mortality: predicted to be low	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
		directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li></ul>		<p>and success of these activities will be assessed annually.</p> <ul style="list-style-type: none"><li>Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).</li><li>Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.</li><li>Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.</li><li>Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.</li></ul>	magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"><li>Water withdrawal from groundwater or surface water body.</li><li>Management of surface water (including seepage and site runoff).</li><li>Water release to surface water body.</li><li>On-site and off-site operation of vehicles and transport of materials</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Site water management, treatment, and release.</li><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>Reclamation of disturbed areas).</li><li>On-site and off-site operation of vehicles and transport of materials.</li></ul>	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Little brown myotis <del>Northern myotis</del>	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>Vegetation clearing activities will occur outside of roosting periods, when practical.</li><li>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by <del>bat species</del> <u>little brown myotis</u>. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (<u>refer to Table 4-1 in final EIS Appendix 9-D which in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).</u></li></ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for <u>little brown myotis</u> <del>bat species</del> within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			
		<u>Little brown myotis</u> <del>M</del> mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>In the event a <u>little brown myotis</u> maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for <u>little brown</u></li></ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of <u>little brown myotis</u> <del>the bat</del>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation	<ul style="list-style-type: none"><li><u>myotis bats</u> to leave but not the ability to re-enter the roosting site.</li></ul>		<u>species</u> to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning	<ul style="list-style-type: none"><li>Locations of these site-specific habitat features used by <u>little brown myotis bats</u> will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li><li>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</li></ul>		
<u>Terrestrial Environment</u>	<u>Northern myotis</u>	<u>Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</u>	<ul style="list-style-type: none"><li><u>Development of access roads and air strip.</u></li><li><u>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</u></li><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Air transportation for workers.</u></li></ul>	<u>Construction</u>	<ul style="list-style-type: none"><li><u>Vegetation clearing activities will occur outside of northern myotis roosting periods, when practical.</u></li><li><u>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as northern myotis maternal rooting sites and hibernacula used by northern myotis. If features are identified in the Project Footprint, appropriate setbacks</u></li></ul>	<u>Alteration and/or loss of habitat; predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</u>	<u>Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern myotis within the Terrestrial RSA to the point where it is not sustainable or</u>
			<ul style="list-style-type: none"><li><u>On-site and off-site operation of vehicles and transport of materials.</u></li><li><u>Air transportation for workers.</u></li></ul>	<u>Operation</u>			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		Northern myotis mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning	<ul style="list-style-type: none"><li>and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan).</li><li>In the event a northern myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for northern myotis to leave but not the ability to re-enter the roosting site.</li></ul>		<a href="#">available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>Locations of these site-specific habitat features used by northern myotis will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li></ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern myotis to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation	<ul style="list-style-type: none"><li>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</li></ul>		
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
<a href="#">Terrestrial Environment</a>	<a href="#">Bank Swallow</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li><li><a href="#">Water management (including treatment and site runoff).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Construction</a>	<ul style="list-style-type: none"><li><a href="#">Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the bank swallow nesting season, when practical. The breeding and nesting season for most bank swallows in Saskatchewan typically spans a period from May 15 to July 31.</a></li><li><a href="#">In the event Project activities such as vegetation clearing and/or soil disturbance are required during the bank swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted a by a QP at that location within the Project Area before activities commence to identify the presence of bank swallow nests.</a></li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bank swallow within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>	<ul style="list-style-type: none"><li><a href="#">Active and/or suspected bank swallow nests identified during the pre- disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines</a></li></ul>		
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release.</a></li><li><a href="#">Process water treatment and release.</a></li><li><a href="#">Demolition and disposal of non-salvageable surface infrastructure and materials.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Reclamation of disturbed areas.</a></li></ul>	<a href="#">Decommissioning</a>			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		Bank Swallow mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<u>(e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for bank swallow in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</u>  <ul style="list-style-type: none"><li>Locations of nesting sites used by bank swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li><li>Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.</li></ul>	Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of bank swallow to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			
<u>Terrestrial Environment</u>	<u>Barn Swallow</u>	Amount of habitat that is altered or lost relative to its	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li></ul>	Construction	<ul style="list-style-type: none"><li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the barn swallow</li></ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local	Not Significant: the predicted residual effect of alteration and/or loss of

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		<a href="#">availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li><a href="#">Water management (including treatment and site runoff).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>		<a href="#">nesting season, when practical. The breeding and nesting season for barn swallow in Saskatchewan typically spans a period from May 15 to September 30.</a>	<a href="#">geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">habitat is not expected to alter the integrity of the habitat for barn swallow within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>	<ul style="list-style-type: none"><li><a href="#">In the event Project activities such as vegetation clearing and/or soil disturbance are required during the barn swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of barn swallow nests.</a></li></ul>		
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release.</a></li><li><a href="#">Process water treatment and release.</a></li><li><a href="#">Demolition and disposal of non-salvageable surface infrastructure and materials.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Reclamation of disturbed areas.</a></li></ul>	<a href="#">Decommissioning</a>	<ul style="list-style-type: none"><li><a href="#">Active and/or suspected barn swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for barn swallow in Saskatchewan) in</a></li></ul>		
		<a href="#">Barn Swallow mortalities directly or indirectly</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li></ul>	<a href="#">Construction</a>		<a href="#">Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term</a>	<a href="#">The predicted residual effect of change in mortality is not expected to alter the integrity of</a>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		attributable to the Project.	<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>		<u>accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</u> <ul style="list-style-type: none"><li>Locations of nesting sites used by barn swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li></ul>	duration, infrequent, and fully reversible.	the regional populations of barn swallow to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			
Terrestrial Environment	Common Nighthawk	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>Water management (including treatment and site runoff).</li><li>Surface water withdrawal.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the common nighthawk nesting season, when practical. The breeding and nesting season for common nighthawk in Saskatchewan typically spans a period from May 1 to August 31.</li></ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for common nighthawk within the Terrestrial RSA to the point where it is not sustainable or available to
			<ul style="list-style-type: none"><li>Management of surface water (including seepage and site runoff).</li></ul>	Operation	<ul style="list-style-type: none"><li>In the event Project activities such as vegetation clearing and/or soil disturbance are</li></ul>		

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Water release to surface water body.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>		<p><a href="#">required during the common nighthawk breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of common nighthawk nests.</a></p> <ul style="list-style-type: none"><li><a href="#">Active and/or suspected common nighthawk nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</a></li></ul>		<a href="#">contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li>Site water management, treatment, and release.</li><li>Process water treatment and release.</li><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>				
		<a href="#">Common Nighthawk mortalities directly or indirectly attributable to the Project.</a>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<a href="#">Construction</a>		<a href="#">Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.</a>	<a href="#">The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of common nighthawk to the point where they are not sustainable or available to</a>
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<a href="#">Operation</a>			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			<a href="#">contribute to ecological functions.</a>
<a href="#">Terrestrial Environment</a>	<a href="#">Horned Grebe</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>Water management (including treatment and site runoff).</li><li>Surface water withdrawal.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction	<ul style="list-style-type: none"><li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the horned grebe nesting season, when practical. The breeding and nesting season for horned grebe in Saskatchewan typically spans a period from May 1 to September 15.</li><li>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the horned grebe breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to</li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for horned grebe within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li>Management of surface water (including seepage and site runoff).</li><li>Water release to surface water body.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Site water management, treatment, and release.</li><li>Process water treatment and release.</li></ul>	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>		<ul style="list-style-type: none"><li>Identify the presence of horned grebe nests.</li><li>Active and/or suspected horned grebe nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</li><li>Locations of nesting sites used by horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li></ul>		
		Horned Grebe mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of horned grebe to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
<a href="#">Terrestrial Environment</a>	<a href="#">Olive-Sided Flycatcher</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li><li><a href="#">Water management (including treatment and site runoff).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Construction</a>	<ul style="list-style-type: none"><li><a href="#">Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the olive-sided flycatcher nesting season, when practical. The breeding and nesting season for olive-sided flycatcher in Saskatchewan typically spans a period from May 1 to August 31.</a></li><li><a href="#">In the event Project activities such as vegetation clearing and/or soil disturbance are required during the olive-sided flycatcher breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of olive-sided flycatcher nests.</a></li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for olive-sided flycatcher within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>	<ul style="list-style-type: none"><li><a href="#">Active and/or suspected olive-sided flycatcher nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with</a></li></ul>		
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release.</a></li><li><a href="#">Process water treatment and release.</a></li><li><a href="#">Demolition and disposal of non-salvageable surface infrastructure and materials.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Reclamation of disturbed areas.</a></li></ul>	<a href="#">Decommissioning</a>			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		<a href="#">Olive-Sided Flycatcher mortalities directly or indirectly attributable to the Project.</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Construction</a>	<a href="#">regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</a>	<a href="#">Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.</a>	<a href="#">The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of olive-sided flycatcher to the point where they are not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>			
			<ul style="list-style-type: none"><li><a href="#">Demolition and disposal of non-salvageable surface infrastructure and materials.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Reclamation of disturbed areas.</a></li></ul>	<a href="#">Decommissioning</a>			
<a href="#">Terrestrial Environment</a>	<a href="#">Rusty Blackbird</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li><li><a href="#">Water management (including treatment and site runoff).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li></ul>	<a href="#">Construction</a>	<ul style="list-style-type: none"><li><a href="#">Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the rusty blackbird nesting season, when practical. The breeding and nesting season for rusty blackbird in Saskatchewan typically spans a period from May 1 to July 31.</a></li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for rusty blackbird within the Terrestrial RSA to the</a>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Air transportation for workers.</li></ul>	Operation	<ul style="list-style-type: none"><li>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the rusty blackbird breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of rusty blackbird nests.</li></ul>		point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"><li>Management of surface water (including seepage and site runoff).</li><li>Water release to surface water body.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>				
			<ul style="list-style-type: none"><li>Site water management, treatment, and release.</li><li>Process water treatment and release.</li><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>				
			<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>				
		Rusty Blackbird mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li></ul>	Operation	<ul style="list-style-type: none"><li>Active and/or suspected rusty blackbird nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</li></ul>	Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of rusty blackbird to the point where they are not sustainable or available to

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Air transportation for workers.</li></ul>				<a href="#">contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	<a href="#">Decommissioning</a>			
<a href="#">Terrestrial Environment</a>	<a href="#">Short-eared Owl</a>	<a href="#">Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>Water management (including treatment and site runoff).</li><li>Surface water withdrawal.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<a href="#">Construction</a>	<ul style="list-style-type: none"><li>Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the short-eared owl nesting season, when practical. The breeding and nesting season for short-eared owl in Saskatchewan typically spans a period from March 25 to August 1.</li><li>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the short-eared owl breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to</li></ul>	<a href="#">Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for short-eared owl within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li>Management of surface water (including seepage and site runoff).</li><li>Water release to surface water body.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	<a href="#">Operation</a>			
			<ul style="list-style-type: none"><li>Site water management, treatment, and release.</li></ul>	<a href="#">Decommissioning</a>			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
			<ul style="list-style-type: none"><li>Process water treatment and release.</li><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>		<ul style="list-style-type: none"><li>Identify the presence of short-eared owl nests.</li><li>Active and/or suspected short-eared owl nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</li></ul>		
		<u>Short-eared Owl mortalities directly or indirectly attributable to the Project.</u>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Construction		<u>Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.</u>	<u>The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations short-eared owl to the point where they are not sustainable or available to contribute to ecological functions.</u>
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			
<u>Terrestrial Environment</u>	<u>Yellow Rail</u>	<u>Amount of habitat that is altered or lost</u>	<ul style="list-style-type: none"><li>Development of access roads and air strip.</li></ul>	Construction	<ul style="list-style-type: none"><li>Site clearing and other works that involve disturbance of vegetation</li></ul>	<u>Alteration and/or loss of habitat:</u>	<u>Not Significant: the predicted residual</u>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures*	Predicted Residual Effect	Significance
		<a href="#">relative to its availability in the Terrestrial RSA.</a>	<ul style="list-style-type: none"><li><a href="#">Site preparation an earthworks; clearing, leveling and grading of the Project Area.</a></li><li><a href="#">Water management (including treatment and site runoff).</a></li><li><a href="#">Surface water withdrawal.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>		<a href="#">and/or soil will be conducted outside of the yellow rail nesting season, when practical. The breeding and nesting season for yellow rail in Saskatchewan typically spans a period from May 1 to July 15.</a>	<a href="#">predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.</a>	<a href="#">effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for yellow rail within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.</a>
			<ul style="list-style-type: none"><li><a href="#">Management of surface water (including seepage and site runoff).</a></li><li><a href="#">Water release to surface water body.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Air transportation for workers.</a></li></ul>	<a href="#">Operation</a>	<a href="#">In the event Project activities such as vegetation clearing and/or soil disturbance are required during the yellow rail breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of yellow rail nests.</a>		
			<ul style="list-style-type: none"><li><a href="#">Site water management, treatment, and release.</a></li><li><a href="#">Process water treatment and release.</a></li><li><a href="#">Demolition and disposal of non-salvageable surface infrastructure and materials.</a></li><li><a href="#">On-site and off-site operation of vehicles and transport of materials.</a></li><li><a href="#">Reclamation of disturbed areas.</a></li></ul>	<a href="#">Decommissioning</a>	<a href="#">Active and/or suspected yellow rail nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the</a>		
		<a href="#">Yellow Rail mortalities directly</a>	<ul style="list-style-type: none"><li><a href="#">Development of access roads and air strip.</a></li></ul>	<a href="#">Construction</a>		<a href="#">Change in mortality: predicted to be low</a>	<a href="#">The predicted residual effect of</a>

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>+</sup>	Predicted Residual Effect	Significance
		or indirectly attributable to the Project.	<ul style="list-style-type: none"><li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>		<u>disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</u>	<u>magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.</u>	<u>change in mortality is not expected to alter the integrity of the regional populations of yellow rail to the point where they are not sustainable or available to contribute to ecological functions.</u>
			<ul style="list-style-type: none"><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Air transportation for workers.</li></ul>	Operation			
			<ul style="list-style-type: none"><li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li><li>On-site and off-site operation of vehicles and transport of materials.</li><li>Reclamation of disturbed areas.</li></ul>	Decommissioning			

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Table 5-24.2 Summary of Significance of the Cumulative Effects on Wildlife Species At Risk

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	<ul style="list-style-type: none"><li>Nine-spotted lady beetle</li><li>Transverse lady beetle</li><li>Yellow-banded bumble bee</li><li>Northern leopard frog</li><li>Little brown myotis</li><li>Northern myotis</li><li>Bank Swallow</li><li>Barn Swallow</li></ul>	Alteration and/or loss of habitat.	<b>Not significant:</b> The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
		<ul style="list-style-type: none"><li>Common Nighthawk</li><li>Horned Grebe</li><li>Olive-sided Flycatcher</li><li>Rusty Blackbird</li><li>Short-eared Owl</li><li>Yellow Rail</li></ul>	Change in mortality.	<b>Not significant:</b> The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.

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IR-174

- Department: ECCC
- Project Effects Link: SAR - Bats
- Reference to EIS, appendices, or supporting documentation: Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
IR-174	-	<p><b>Context and Rationale:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p>Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<p>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</p> <p>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</p> <p>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</p> <p>4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</p>	<p>As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches.</p> <p>In response to a variety of IRs, including this IR, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. This new EIS appendix provides information on little brown myotis and northern myotis. We note Denison’s commitment to pre-construction surveys to identify potential for maternity and nursery roosting habitat. Refer to response to IR-134 for the timing of clearing activities outside of roosting periods. Results from pre-construction surveys and continuous monitoring (described in Section 9.3.8) will be used in the adaptive management process to update Project design and additional mitigation measures, if required.</p>	<p>This response has not been accepted.</p> <p>Items 1., 3. And 4. of IR-174 are accepted, however, item 2. Of IR-174, which asked for mapping of suitable myotis habitat, was not addressed.</p> <p>Mapping of suitable habitat or results from baseline studies is required to understand Project impacts to Species At Risk (SAR) bat species. This may include providing mapping of bat acoustic results, including locations along with frequency of detections.</p> <p>See also IR-134 and follow-up 134-R1.</p>	<p>Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure 2-9 of Appendix 9-F of the revised draft EIS.</p> <p>The EA used a habitat-based approach to predict the effects of the Project on bat species. Further, in the event that site clearing is necessary, pre-clearance wildlife sweeps will be completed and appropriate mitigation will be developed and implemented.</p> <p>The pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will to be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These sweeps are intended to identify sensitive wildlife features (including hibernacula or potential roosting sites for myotis species) that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these surveys, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.</p>	<p><b>Note to Denison:</b> There is additional text being drafted related to this topic, but it is still under review and may provide clarity on the outstanding request.</p> <p>Items one, three, and four have been accepted, but the response to item 2, regarding describing and mapping of locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and an explanation of how these habitats may be affected by Project activities, is outstanding.</p> <p>In responding to item two, the Proponent has provided a map of species detected and frequency of detection in the local study area over two days on July 22 and 23, 2019. ECCC notes that analysis is lacking for the regional study area, despite a few autonomous recording units (ARUs) that were placed outside the LSA.</p> <p>Data from two consecutive days in the same month is not an accepted method to document baseline occurrences associated with suitable habitat. The legend for Figure 2-9 is not clear in that frequency of detection is mapped based on two criteria: little brown myotis and little brown/northern myotis.</p> <p>The Proponent should use a scientifically defensible method to document baseline occurrences associated with suitable habitat. The Proponent should clarify the legend and explain the values found within it, including if the turquoise dot represent occurrence of both little brown and northern myotis. Baseline data for bat SAR must be adequate to capture within and between year variability and to allow for statistically robust comparison to assess potential impacts on SAR over the lifecycle of the project. In this regard, Denison is expected to provide additional baseline data for bat SAR. If Denison choses to rely on literature data, a justification of applicability to the project is required. Nevertheless, Denison is expected to at a minimum commit to additional baseline monitoring prior to any disturbance, and to provide a description of the monitoring methods for review. These baseline surveys must be focused on suitable habitat for bat SAR that is to be identified through the requested mapping.</p> <p>To close this IR, Denison must:</p> <ol style="list-style-type: none"><li>1. Clarify the legend of Figure 2-9 with respect to frequency of detection</li><li>2. Provide suitable bat SAR habitat information in the form of a map</li><li>3. Provide additional baseline data for bat SAR based on literature sources and justify applicability to the project</li><li>4. Provide a description of proposed methods for bat SAR field monitoring for review</li></ol>	<p>See IR-174 Round 3 Attachment below for supporting maps associated with responses to parts 2 and 3; the round 3 attachment is located at the end of this file.</p> <p>1. The legend of revised draft EIS Appendix 9-F, Figure 2-9 (with respect to frequency of detection) shows the total number of passes and/or buzzes detected. We note this was available in Appendix 9-B Terrestrial Baseline. For additional reference it is also noted that the acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis, hence the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis. These clarifications are included in the figures below and are included in Appendix 9-F of the final EIS.</p> <p>2. Refer to IR-174 Round 3 Attachment below for ECCC’s requested map edits, that builds on the information presented in the map provided in revised draft EIS Appendix 9-F Figure 2-9 provided with the Round 2 response. Specifically, please see Figure IR-174 Round 3-1 and Figure IR-174 Round 3-2. These maps present the same information from Appendix 9-F Figure 2-9 only at a different spatial scale and with the Project Area unshaded to facilitate review.</p> <p>3. As noted in Appendix 9-D, habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013). Hibernacula and maternity sites are reported as being the main limiting habitat features for this species (COSEWIC 2013), and this, as described below, is consistent with conditions at the Project site and surrounding area.</p> <p>Hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (-4 to 13°C) and humidity (&gt;80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no hibernacula anticipated in the Project Area (i.e., caves, mines, buildings with stable and specific temperatures per COSEWIC 2013). Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats); there are no man-made structures (e.g., mine openings or buildings) in the Project Area. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the</p>	<p>Following the supplementary information provided by Denison on July 5<sup>th</sup>, CNSC staff determined that it is unclear from the proponent’s response whether Denison will perform both pre-disturbance surveys <b>and</b> additional baseline surveys for bat SAR.</p> <p>In order to resolve this IR, Denison are expected to:</p> <ol style="list-style-type: none"><li>1. Revise Figure 2-9 to re-label frequency as number of detections by time. Clarify regarding the turquoise dots if species data is uncertain in all cases or were detections for some identifiable?</li><li>2. Revise Figure IR-174 Round 3-1 and Figure IR-174 Round 3-2 to depict habitat potential for different life stages of the species for different bats.</li><li>3. Provide the proposed methods for the additional bat SAR baseline surveys including a description of the statistical approaches to be used. The methods must demonstrate how the baseline data will be of sufficient sample size and duration to obtain a basic understanding of within-year and between-year variation.</li><li>4. Provide a commitment to conduct additional bat SAR baseline surveys in their commitments register.</li></ol>	<p>1. The frequency of detections was on a 5 minute interval. This has been clarified in Figure 2-9 of Appendix 9-F. We can confirm the turquoise dots represent passes or buzzes that were uncertain (unable to distinguish echolocation call characteristics between bat species) in all cases.</p> <p>2. See <b>Attachment IR-174 (Round 4)</b> below for the response to this IR along with supporting maps.</p> <p>3. Methods for future pre-construction baseline bat surveys will build on the 2019 baseline (refer to EIS Appendix 9-B) and methods from the 2019 baseline are provided below along with information on how comparisons within year and between years will be completed.</p> <p><i>Methods</i></p> <p>Surveys will be commenced one half hour after sunset and ended one half hour before sunrise. Survey stations will be established 500 m apart along linear features where safe night travel was possible.</p> <p>Surveys will only be completed during appropriate weather conditions, with weather attributes (temperature, sky condition and wind (Beaufort scale)) recorded throughout the survey.</p> <p>Each survey site consists of a five-minute listening period using a Wildlife Acoustics Echo Meter Touch 2 Pro. The detector will be held with the microphone at a 45 degree angle and slowly rotated 360 degrees for the duration of the sampling period. If a bat is detected the detector is held stationary for 15 seconds to avoid duplicate counts.</p> <p>Total detector hours will be calculated for the Project area and by ecosite/vegetation cover type. Ecosite/vegetation cover type for each survey point is established by utilizing the dominate ecosite/vegetation cover type within a 50 m radius of the survey point.</p> <p><i>Acoustic Bat Call Analysis</i></p> <p>Data will be analyzed using Wildlife Acoustics Kaleidoscope software. Echolocation call characteristics will be used to identify bat species. Call characteristics used to establish species included:</p> <ul style="list-style-type: none"><li>• minimum frequency</li><li>• maximum frequency</li><li>• call duration</li><li>• call slope</li><li>• call shape</li></ul> <p>Call characteristics will be compared to reference calls in literature and call libraries (WDNR 2016, WNDD 2016, Keinath 2011, Adams 2003). In addition, reference calls within Omnia’s call library will be used where possible.</p> <p>For future monitoring of bat species Denison will continue to inventory bat presence at given sites and this data will be analyzed to characterize:</p> <ol style="list-style-type: none"><li>1. Presence (occupancy)</li><li>2. Relative abundance</li><li>3. Change metrics to be analyzed include:<ol style="list-style-type: none"><li>a. Annual and total change at specific site</li><li>b. Annual and total change across all sites</li></ol></li></ol> <p>The analysis will be done using mean and 95% credible interval bars and will include covariates such as time of year</p>



Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
							<p>5. Commit to an EA <u>commitment</u> to collect additional bat SAR field baseline data prior to disturbance</p>	<p>Project Area are considered representative of the landscape in the wildlife LSA and RSA.</p> <p>Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). As highlighted above, since there are no rock crevices, buildings, or bat houses in the Project Area, a consideration for maternal roost potential was focused on the areas where larger diameter trees may be present.</p> <p>Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figure 2-10 below, and include ecosites RF1 (regenerating forest &gt;5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/ balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the <i>potential</i> to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height &lt;10 cm. Refer Appendix 9-B for representative photos of the selected ecosites.</p> <p>Based on this conservative mapping exercise, the Project Area contains small areas of suitable potential maternal roost habitat. The total Project Area is around 170 ha and potential bat maternal roost ecosites represent less than 49 ha, when as noted above it is assumed that the ecosites identified above provide trees suitable for maternity roosts across their entirety.</p> <p>The above text has been added to Appendix 9-F of the final EIS along with Figure IR-174 Round 3-3. We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation.</p> <p>We also refer the reviewer to Appendix 9-D for a summary of species-specific mitigation measures for bats; text from Section 3.3.3 has been included below in <i>italicized font</i> for ease of review:</p> <p><i>Bat Species</i></p> <ul style="list-style-type: none"><li><i>Vegetation clearing activities will occur outside of roosting periods, when practical.</i></li><li><i>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by bat species. If features are identified in the Project Footprint,</i></li></ul>	<p>(date), precipitation, temperature, forest cover, Ecosite and proximity to water/wetland. Appropriate statistical methods to compare pre-construction baseline and 2019 baseline data spatially and temporally will be employed and accompanied by power analysis.</p> <p>Results of acoustic bat surveys will be submitted to Saskatchewan's Conservation Data Centre.</p> <p>4. Commitment 9-37 has been updated in version 3 of Denison's commitment register (additions in bold) and now reads: "<b>Pre-construction baseline</b> acoustic bat surveys will be completed prior to construction, building on the 2019 surveys (Appendix 9-B). The surveys will determine the presence/non-absence, diversity and relative abundance of bat species in the Project Area. <b>Results of acoustic bat surveys will be submitted to Saskatchewan's Conservation Data Centre</b>".</p>	

Original IR#	Follow- Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
								<p><i>appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).</i></p> <ul style="list-style-type: none"><li><i>In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.</i></li><li><i>Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</i></li><li><i>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</i></li></ul> <p>4. Refer to response to IR-142, IR-159, IR-167-R1 for information on the bat-specific pre-clearance sweeps. We also note that Commitment 9-3 outlines Denison's commitment to pre-disturbance wildlife clearance surveys.</p> <p>5. A commitment to complete pre-construction / disturbance bat surveying has been added to the commitments register as 9-37, as follows:</p> <p>“Acoustic bat surveys will be completed prior to construction, building on the 2019 surveys (Appendix 9-B). The surveys will determine the presence/non-absence, diversity and relative abundance of bat species in the Project Area.”</p> <p>For clarity, this additional pre-construction / disturbance data will be used to inform the execution of site development activities and additionally provides further information that can be used within the context of follow-up monitoring as a basis for temporal comparison. At this time, the intent is not to integrate such information into the EIS, nor does Denison and its SMEs believe the additional information is necessary to for EA determination with respect to potential project-related effects on bats.</p> <p>References:</p> <p>COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis <i>Myotis lucifugus</i>, Northern Myotis <i>Myotis septentrionalis</i>, and Tri-colored Bat <i>Perimyotis subflavus</i> in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.</p> <p>Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. <i>Journal of Fish and Wildlife Management</i> 11(1):311–320.</p>		



**Related information: Round 1 response – new EIS Appendix 9-D**





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AND PASSION**

# Denison Mines Corp.

## Appendix 9-D Wildlife Species at Risk

**New Appendix to final EIS, Section 9**

**Version 1**

**July 2023**



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## Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	<i>Species at Risk Act</i>
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component

# Introduction

## Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 0.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 0 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 0.1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

**Table 0.1 Wildlife Species at Risk Listed by Environment and Climate Change Canada**

Common Name	Scientific Name	Discussed in the draft EIS
<b>Nine-spotted lady beetle</b>	<b><i>Coccinella ovemnotata</i></b>	No
<b>Transverse lady beetle</b>	<b><i>Coccinella transversoguttata</i></b>	No
<b>Yellow-banded bumble bee</b>	<b><i>Bombus terricola</i></b>	No
<b>Northern leopard frog</b>	<b><i>Lithobates pipiens</i></b>	No
<b>Little brown myotis</b>	<b><i>Myotis lucifugus</i></b>	No
<b>Northern myotis</b>	<b><i>Myotis septentrionalis</i></b>	No
Wolverine	<i>Gulo gulo</i>	Yes
Woodland caribou	<i>Rangifer tarandus caribou</i>	Yes
<b>Bank Swallow</b>	<b><i>Riparia riparia</i></b>	No
<b>Barn Swallow</b>	<b><i>Hirundo rustica</i></b>	No
Common Nighthawk	<i>Chordeiles minor</i>	Yes
<b>Horned Grebe</b>	<b><i>Podiceps auritus</i></b>	No
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes

Common Name	Scientific Name	Discussed in the draft EIS
Rusty Blackbird	<i>Euphagus carolinus</i>	Yes
Short-eared Owl	<i>Asio flammeus</i>	Yes
Yellow Rail	<i>Coturnicops noveboracensis</i>	Yes

Of the 16 species listed in Table 0.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

## Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 0.2 and Table 0.3, which formed the basis for the subsequent VC-specific assessment.

**Table 0.2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project**

Valued Component	Rationale
<b>Biophysical Environment</b>	
<b><i>Terrestrial Environment</i></b>	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., <i>Species at Risk Act</i> [SARA; Government of Canada 2022], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], <i>The Wildlife Act, 1998</i> [Government of Saskatchewan 2020]).

Valued Component	Rationale
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], <i>Migratory Birds Convention Act 1994</i> [Government of Canada 2017], <i>Saskatchewan Activity Restriction Guidelines for Sensitive Species</i> [Government of Saskatchewan 2017], <i>The Wildlife Act 1998</i> [Government of Saskatchewan 2020]).

**Table 0.3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project**

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km <sup>2</sup> ) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.



Valued Component	Key Indicator	Measurable Parameter
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities.  The number of Yellow Rail mortalities directly or indirectly attributable to the Project.

The five bird species identified in Table 0.3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

## Supplemental Information

As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 0.1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

**Table 0.1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement**

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
<b>Arthropods</b>						
Nine-spotted lady beetle	<i>Coccinella novemnotata</i>	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 0 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	<i>Coccinella transversoguttata</i>	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 0 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	<i>Bombus terricola</i>	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 0 for further details.	Unlikely LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
<b>Amphibians</b>						
Northern leopard frog	<i>Lithobates pipiens</i>	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to	LSA is located within COSEWIC range; no observations in SKCDC	Not included as a VC in the EIS. A review of life history requirements and discussion on

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				bottom; (2) breeding and larval waterbodies with shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow marshes, moist upland meadows where grass height is less than 1 m. See Section 0 for further details.	and no Project-specific observations to date. Amphibian nocturnal call and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs ( <i>Pseudacris maculata</i> ) were detected (Appendix 9-C).	effects assessment are included in this Appendix.
Bats						
Little brown myotis	<i>Myotis lucifugus</i>	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 0 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	<i>Myotis septentrionalis</i>	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging	Documented during the acoustic bat surveys as part of the baseline field program as	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				areas and suitable locations for roosting and maternity colonies. See Section 0 for further details.	present in the LSA and RSA (Appendix 9-C).	
<b>Terrestrial Wildlife Species</b>						
Wolverine	<i>Gulo gulo</i>	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	<i>Rangifer tarandus caribou</i>	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
<b>Avian Species</b>						
Bank Swallow	<i>Riparia riparia</i>	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).

Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
				open habitats. See Section 0 for further details.		
Barn Swallow	<i>Hirundo rustica</i>	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 0 for further details.	Documented during the breeding bird surveys as part of the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	<i>Chordeiles minor</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	<i>Podiceps auritus</i>	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 0 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5)..
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and



Common Name	Scientific Name	Provincial Status	Federal Status <sup>1</sup>	Preferred Habitat	Documented Occurrence in the Local Study Area <sup>2</sup>	Reference in the Environmental Impact Statement (EIS)
					as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Rusty Blackbird	<i>Euphagus carolinus</i>	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	<i>Asio flammeus</i>	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	<i>Coturnicops noveboracensis</i>	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

1 Schedule 1 under the *Species at Risk Act*.

- 2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

## Arthropods

### Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

## Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



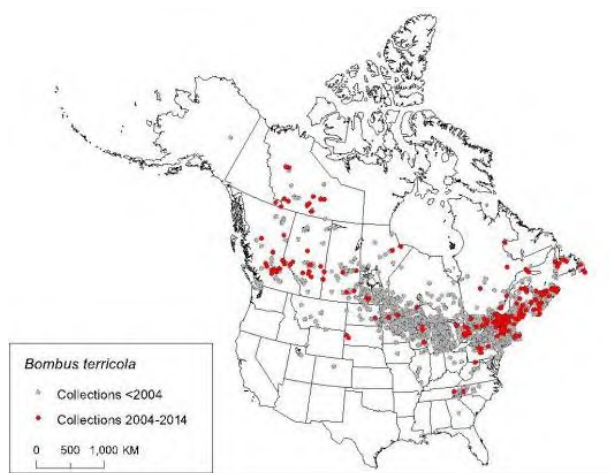
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section **Error! Reference source not found..**

## Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015).

After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

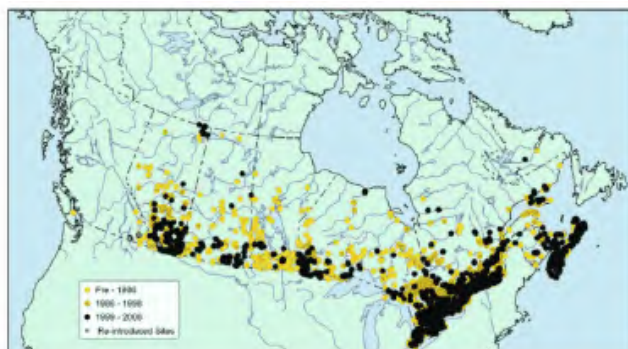
The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015). The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

## Amphibians

### Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three distinct habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral

pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

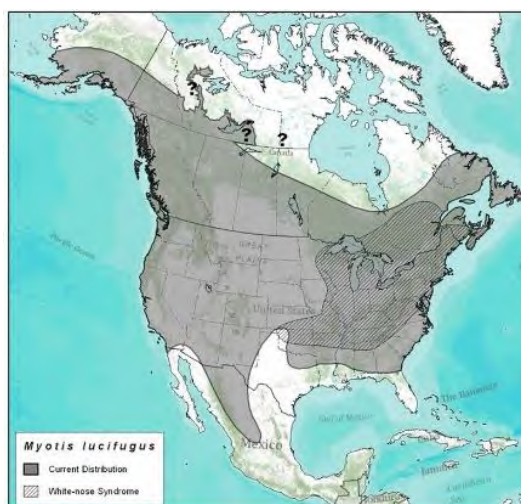


## Bats

### Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity



Source: COSEWIC (2013a).

sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease that causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

## Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has been identified as the main threat for northern myotis



Source: COSEWIC (2013a).

populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a)

## Avian Species

### Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making



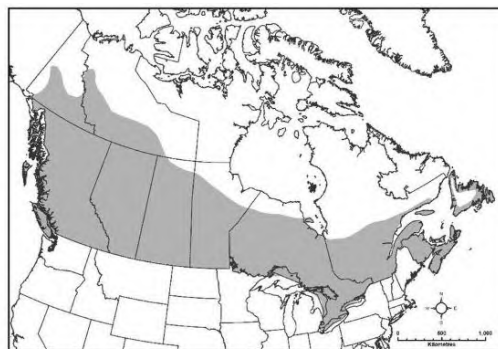
Source: COSEWIC (2013b).



them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

## Barn Swallow

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021). Historically, suitable nesting sites were likely provided by caves, cliff faces, rock ledges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).



Source: COSEWIC (2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021).

## Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec





and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young (COSEWIC 2009b,

Source: COSEWIC 2009b

Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

## Mitigation Measures

The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

### Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
  - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;



- designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;
  - controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.
- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
  - The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
  - Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
  - Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
  - A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
  - Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
  - Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
  - Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
  - The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.

- All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

## General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**.

### Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- **Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).**
- **Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.**

## Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- **Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.**

## Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

## Wildlife Deterrence and Prevention of Wildlife Entrapment

- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**
- **Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.**
- **Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).**
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- **Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.**

- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

## Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- **Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.**
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

## Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- **Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.**
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interact.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or

access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.

- The use of hazardous materials will be limited as much as possible.
- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

## Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**. These will be added to the final EIS.

### Arthropod Species

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:



- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species.**

## Amphibian Species

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).**
- **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.**
- **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.**

## Bat Species

- Vegetation clearing activities will occur outside of roosting periods, when practical.
- **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal roosting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**

- In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.
- Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

## Avian Species

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.
- Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.
- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.

## Residual and Cumulative Effects Summary

The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 0.1. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 0.2.

**Table 0.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk**

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
<b>Terrestrial Environment</b>	Nine-spotted lady beetle Transverse lady beetle Yellow-banded bumble bee	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>Waste management (composting, domestic and industrial landfill operation, recycling).</li> <li>Water management (including treatment).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on these species, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the arthropod SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to groundwater and/or surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			

<sup>1</sup> Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Site water management, treatment, and release</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<p>previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.</p> <ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>		
			<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, levelling, and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>• <b>Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on arthropod species.</b></li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the arthropod SAR to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>The proposed mitigation measures outlined in the EIS, particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: <ul style="list-style-type: none"> <li>The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.</li> <li>Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing</li> </ul> </li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			



Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Construction	<p>additional habitat disturbance.</p> <ul style="list-style-type: none"> <li>- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.</li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>Water withdrawal from groundwater or surface water body.</li> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials</li> </ul>	Operation	<ul style="list-style-type: none"> <li>• <b>Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>Reclamation of disturbed areas).</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li>• <b>Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li>• <b>Appropriate setback and buffer distances from wetland features where</b></li> </ul>		

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<p>amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.</p> <ul style="list-style-type: none"> <li>Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.</li> </ul>		
Terrestrial Environment	Little brown myotis Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>Vegetation clearing activities will occur outside of roosting periods, when practical.</b></li> <li><b>Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan)).</b></li> </ul>	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bat species within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> <li>Site preparation and earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Construction	<ul style="list-style-type: none"> <li><b>In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.</b></li> <li><b>Locations of these site-specific habitat features used by bats will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</b></li> <li><b>Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.</b></li> </ul>	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the bat species to the point where they are not sustainable or available to contribute to ecological functions
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			
<b>Terrestrial Environment</b>	Bank Swallow	Amount of habitat that is altered or	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> </ul>	Construction	<ul style="list-style-type: none"> <li>Site clearing and other works that involve disturbance of</li> </ul>	Alteration and/or loss of habitat:	Not Significant: the predicted residual

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
	Barn Swallow Common Nighthawk Horned Grebe Olive-sided Flycatcher Rusty Blackbird Short-eared Owl Yellow Rail	lost relative to its availability in the Terrestrial RSA.	<ul style="list-style-type: none"> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>Water management (including treatment and site runoff).</li> <li>Surface water withdrawal.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>		vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.	predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the avian SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>Management of surface water (including seepage and site runoff).</li> <li>Water release to surface water body.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation	<ul style="list-style-type: none"> <li><b>In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted a by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.</b></li> </ul>		
			<ul style="list-style-type: none"> <li>Site water management, treatment, and release.</li> <li>Process water treatment and release.</li> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning	<ul style="list-style-type: none"> <li><b>Active and/or suspected breeding and roosting locations identified during the pre- disturbance wildlife clearance surveys will be protected with a no-</b></li> </ul>		
		Mortalities directly or indirectly	<ul style="list-style-type: none"> <li>Development of access roads and air strip.</li> </ul>	Construction		Change in mortality:	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
		attributable to the Project.	<ul style="list-style-type: none"> <li>Site preparation an earthworks; clearing, leveling and grading of the Project Area.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>		<p><b>disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).</b></p> <ul style="list-style-type: none"> <li>Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.</li> <li>Deterrents designed to discourage or prevent barn swallows from using</li> </ul>	predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of the avian SAR to the point where they are not sustainable or available to contribute to ecological functions.
			<ul style="list-style-type: none"> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Air transportation for workers.</li> </ul>	Operation			
			<ul style="list-style-type: none"> <li>Demolition and disposal of non-salvageable surface infrastructure and materials.</li> <li>On-site and off-site operation of vehicles and transport of materials.</li> <li>Reclamation of disturbed areas.</li> </ul>	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures <sup>1</sup>	Predicted Residual Effect	Significance
					<p>buildings and other Project infrastructure have been previously described in Section 3.2.4 of the EIS.</p> <ul style="list-style-type: none"><li>• Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces</li><li>• Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.</li></ul>		



Table 0.2      Summary of Significance of the Cumulative Effects on Wildlife Species At Risk

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	<ul style="list-style-type: none"><li>Nine-spotted lady beetle</li><li>Transverse lady beetle</li><li>Yellow-banded bumble bee</li><li>Northern leopard frog</li><li>Little brown myotis</li><li>Northern myotis</li><li>Bank Swallow</li><li>Barn Swallow</li></ul>	Alteration and/or loss of habitat.	<b>Not significant:</b> The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
		<ul style="list-style-type: none"><li>Common Nighthawk</li><li>Horned Grebe</li><li>Olive-sided Flycatcher</li><li>Rusty Blackbird</li><li>Short-eared Owl</li><li>Yellow Rail</li></ul>	Change in mortality.	<b>Not significant:</b> The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.

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-

## **Related information: Round 2 response – new EIS Appendix 9-F, Figure 2.9**

### **Species At Risk – *Myotis* Species**

The following information is intended to provide additional context to the responses provided in the IR tracking sheet for IR-174.

Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure .

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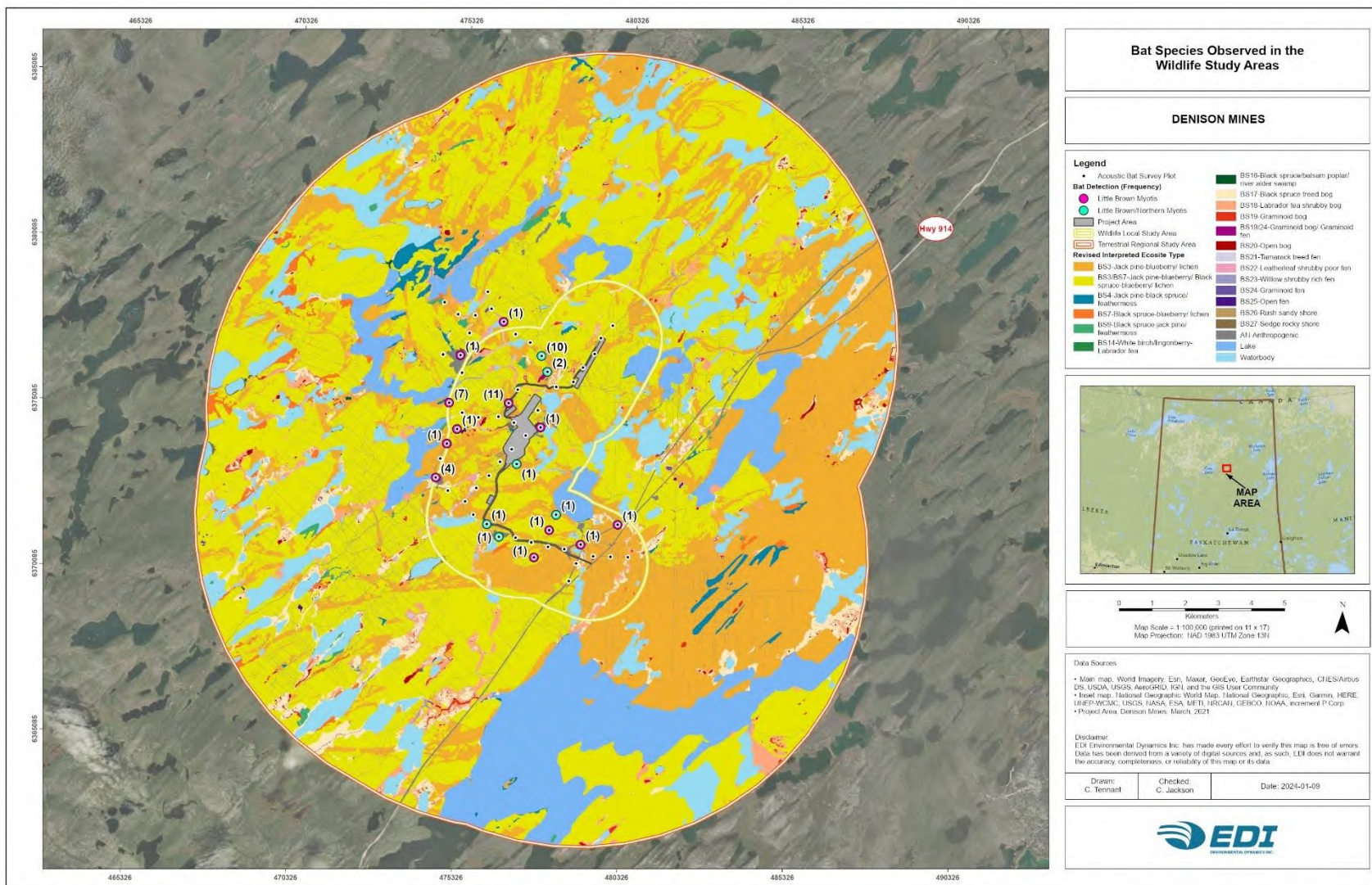
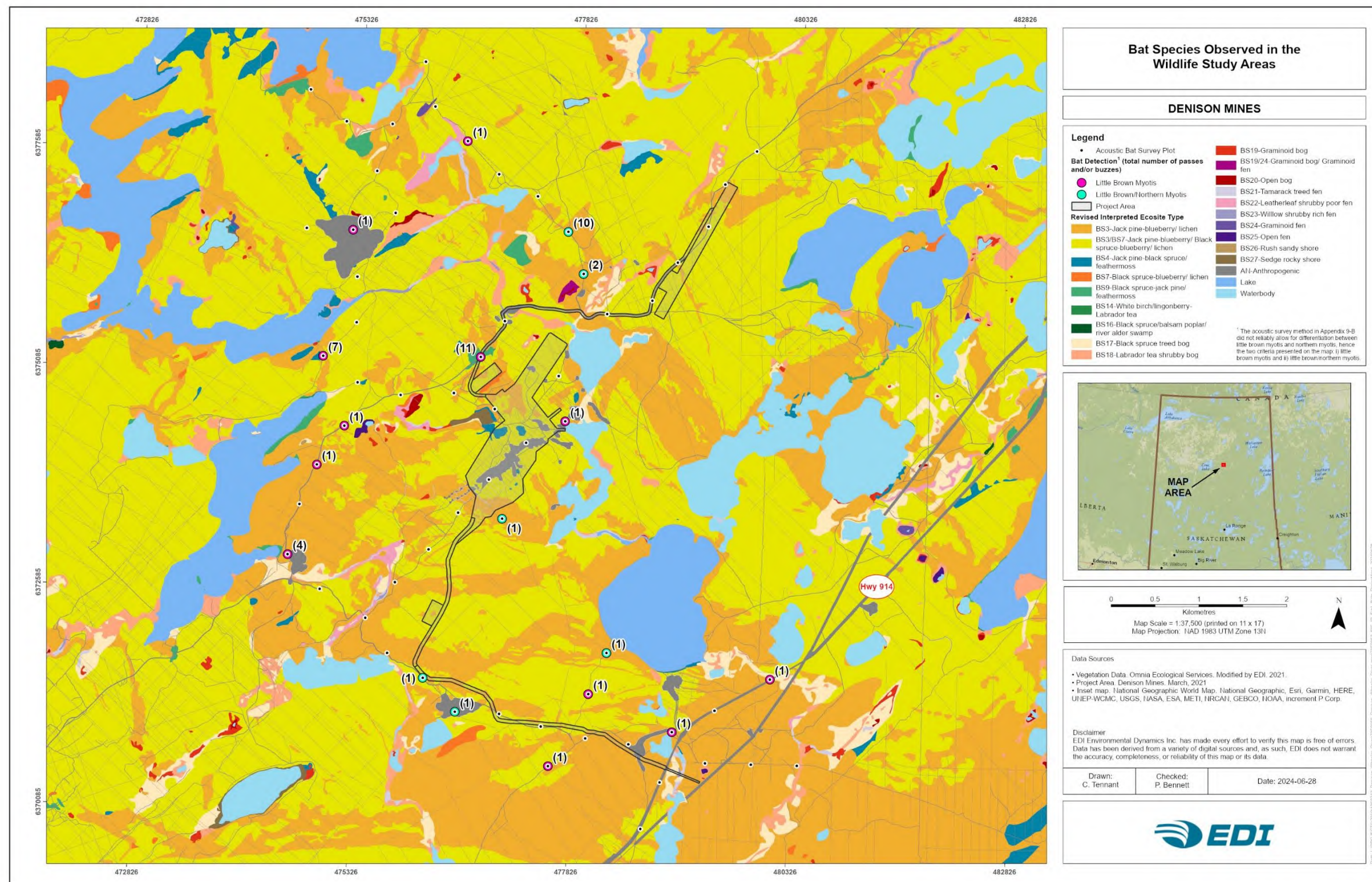


Figure 2-9: Bat Species Observed within the Wildlife Study Areas



## **IR-174, Round 3 Attachment:**





**Figure IR-174 Round 3-1: Bat Species Observed within the Wildlife Study Areas**



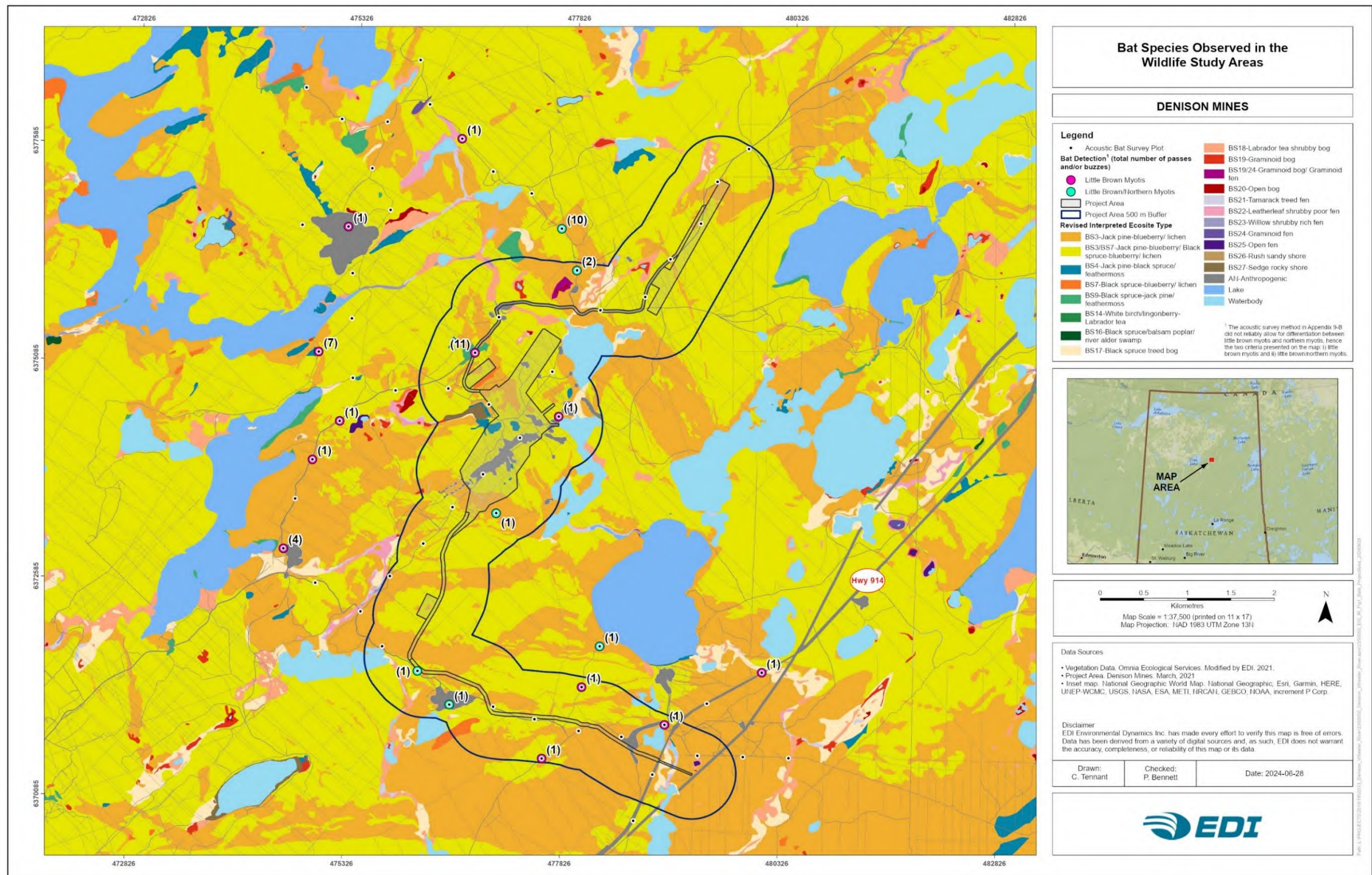
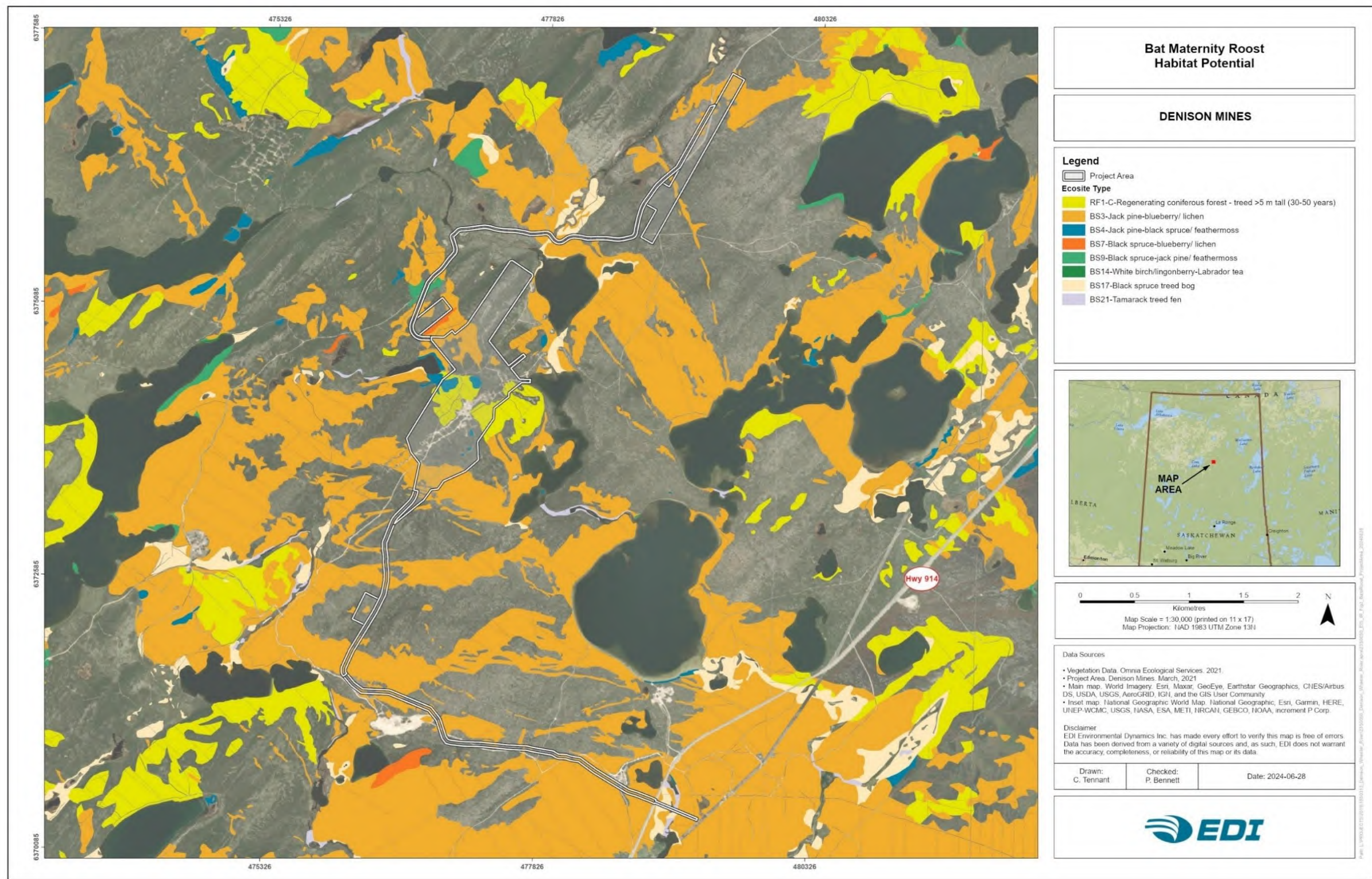


Figure IR-174 Round 3-2: Bat Species Observed within the Wildlife Study Areas (with 500m disturbance buffer shown)

Note: the above figure is provided as Figure 2-9 in Appendix 9-F of the final EIS





**Figure IR-174 Round 3-3: Bat Maternity Roost Habitat Potential**

*Note: the above figure is provided as Figure 2-10 in Appendix 9-F of the final EIS*

## Attachment IR-174 (Round 4):

To address this Round 4 IR, a series of 16 maps are provided in this attachment. There are 4 different life stages shown (i.e., forage habitat potential, overwinter hibernacula potential, maternity roost habitat potential, and summer roost habitat potential) for each bat species (little brown myotis and northern myotis) with both the 1) Project footprint and 2) project footprint plus 500 m buffer. The following list summarizes the map numbers and content:

- Little Brown Myotis Forage Habitat Potential within the...
  - Figure 1: Wildlife Study Areas
  - Figure 2: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Forage Habitat Potential within the...
  - Figure 3: Wildlife Study Areas
  - Figure 4: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Overwinter Hibernacula Habitat Potential within the...
  - Figure 5: Wildlife Study Areas
  - Figure 6: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Overwinter Hibernacula Habitat Potential within the...
  - Figure 7: Wildlife Study Areas
  - Figure 8: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Maternity Roost Habitat Potential within the...
  - Figure 9: Wildlife Study Areas
  - Figure 10: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Maternity Roost Habitat Potential within the...
  - Figure 11: Wildlife Study Areas
  - Figure 12: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Summer Roost Habitat Potential within the...
  - Figure 13: Wildlife Study Areas
  - Figure 14: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Summer Roost Habitat Potential within the...
  - Figure 15: Wildlife Study Areas
  - Figure 16: Wildlife Study Areas (with 500m disturbance buffer shown)

The rationale for each of the 4 life stages is provided below.

### Foraging habitat:

Based on information in Appendix 9-D, both species of bats could potentially forage anywhere and as such, all ecosites were shown as providing potential foraging habitat in Figures 1 to 4.



#### Overwinter hibernacula habitat:

As noted in Appendix 9-D, hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no caves anticipated in the wildlife study areas. Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats). There are no mine openings in the wildlife study areas. We do note that there are buildings in the wildlife study areas are Denison's exploration camp which is located out of the Project Area; this area is shown as providing overwinter hibernacula habitat potential in Figures 5 to 8.

#### Maternity roost habitat:

Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013, Slough and Jung 2020). The only buildings in the wildlife study area are buildings at Denison's existing exploration camp, which are outside of the Project Area. There are no known bat houses in the wildlife study areas. An evaluation of maternal roost potential in trees was focused on the areas where larger diameter trees may be present. Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figures 9, 10, 11, and 12 below, and include ecosites RF1 (regenerating forest >5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/ balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the potential to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height <10 cm. Refer Appendix 9-B for representative photos of the selected ecosites.

#### Summer roost habitat potential:

Little Brown Myotis: Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019).



Northern Myotis: Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018).

Considering the above information, Figures 13 to 16 show ecosites with trees and the existing exploration camp (i.e., buildings). The rationale is that in the summer bats can roost anywhere there are trees. As such, ecosites where trees are not expected are not included in the summer roost habitat potential (e.g., waterbodies, bogs, fens with the exception of BS21 tamarack treed fen are not included in Figures 13 to 16).

#### References:

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Johnson, J.S., Treanor, J.J., Slusher, A.C., and Lacki, M.J. 2019. Buildings provide vital habitat for little brown myotis (*Myotis lucifugus*) in a high-elevation landscape. *Ecosphere* 10(11):e02925. DOI: 10.1002/ecs2.2925

Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. *Journal of Fish and Wildlife Management* 11(1):311–320.

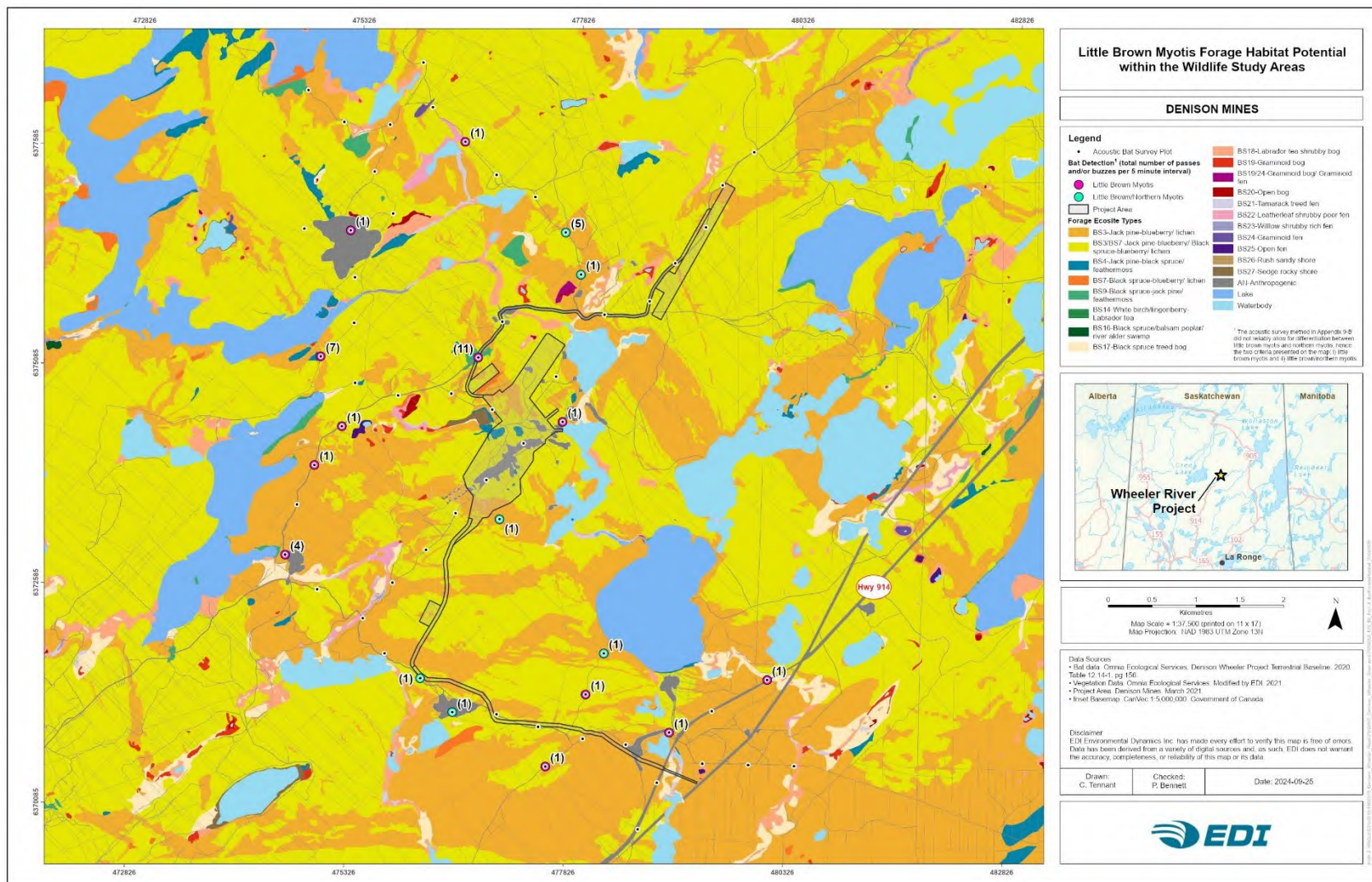


Figure 1



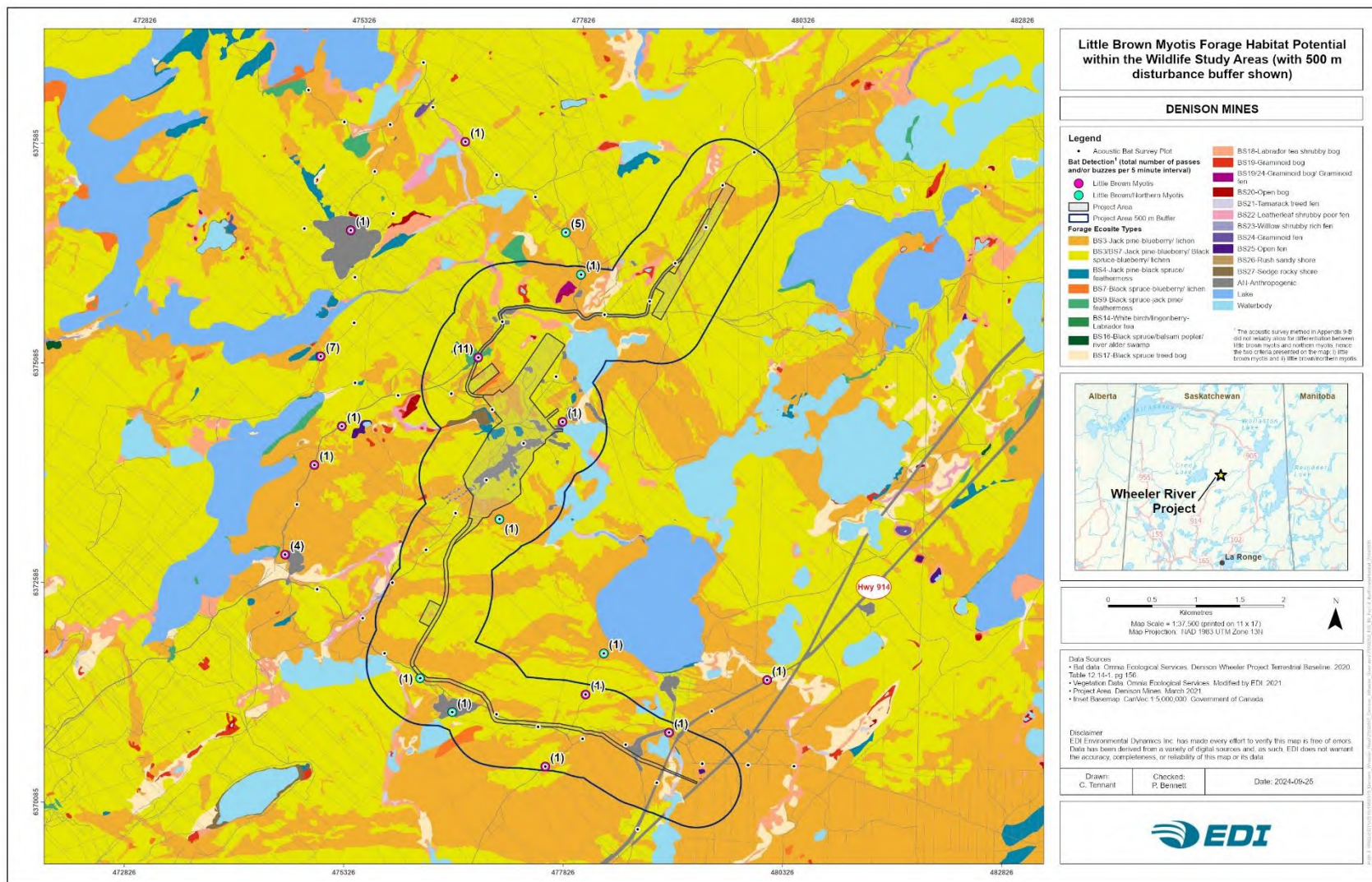


Figure 2



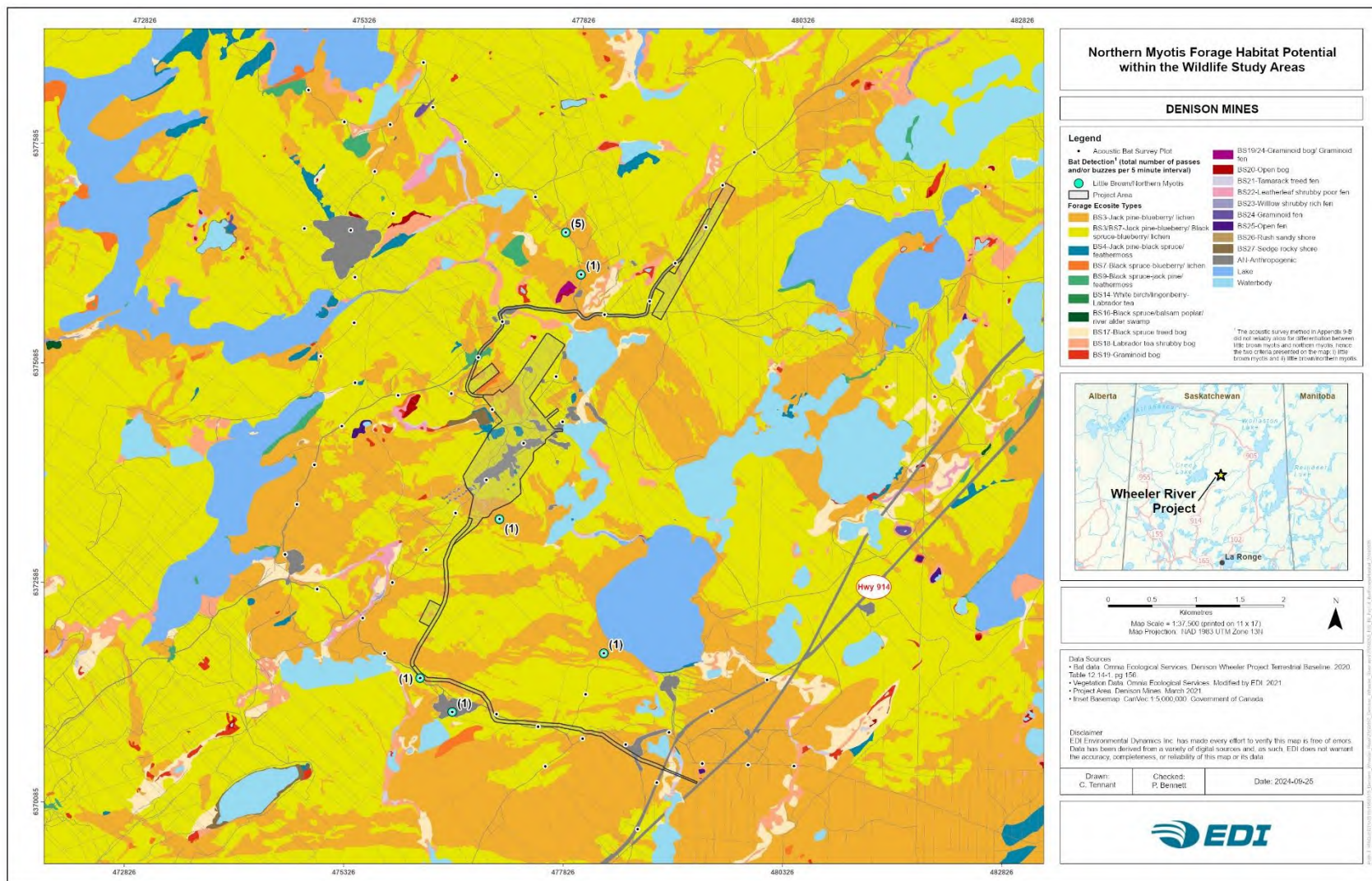


Figure 3



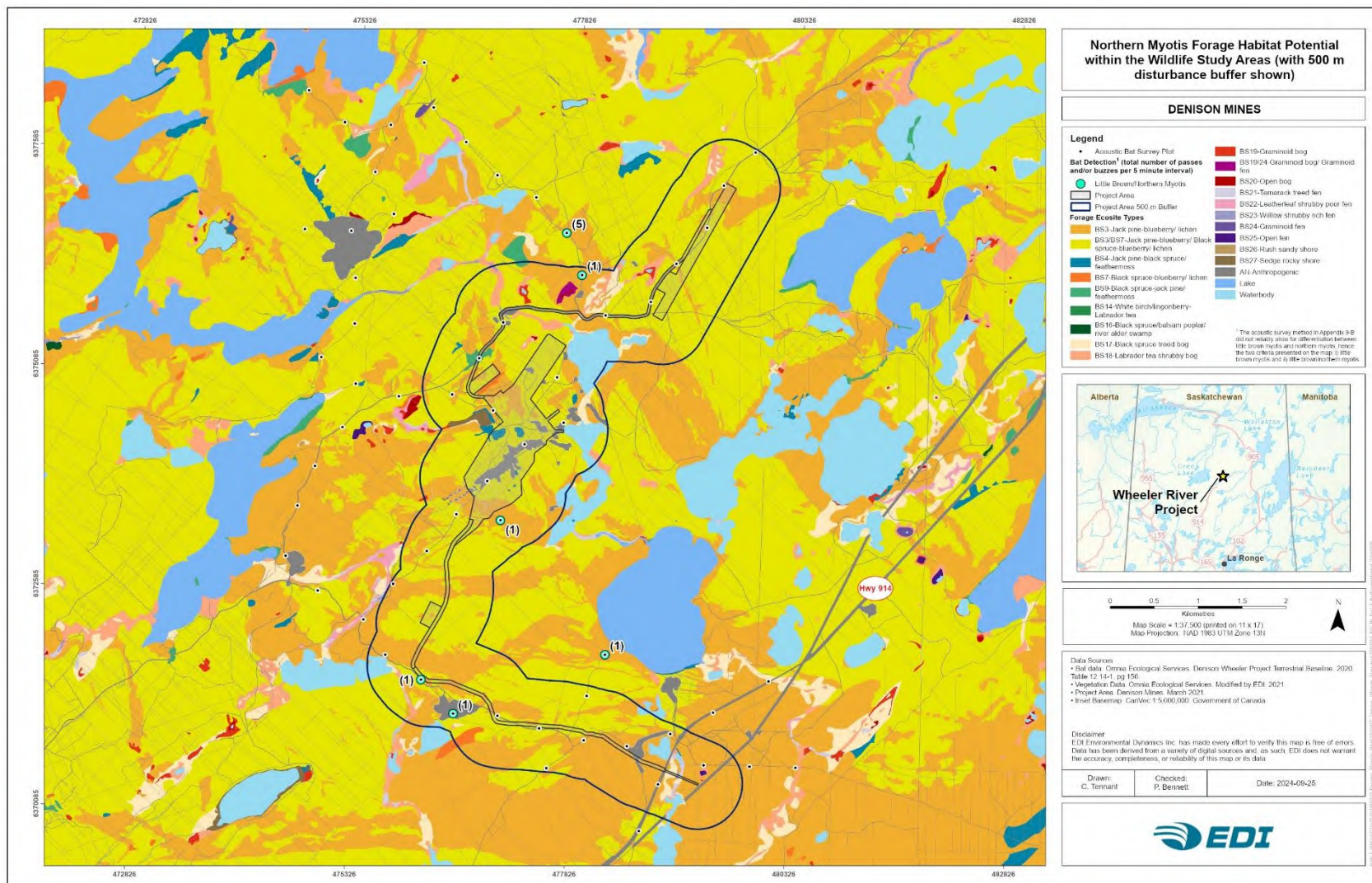


Figure 4



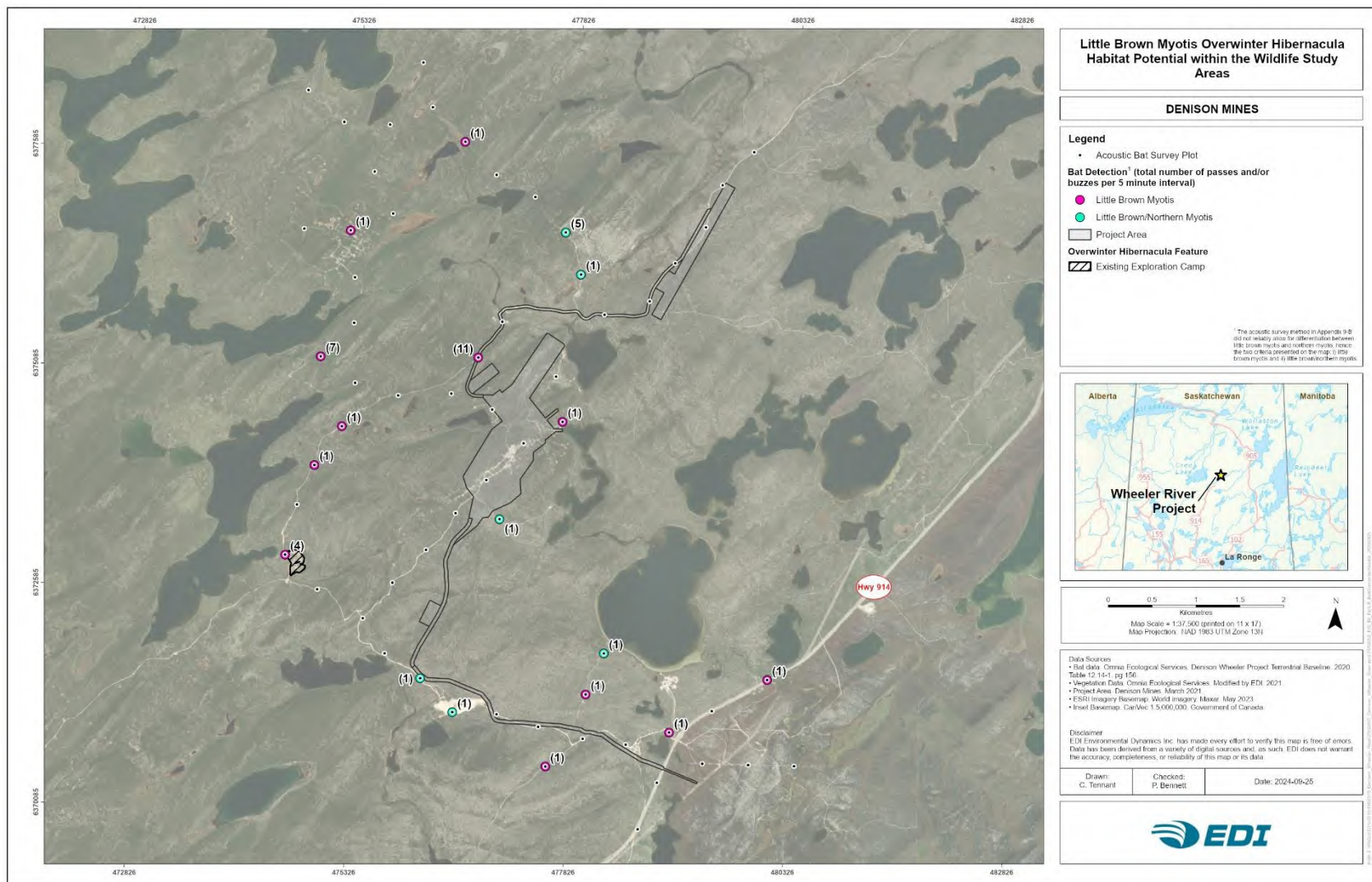


Figure 5





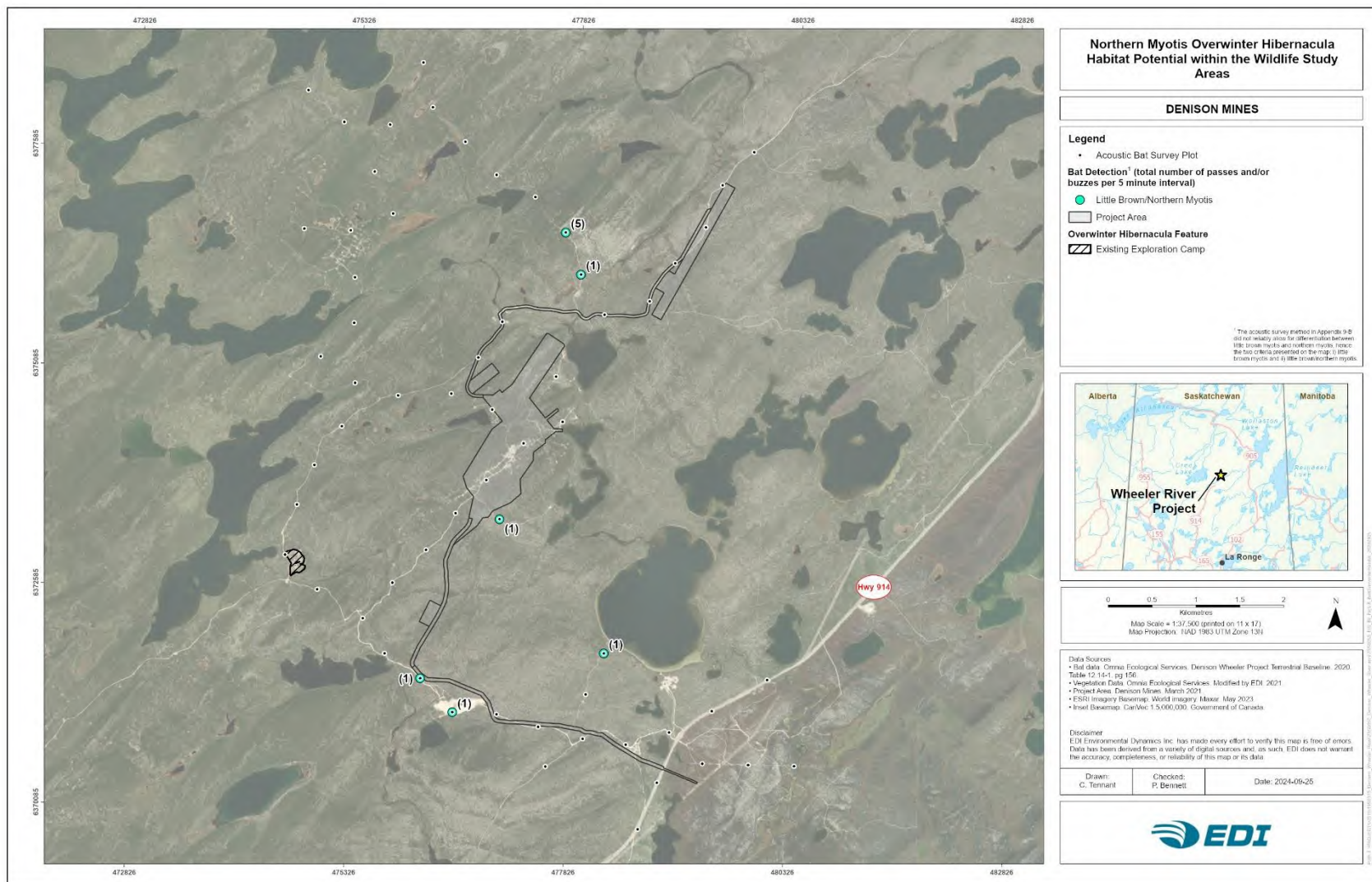


Figure 7



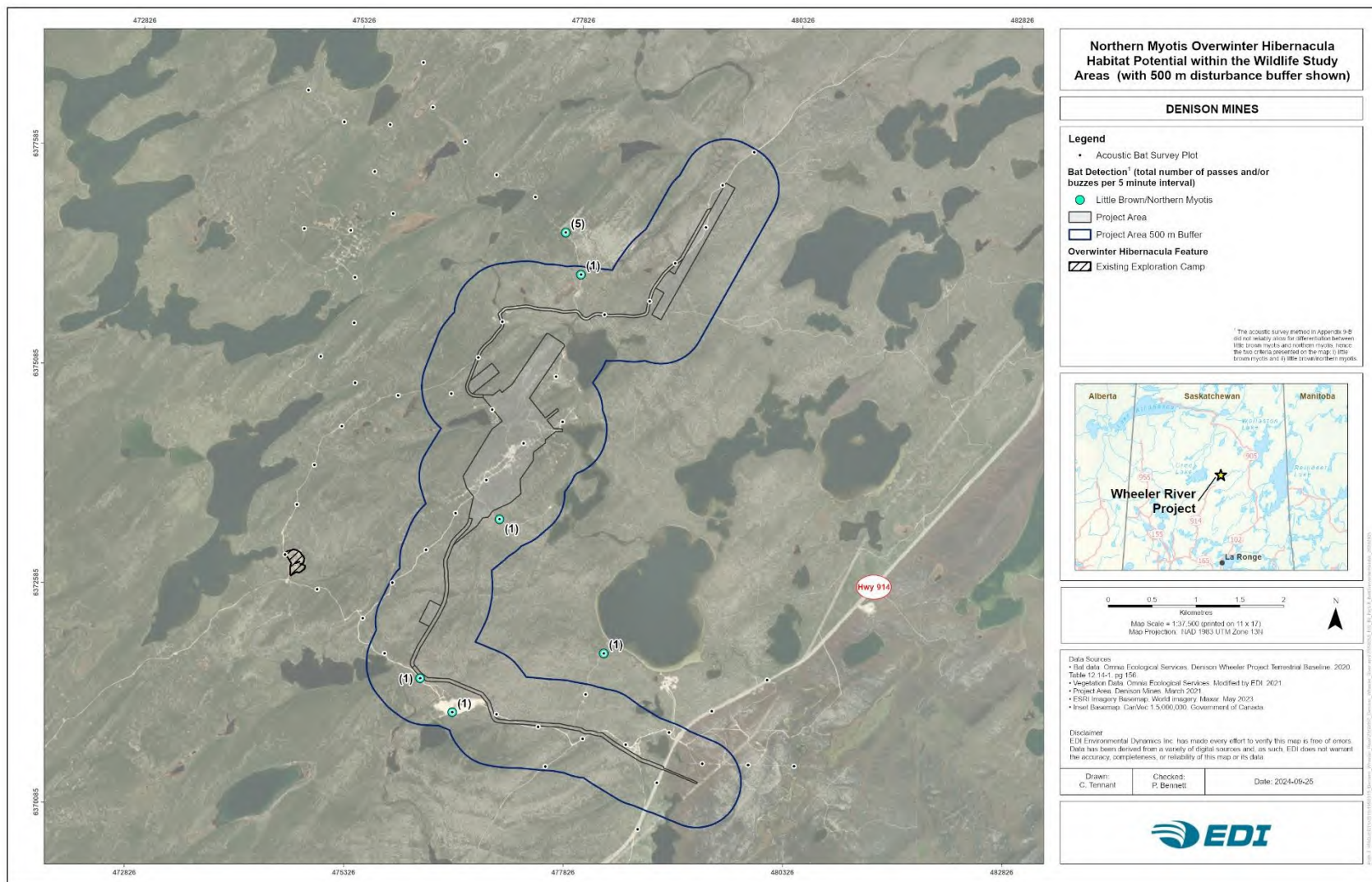


Figure 8



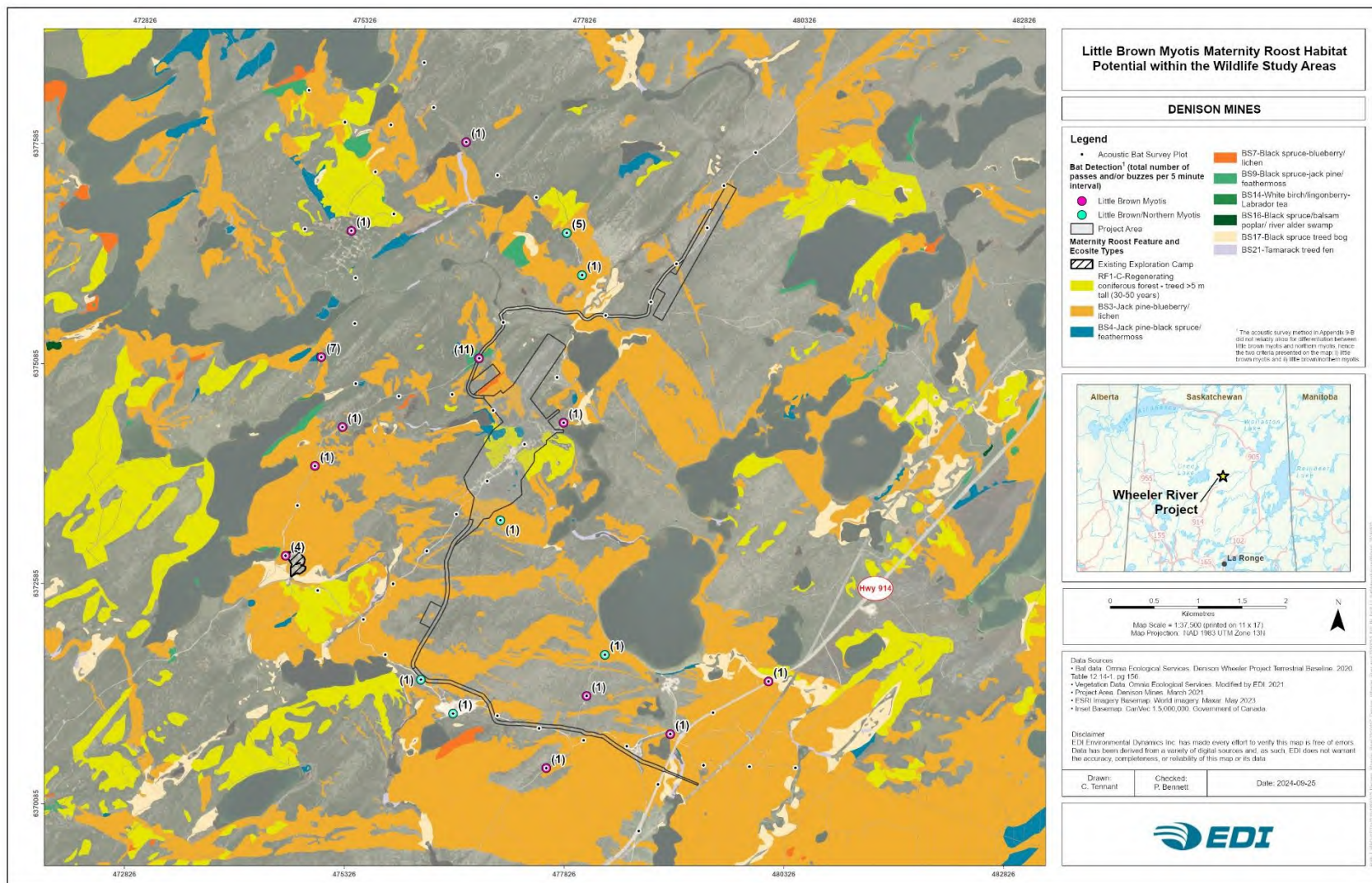


Figure 9



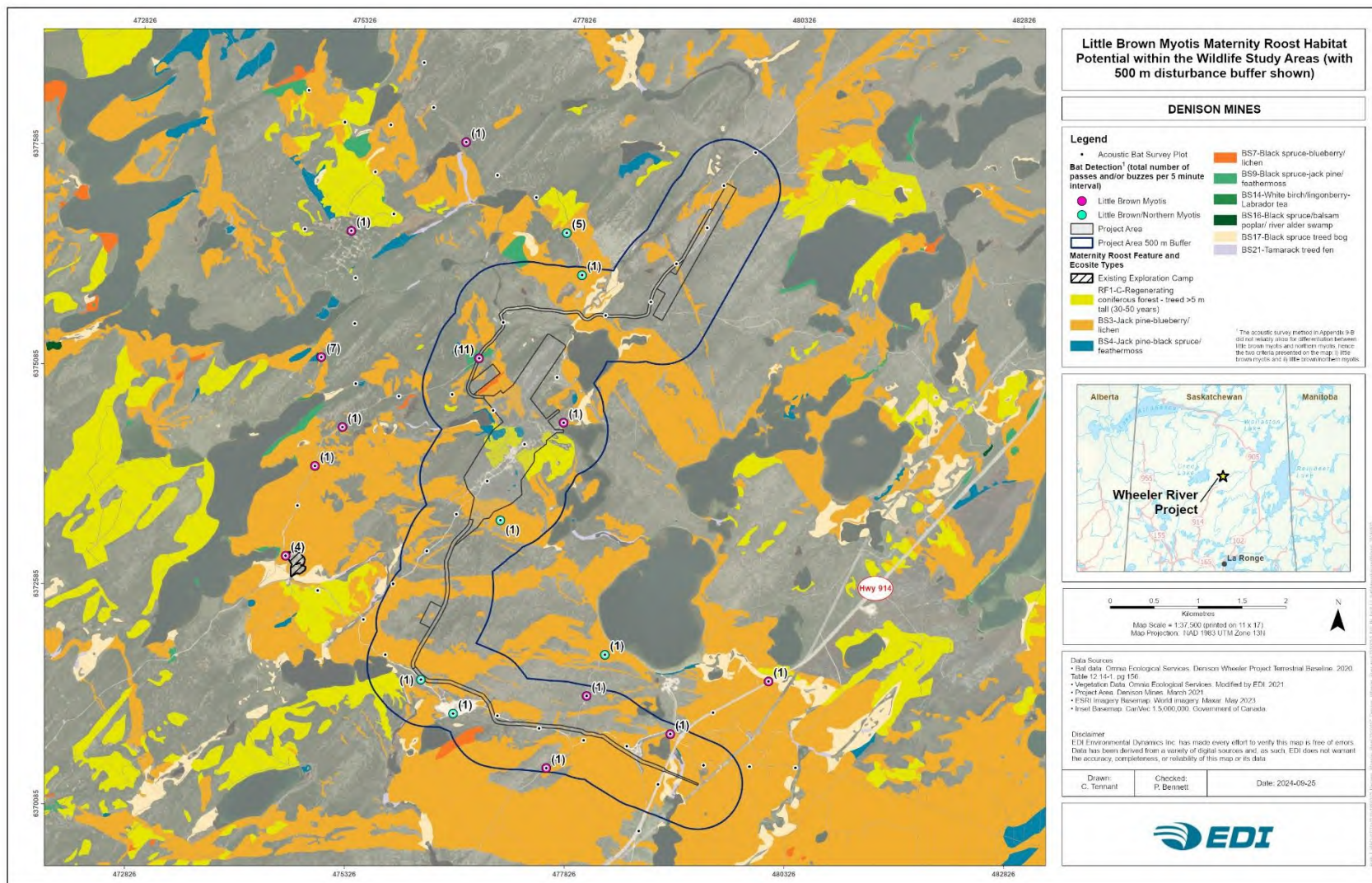


Figure 10



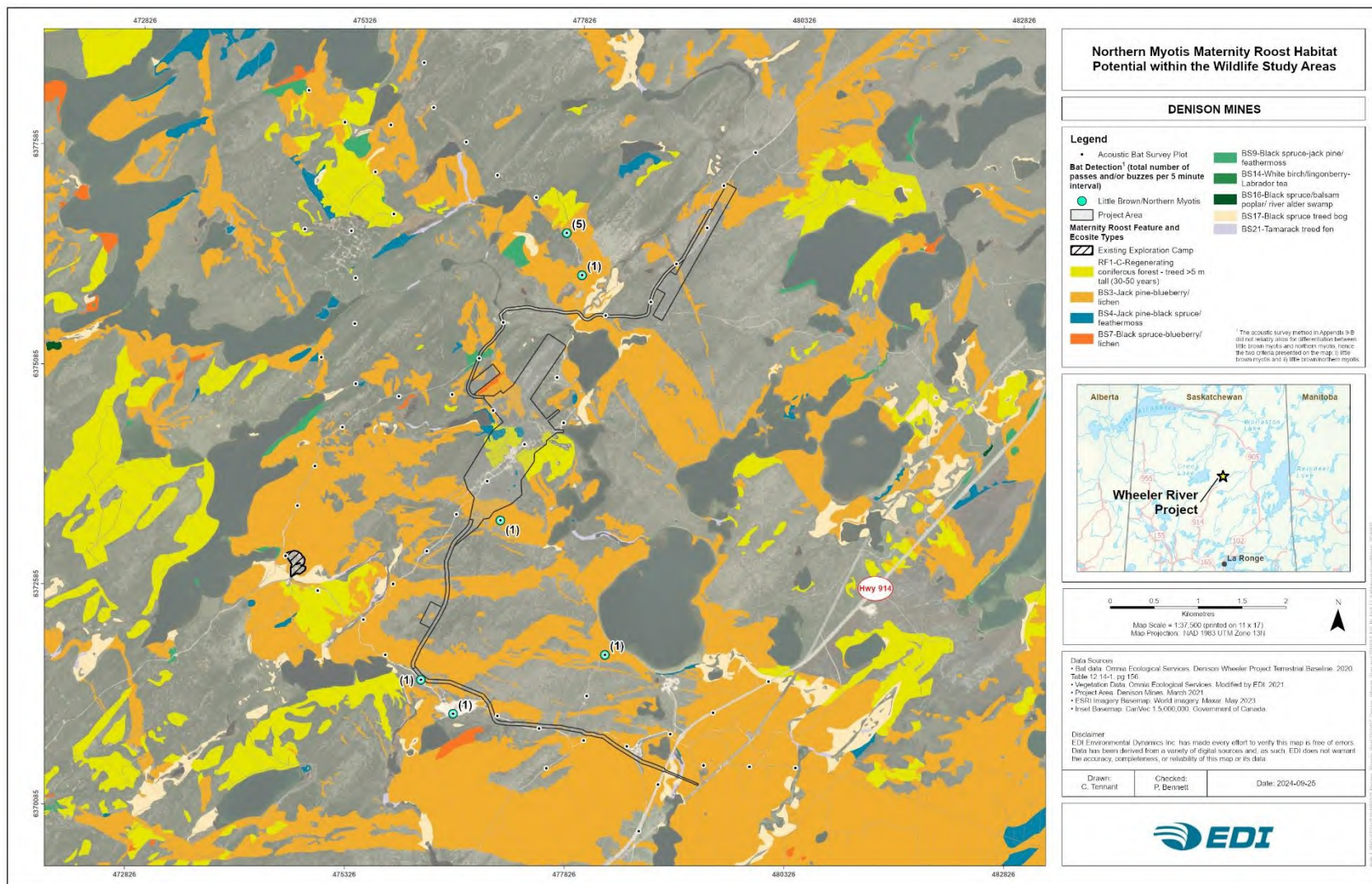


Figure 11



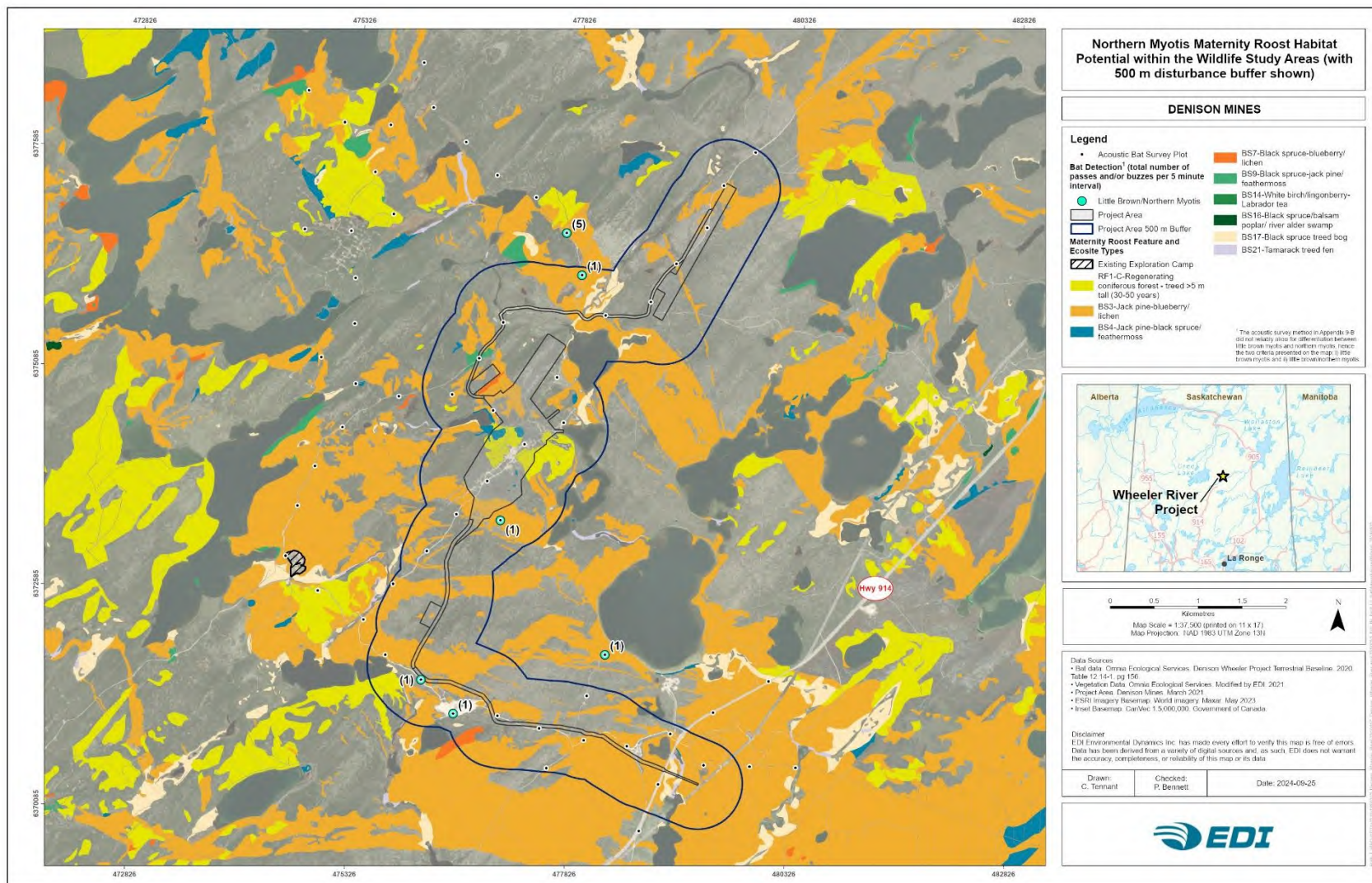


Figure 12



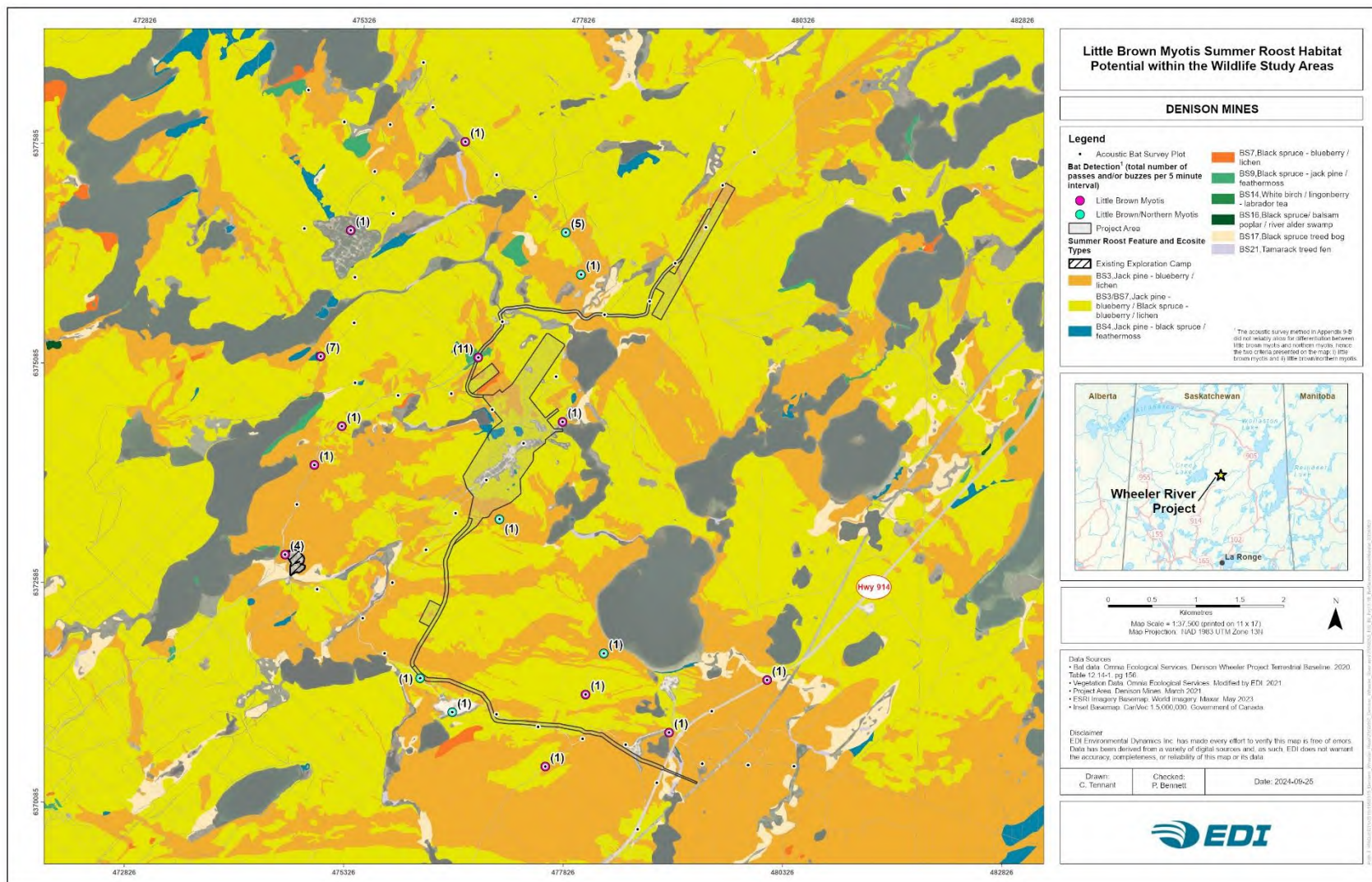


Figure 13



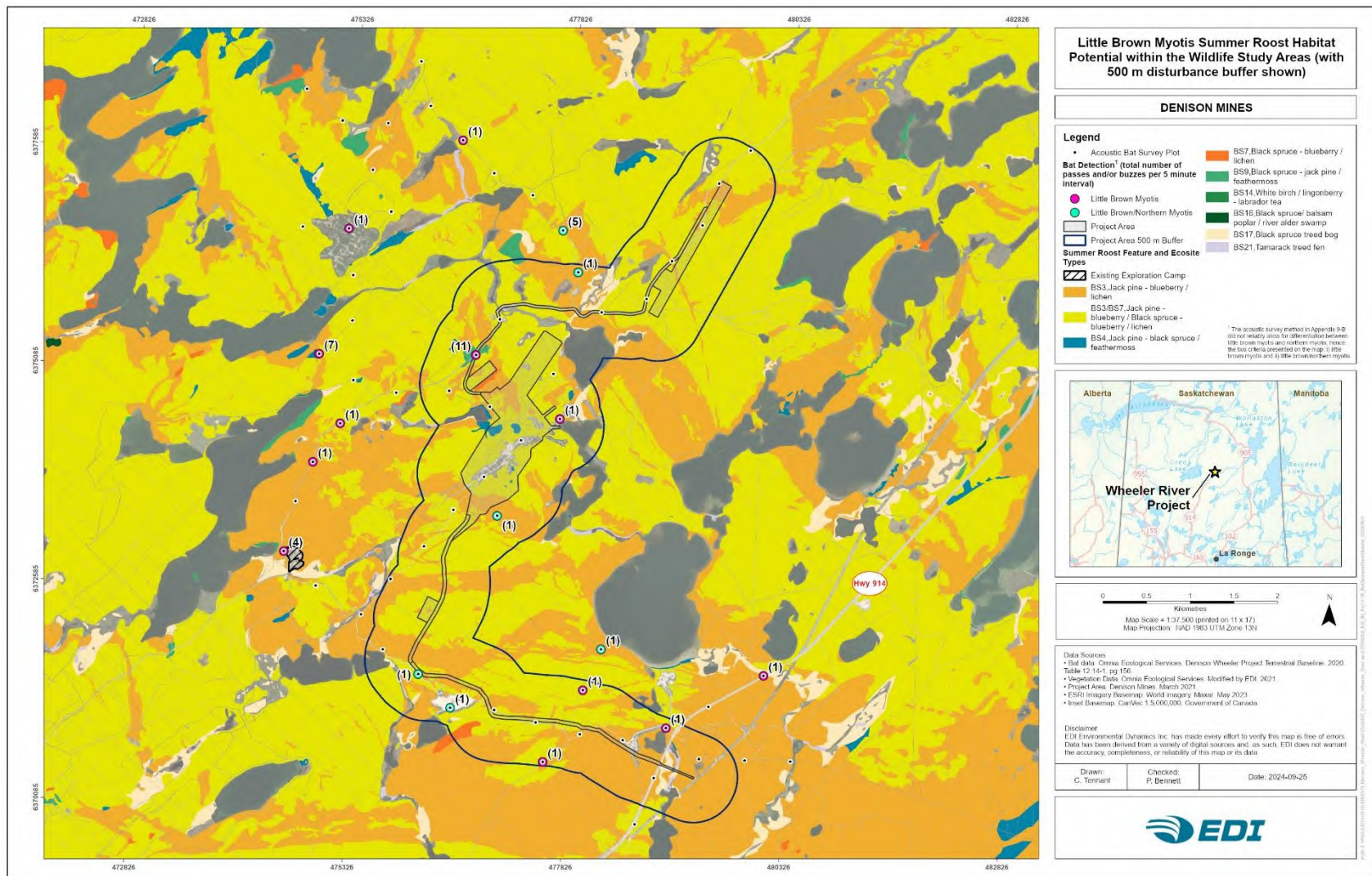


Figure 14



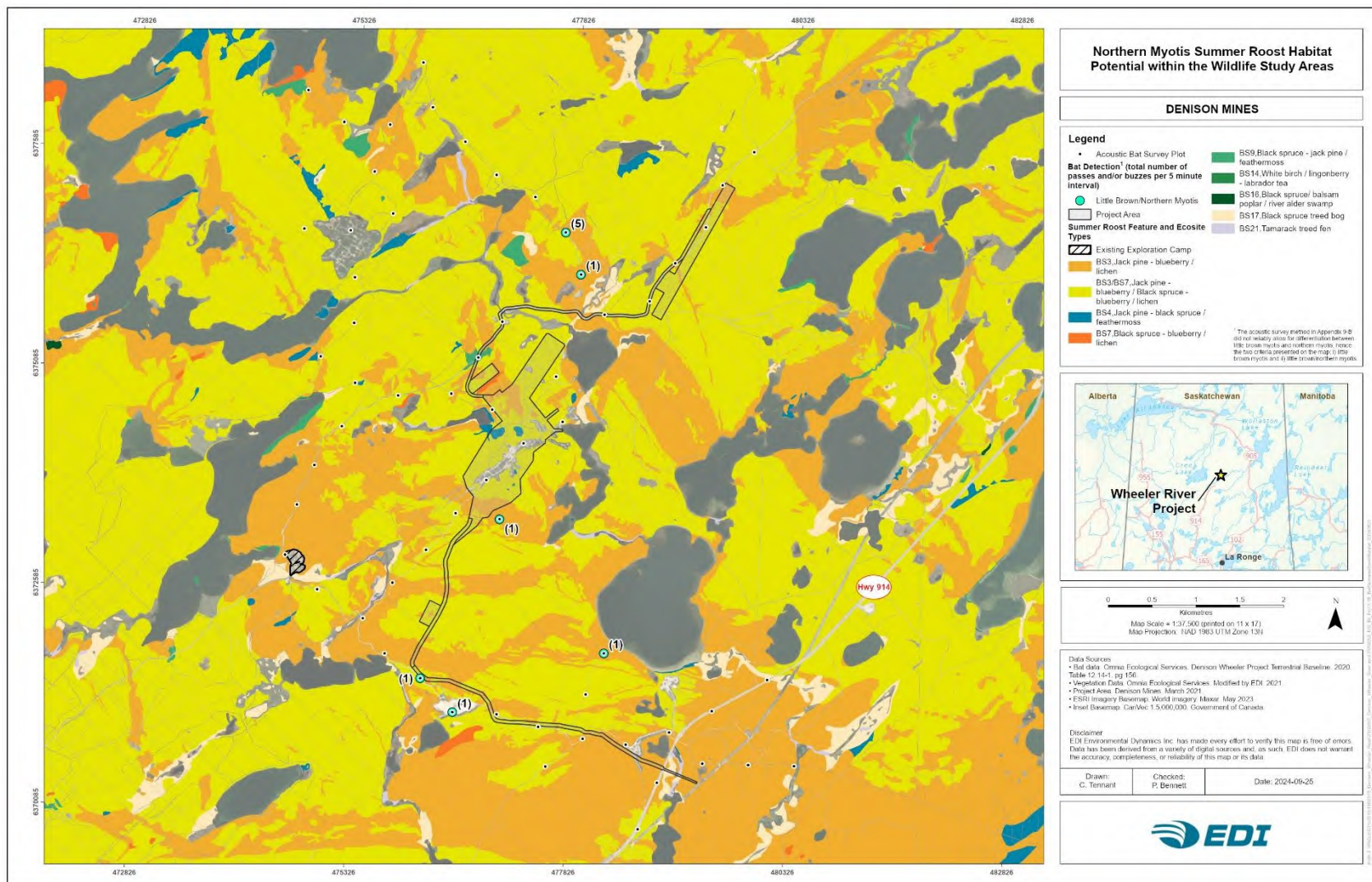


Figure 15



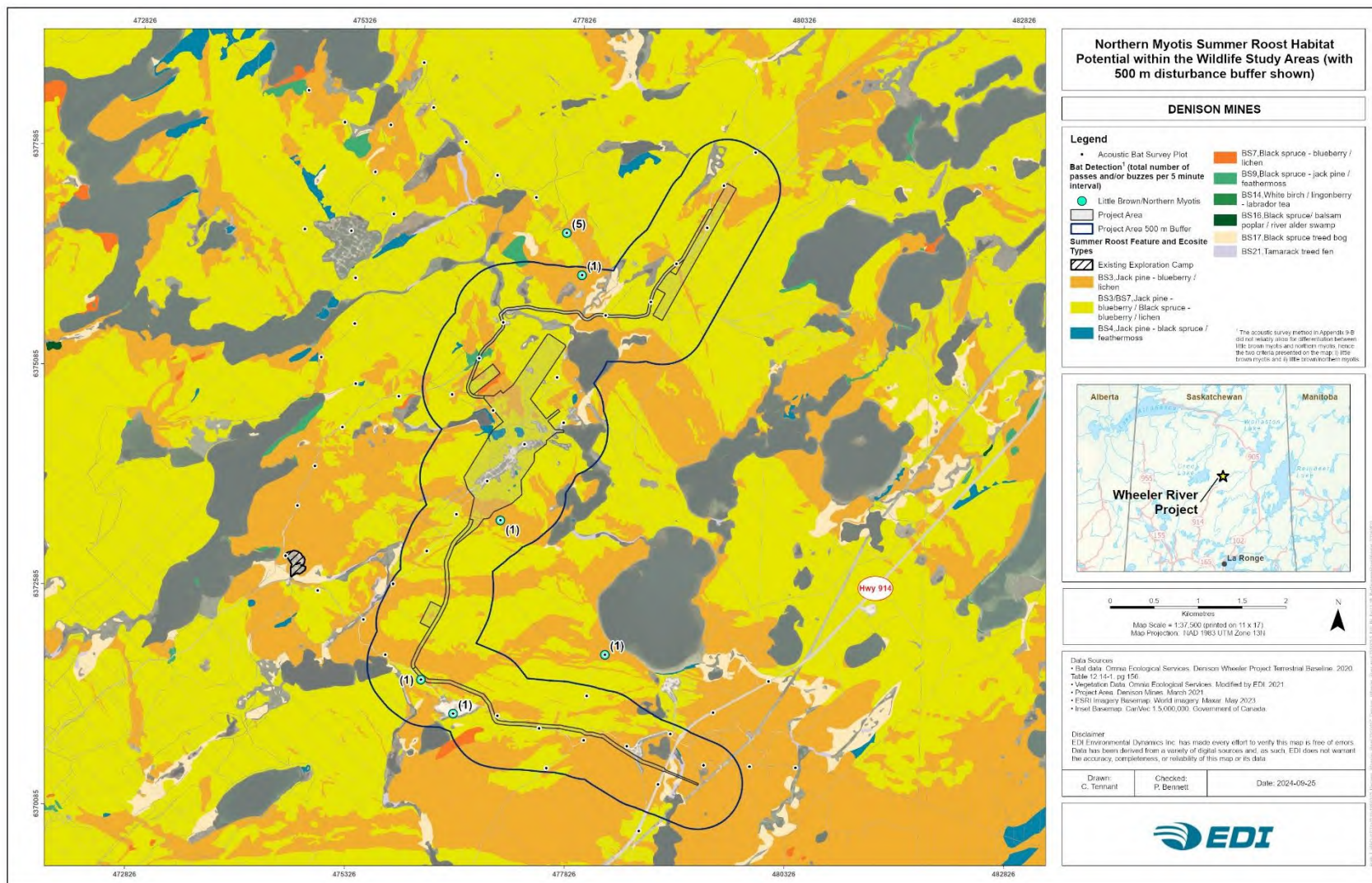
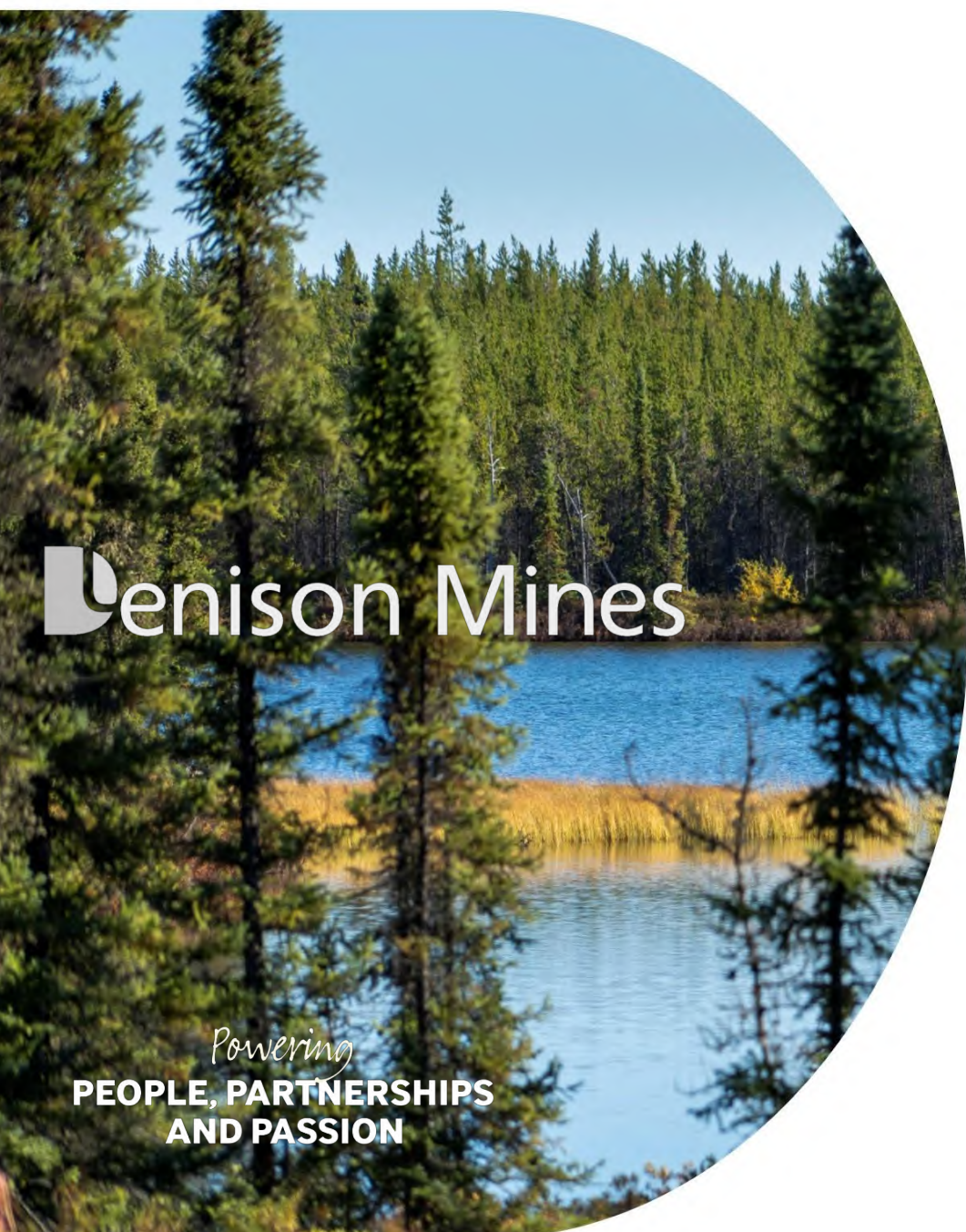


Figure 16





 Lenison Mines

*Powering*  
**PEOPLE, PARTNERSHIPS  
AND PASSION**



# Denison Mines Corp.

## Appendix 9-F Supplemental Information

~~New Appendix to Revised Draft EIS, Updated for Final EIS, Section 9~~

Version ~~32~~

~~July 2024~~October 2024

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## 1 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with an initial list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Denison compiled a list of responses to these initial IRs and provided the FIRT with a revised draft on August 18, 2023. Following the review of these documents, the FIRT provided Denison with a subsequent list of IRs on November 27, 2023. This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) related to woodland caribou, migratory songbird species, and species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA).

## 2 Supplemental Information

### 2.1 Woodland Caribou

The following information is intended to provide additional context to the responses provided in the IR tracking sheet, particularly in regard to the following: IR-137, IR-143, IR 144, IR 145, IR-143/144R1, IR-143/145R1, IR-149, IR-149-R1A and R1B, IR-151, IR-155, and IR-156.

Figure 2-1 illustrates the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate, or high-quality habitat to support woodland caribou in relation to the SK1 range. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat for caribou (Saskatchewan Ministry of Environment 2019). Figure 2-2 provides further insight as to the woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment but in context with the Wildlife Study Areas.

To provide further context on the biophysical attributes for woodland caribou, as referenced in the 2020 Amended Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (ECCC 2020), Figure 2-3 to Figure 2-8 illustrate the location of caribou observations from the baseline field program in relation to calving, foraging, and refuge habitat, based on information received from the Saskatchewan Ministry of Environment (2023). These figures present the information at two different scales: (1) in context with the Wildlife Study Areas, and (2) in relation to the Project Footprint.

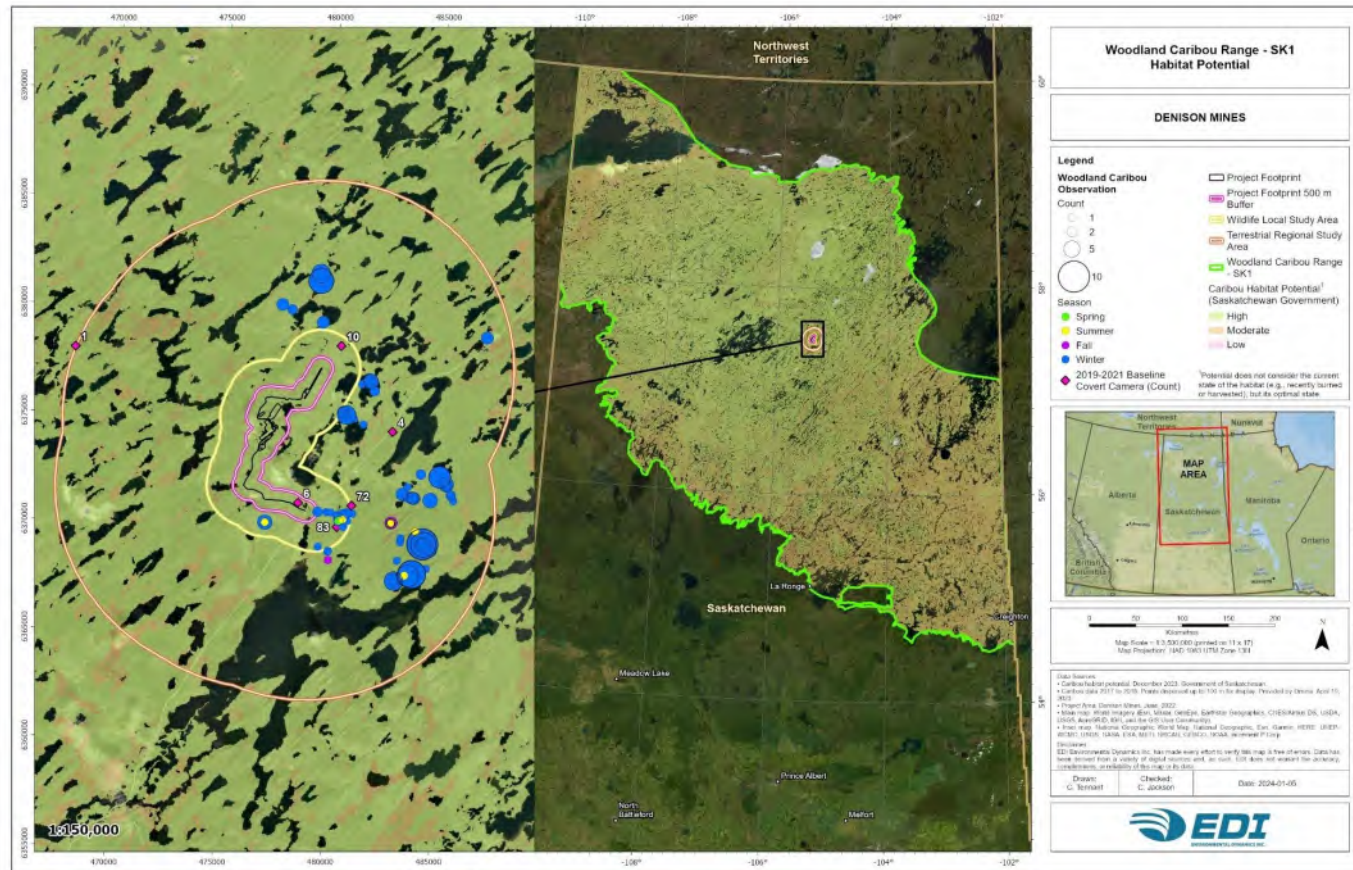


Figure 2-1: Woodland Caribou Range – SK1, Habitat Potential

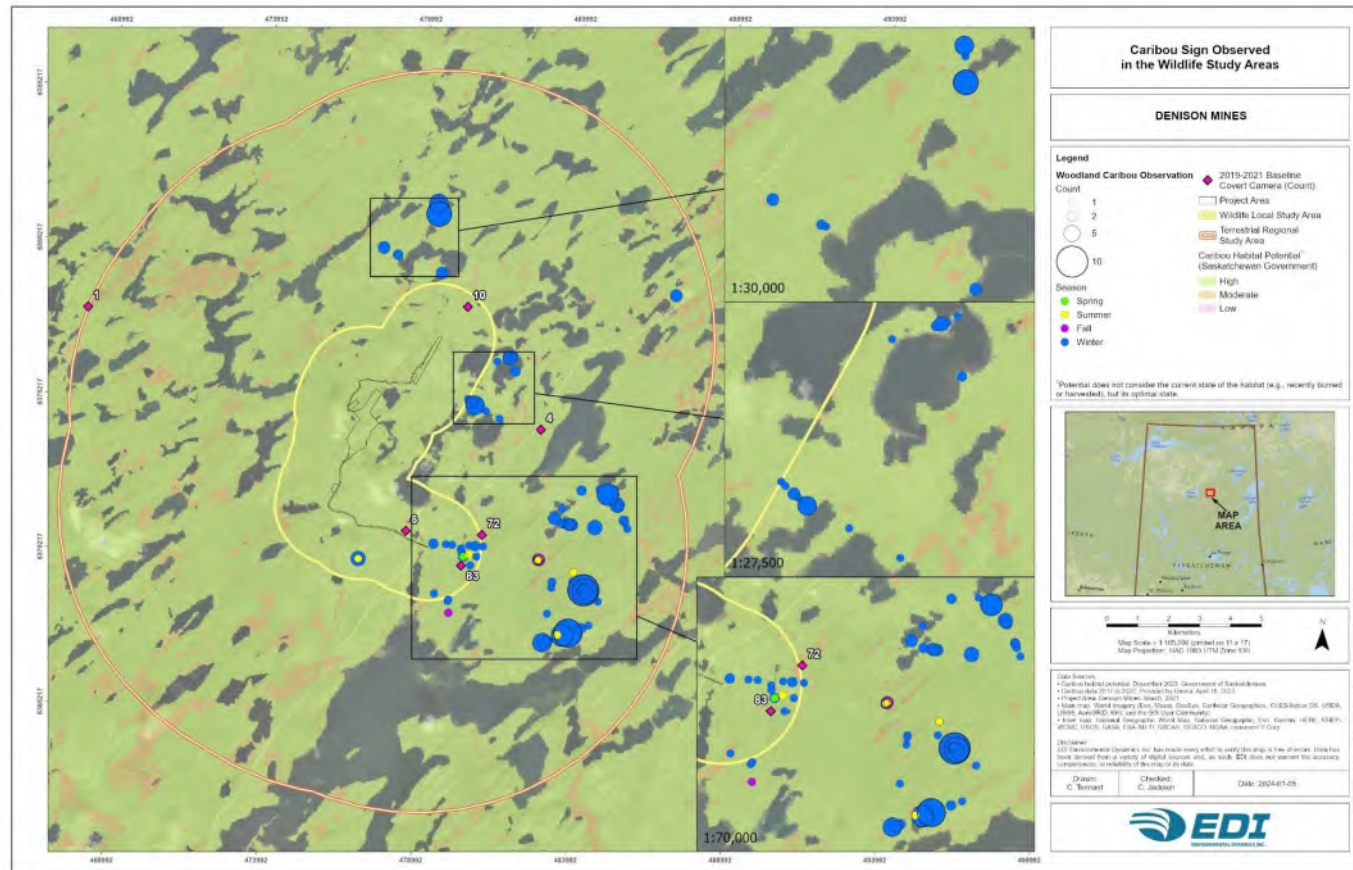
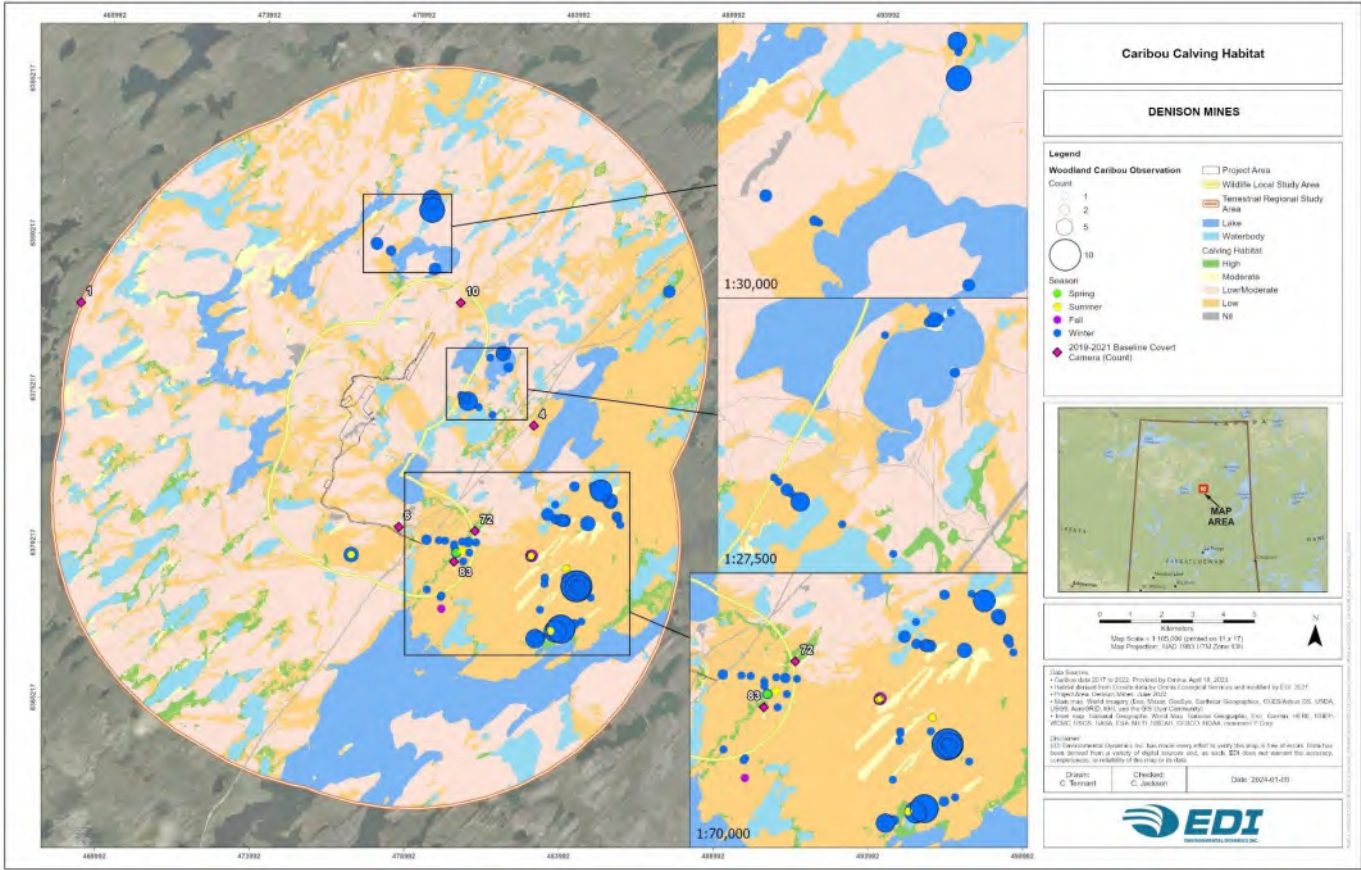


Figure 2-2: Caribou Sign Observed in the Wildlife Study Areas





**Figure 2-3: Caribou Calving Habitat Potential within the Wildlife Study Areas**



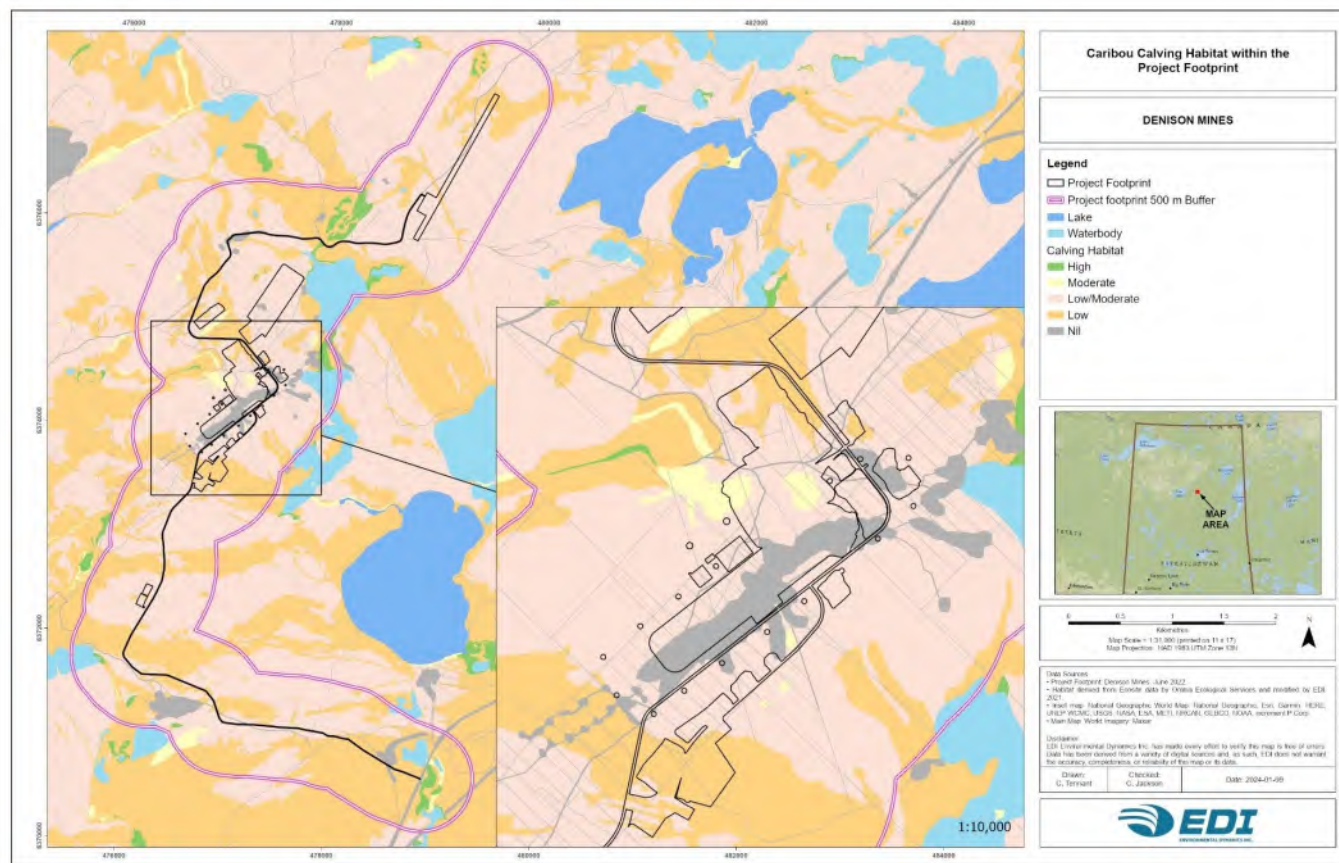
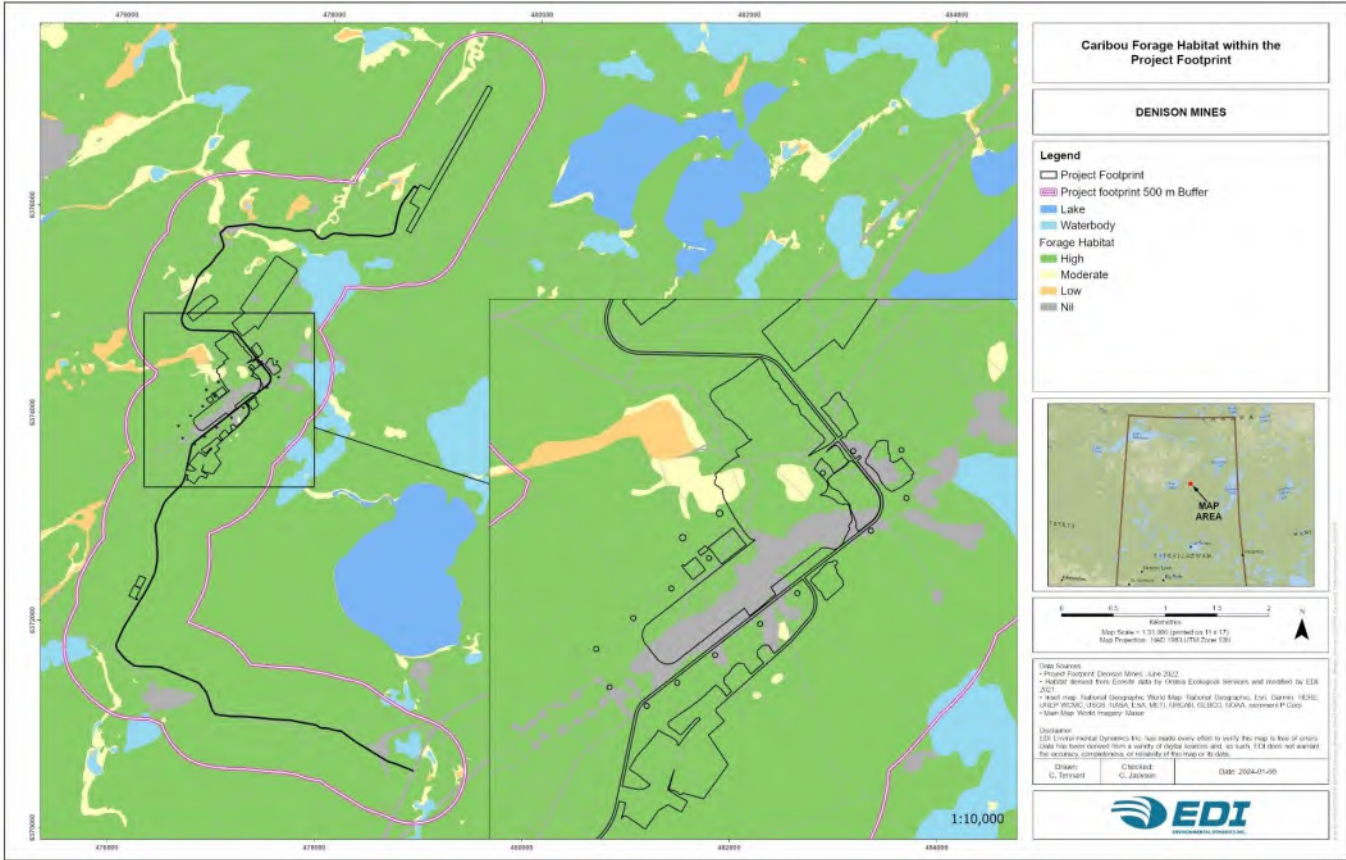


Figure 2-4: Caribou Calving Habitat Potential within the Project Footprint

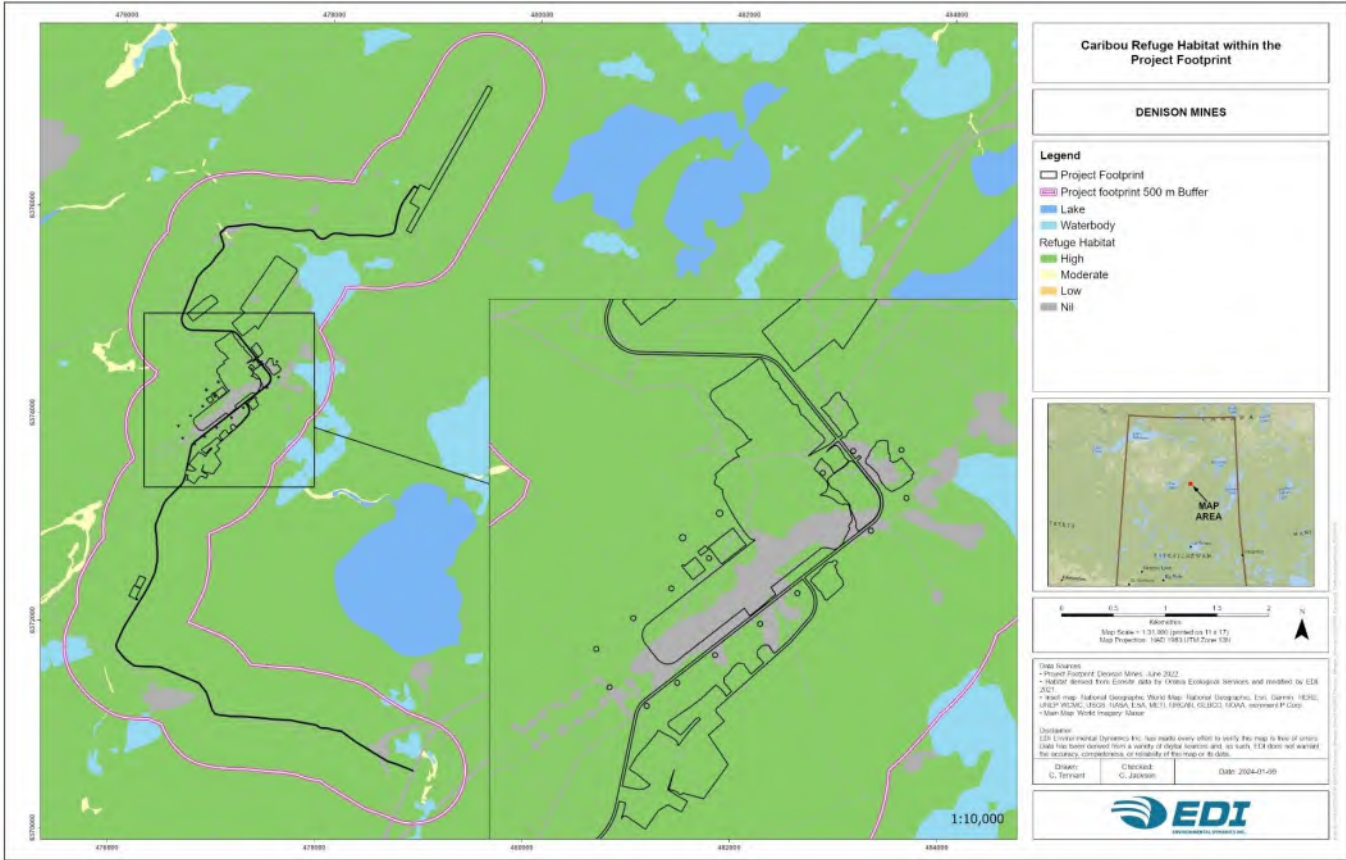




**Figure 2-6: Caribou Forage Habitat Potential within the Project Footprint**



Appendix 9-F Supplemental Information



**Figure 2-8: Caribou Refuge Habitat Potential within the Project Footprint**

## 2.2 Migratory Birds

The following information is intended to provide additional context to the responses provided in the IR tracking sheet, particularly in regard to the following: IR-159 and IR-162. For IR-160, IR-164, IR-169, and IR-170, the updates were made in Section 9 of the EIS.

Number	IR-159_WRP
Dept.	ECCC
Project effects link	Migratory Birds
Reference to EIS, appendices, or supporting documentation	9.4.3.2.3 Baseline Studies – Migratory Songbirds Appendix 9-B, Section 2.10.2, Results
Context and Rationale	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post- construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p> <p><b>Updated Rationale:</b> ECCC recommends that for major projects, a minimum of two years of field surveys should be provided so that temporal variability can be considered when comparing post-construction against baseline records and other available data. More recent data is needed.</p> <p>due to landscape changes that may have occurred since 2017 as well as cumulative effects that have occurred in that time. Additionally, if there was an unusually high population density of birds in 2017 due to extraneous circumstances, Project effects may be attributed to a non-existent decline in the population when the discrepancy can be due to natural variability.</p> <p>A more recent baseline will account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p>
Information Requirement	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.



**Response:**

The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including TK. However, supplemental surveys would not be expected to provide any information/data that would affect or alter the findings of the habitat-based EA.

The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory songbird species were documented. A summary of the total number of individuals observed for each species across all plots are presented below.

Common Name	Scientific Name	Number of Individuals Observed
American Robin	<i>Turdus migratorius</i>	8
Bald Eagle	<i>Haliaeetus leucocephalus</i>	1
Canada Goose	<i>Branta canadensis</i>	50
Canada Jay	<i>Perisoreus canadensis</i>	10
Chipping Sparrow	<i>Spizella passerina</i>	19
Common Loon	<i>Gavia immer</i>	2
Common Tern	<i>Sterna hirundo</i>	1
Dark-eyed Junco	<i>Junco hyemalis</i>	10
Greater Yellowlegs	<i>Tringa melanoleuca</i>	1
Hermit Thrush	<i>Catharus guttatus</i>	11
Lincoln's Sparrow	<i>Melospiza lincolni</i>	8
Orange-crowned Warbler	<i>Leiothlypis celata</i>	2
Palm Warbler	<i>Setophaga palmarum</i>	10
Red-breasted Merganser	<i>Mergus serrator</i>	2
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	14
Savannah Sparrow	<i>Passerculus sandwichensis</i>	1
Solitary Sandpiper	<i>Tringa solitaria</i>	0
Song Sparrow	<i>Melospiza melodia</i>	2
Spotted Sandpiper	<i>Actitis macularius</i>	1

Common Name	Scientific Name	Number of Individuals Observed
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	6
White-throated Sparrow	<i>Zonotrichia albicollis</i>	24
White-winged Crossbill	<i>Loxia leucoptera</i>	40
Yellow Warbler	<i>Setophaga petechia</i>	3
Yellow-rumped Warbler	<i>Setophaga coronata</i>	12

Number	IR-162_WRP
Dept.	ECCC
Project effects link	Migratory birds
Reference to EIS, appendices, or supporting documentation	Section 9.4.3.3, Bird Species at Risk
Context and Rationale	<p><b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.</p> <p>In Section 9.4.3.3. the Proponent states:</p> <p>“It is acknowledged that the listed Barn Swallow (<i>Hirundo rustica</i>) and Horned Grebe (<i>Podiceps auratus</i>) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”</p> <p>Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.</p> <p><b>Updated Rationale:</b> The management plans for these three species demonstrate the variability in their habitat selection.</p> <p>The Management Plan for the Yellow Rail (<i>Coturnicops noveboracensis</i>) in Canada (Environment Canada, 2013) states “Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert</p>

	<p>1999, COSEWIC 2009), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). “</p> <p>The Management Plan for the Rusty blackbird (<i>Euphagus carolinus</i>) in Canada (Environment Canada 2015), states: “Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka et al. 2010a, Matsuoka et al. 2010b, Greenberg et al. 2011).”</p> <p>The Management Plan for the Horned Grebe (<i>Podiceps auritus</i>), Western population, in Canada (ECCC, 2022) states: “The Horned Grebe breeds in small (generally 0.5 to 2 ha, but ranging from 0.24 to 18.2 ha), shallow (at least 20 cm deep, but on average 40 cm), and usually fishless, perennial wetlands, but they can also nest on larger lakes with shallow edges and sufficient emergent vegetation. Breeding sites usually contain at least 40% open water with beds of emergent vegetation, such as sedges (<i>Carex</i> spp.), rushes (<i>Juncus</i> spp.) and cattails (<i>Typha</i> spp.) (Faaborg 1976, Kuczynski et al. 2012, Routhier 2012, Stedman 2018).”</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures. This will allow for a more accurate review of the chosen mitigation measures.</p>
Information Requirement	<p>Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>Assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>See also related IRs: IR-160 and IR-161.</p>

#### **Response:**

As per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project’s effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA.

Nesting habitat requirements of the horned grebe are similar at a landscape level to those represented by yellow rail and rusty blackbird in that they are typically found associated with northern waterbodies and watercourses with various forms of emergent vegetation. At a site-specific scale, there are subtle differences in nesting habitat requirements, as summarized previously by ECCC in the Context and Rationale response.

Given the nesting habitat requirements of these species, the available habitat types within the Denison study areas (e.g., Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area) for use by these species include the following ecosite types: Labrador tea shrubby bog (BS18), graminoid bog (BS 19), graminoid bog/graminoid fen (BS19/BS24), open bog (BS 20), leatherleaf shrubby poor fen (BS22), willow shrubby rich fen (BS23), graminoid fen (BS24), open fen (BS25), and waterbodies and lakes. The habitat-based methodology of the environmental assessment adequately and appropriately addresses effects on these habitat types and the associated migratory bird species that could potentially use these

habitat types. Further assessment of each species would not be expected to affect or alter the findings of the habitat-based environmental assessment.

The characterization of the alteration and/or habitat loss residual effect considers the Project effects on available habitat used by these three migratory breeding birds within the Wildlife LSA and Terrestrial RSA. As outlined in Table 9.3-18, 0.05% of the Project Area, 11.5% of the Wildlife LSA, and 24.2% of the Terrestrial RSA provide habitat types that are potentially available to these three migratory breeding bird species.

Direct habitat loss is calculated as the area of available habitat lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during Construction. In the Project Area, 0.09 ha or 100% of available habitat is assumed to be removed and will not be available to these species for the duration of the Project (Table 9.3-19). This considers that the Project Area has previously been disturbed (i.e., almost 15% of the Project Area is disturbed by anthropogenic activities) and includes only 0.02 ha (0.01%) of landscape covered by waterbodies. This relates to a removal of 0.02% of available habitat within the Wildlife LSA and 0.001% in the Terrestrial RSA.

An additional 93.9 ha (17.0%) of available habitat in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance (Table 9.3-19). This area of indirect effect represents 1.0% of available habitat in the Terrestrial RSA that may experience habitat alteration.

### 2.3 Species At Risk – *Myotis* Species

The following information is intended to provide additional context to the responses provided in the IR responses to for IR-174 associated with both the Round 2 and Round 3 responses.

Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types (refer to Appendix 9-B). The location of the survey points, species detected, and frequency of detections are included in Figure 2-9.

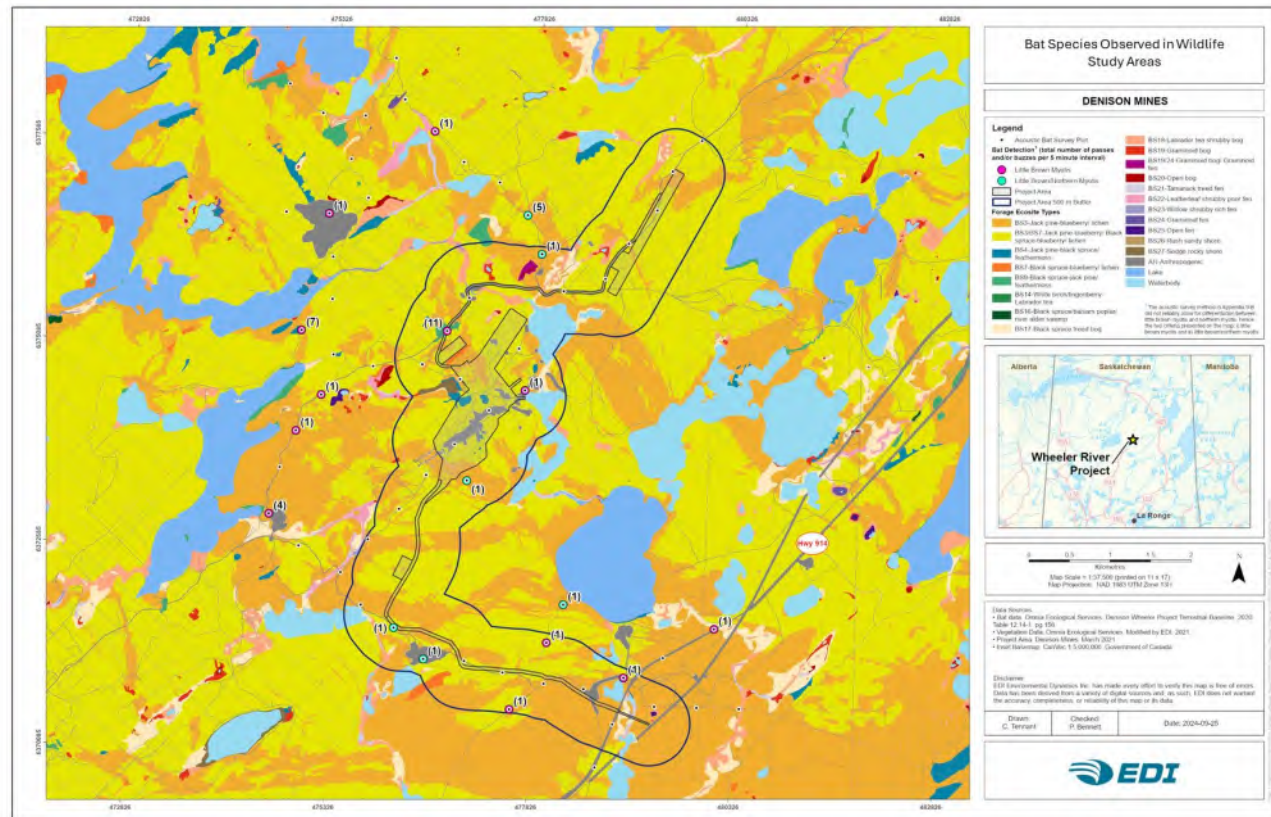
As noted in Appendix 9-D, habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013). Hibernacula and maternity sites are reported as being the main limiting habitat features for this species (COSEWIC 2013), and this, as described below, is consistent with conditions at the Project site and surrounding area.

Hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (~4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no hibernacula anticipated in the Project Area (i.e., caves, mines, buildings with stable and specific temperatures per COSEWIC 2013). Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats); there are no man-made structures (e.g., mine openings or buildings) in the Project Area. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the Project Area are considered representative of the landscape in the wildlife LSA and RSA.

Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). As highlighted above, since there are no rock crevices, buildings, or bat houses in the Project Area, a consideration for maternal roost potential was focused on the areas where larger diameter trees may be present.

Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figure 2-10 below, and include ecosites RF1 (regenerating forest >5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the *potential* to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height <10 cm. Refer to Appendix 9-B for representative photos of the selected ecosites.

Based on this conservative mapping exercise, the Project Area contains small areas of suitable potential maternal roost habitat. The total Project Area is around 170 ha and potential bat maternal roost ecosites represent less than 49 ha, when as noted above it is assumed that the ecosites identified above provide trees suitable for maternity roosts across their entirety. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the Project Area are considered representative of the landscape in the wildlife LSA and RSA.

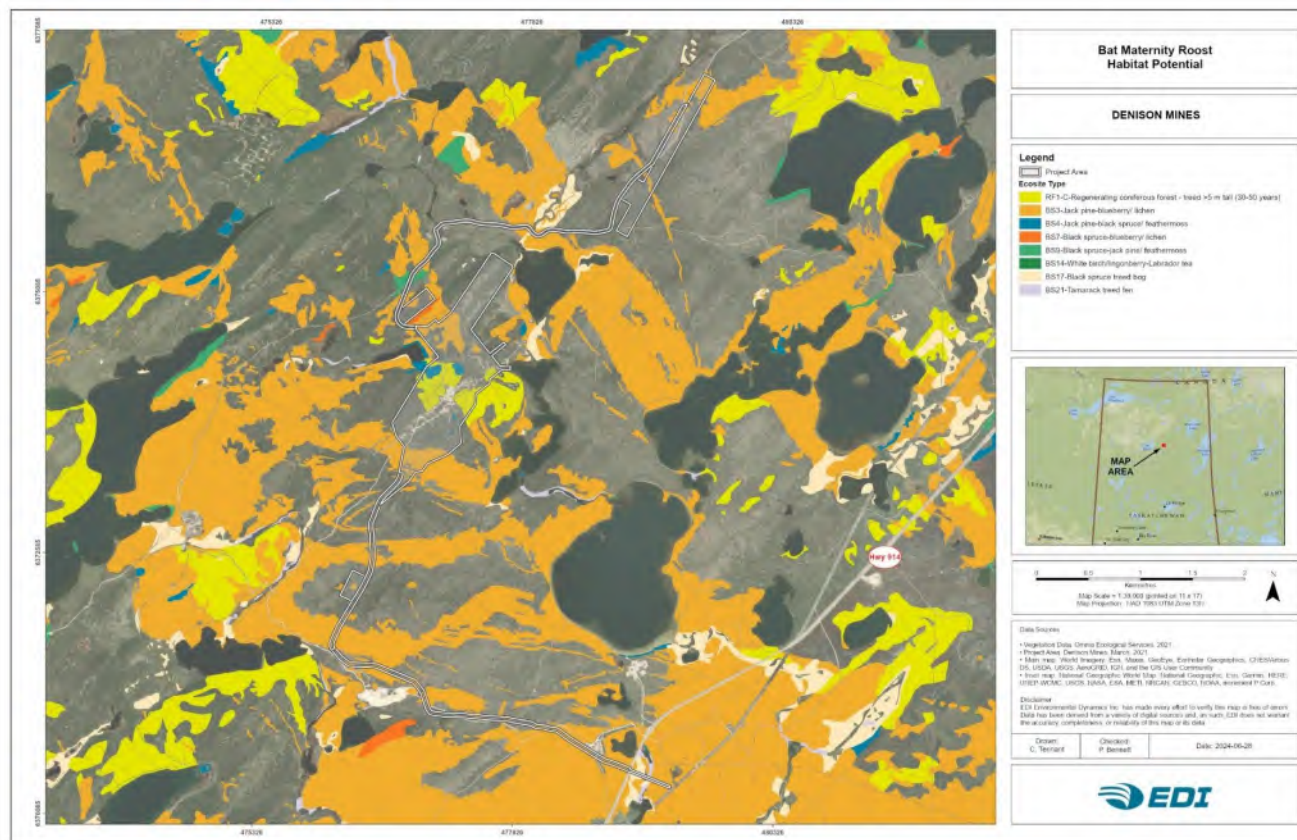






**Figure 2-9: Bat Species Observed within the Wildlife Study Areas**

**Commented [A1]:** Update the dots



**Figure 2-10: Bat Maternity Roost Habitat Potential**

### 3 References

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- COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis*, and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.
- Environment and Climate Change Canada (ECCC). 2020. *Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act Recovery Strategy Series*. Environment and Climate Change Canada, Ottawa. xiii + 143pp.
- Saskatchewan Breeding Bird Atlas. 2017. Data accessed from NatureCounts, a node of the Avian Knowledge Network, Birds Canada. (<http://www.naturecounts.ca/>). Accessed January 15, 2024.
- Saskatchewan Ministry of Environment (SK MOE). 2019c. *Range Plan for Woodland Caribou in Saskatchewan – Boreal Plain Ecozone - SK2 Central Caribou Administration Unit*. July 2019. 90 pp.
- Saskatchewan Ministry of Environment (SK MOE). 2023. *SK1 habitat potential raster data for woodland caribou in Saskatchewan*. Email from Lisa Stuart, GIS analyst, Saskatchewan Ministry of Environment. December 8, 2023 email.
- Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. *Journal of Fish and Wildlife Management* 11(1):311–320.

Annex 7

**Federal Indigenous Review Team (FIRT) – Advice to the Proponent for the Wheeler River Environmental Impact Statement (EIS) October 2024**

**\*\***The [March 2023 Advice to the Proponent table](#) and [November 2023 Advice to the Proponent table](#) with Denison’s responses are available below

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response October 24, 2024
AD-72	CNSC	Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events  Appendix 8C	In Section (List of Appendices, p. iv) of “S8_App 8-C Hydrological Effects Assessment Report Wheeler River” states “Appendix III- Response to IR-103”. This is incorrect and refers to IR-103.	This reference should be edited to “Appendix III- Response to IR-102.”	This has been corrected in the final EIS.
AD-73	Environment and Climate Change Canada (ECCC)	Section 2.2.3 Project Description Proponent response to IR-12-R1B	The Proponent provided maps of the proposed water management structures for the road to the airstrip and the airstrip in Attachment IR-12. However, they should commit to including them in the Final EIS. Inclusion of these maps will allow for improved understanding of site water management and transportation of non-contact water.	ECCC recommends that the Proponent Include maps of the proposed water management structures for the road to the airstrip and the air strip, provided in Attachment IR-12, in the Final EIS.	Thank you for the advice comment. The information used to address the IRs associated with proposed site water management is extracted from the most current engineering design documents which will be further refined as the Project progresses through construction. Denison provides engineering design documents to the Province of Saskatchewan as part of the provincial permitting process. The engineering documents associated with the site water management plan become the single source of information as part of Denison’s Quality Management System. Denison will adhere to all site water management commitments outlined in the EIS, including any commitments listed within the IR responses.
AD-74	ECCC	Section 8 (Aquatic Environment); Appendix 10-A (ERA)	The predicted effluent concentration of 42 ug/L for the proposed Project represents a very high concentration of selenium. For comparison, the Canadian Council of Ministers of the Environment (CCME) guideline is 1 ug/L ( <a href="#">January, 2022: Proposed Approach for Coal Mining Effluent Regulations – Discussion Document (canada.ca)</a> )	Given the high selenium concentrations predicted in the discharge, ECCC recommends that the Proponent: <ul style="list-style-type: none"><li>Identifies effective mitigation measures (including source control) to avoid effects in the receiving environment, and</li><li>Analyzes the extent to which selenium concentrations in effluent can be reduced.</li></ul>	Proposed effluent release to the environment starts at Operation phase and BATEA information will come with the application for the license to operate. Denison commits to following the guidance and requirements of REGDOC-2.9.2 to develop effluent discharge targets as per operational licensing and in consultation with the CNSC.
AD-75	ECCC	Section 2.2.3 Project Description Proponent response to IR-12	While the Proponent did provide in Attachment IR-12 the requested proposed water management structures, for the road to airstrip and the airstrip, the information surrounding the proposed water management structures is found within multiple documents which makes it difficult for readers to understand the resulting impacts to water quality.	The proposed water management structures for the road to airstrip and the airstrip should be included in the Final EIS to allow for the effects of these structures to be more readily understandable. Additionally, the Proponent should respond to questions within a single document to reduce the complexity involved in understanding the environmental effects of the Project.	Thank you for the advice comment. The information used to address the IRs associated with proposed site water management is extracted from the most current engineering design documents which will be further refined as the Project progresses through construction. Denison provides engineering design documents to the Province of Saskatchewan as part of the provincial permitting process. The engineering documents associated with the site water management plan become the single source of information as part of Denison’s Quality Management System. Denison will adhere to all site water management commitments outlined in

<sup>1</sup> Unless otherwise stated, the section noted refers to the draft EIS



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response October 24, 2024
					the EIS, including any commitments listed within the IR responses.
AD-76	ECCC	Section 8.4.4.2.3, Aquatic Environment IR-124-R1 Response from Denison	CSA N288.6-22 is the latest standard for the nuclear industry for the assessment of risk associated with releases from the nuclear industry to the environment. The statistical and environmental considerations required in the establishment of baseline data as well as the use of mathematical models are set out in the standard to ensure that the risk assessments are defensible.	The Proponent should apply CSA N288.6-22 to risk assessment for sediment where appropriate.	CSA N288 guidance documents are used in an integrated manner and Denison is confident the standards have been used appropriately.
AD-77	ECCC	Section 9.3.3.3, Baseline Studies Section 9.3.5 Mitigation Measures IR 142, 159, and 167 Responses from Denison  IR-142-159-167-R1 IR-170	<p>It is unclear how conducting wildlife sweeps seven days in advance will adequately identify and mitigate for all species, especially species at risk. Similarly, uncertainty remains regarding how adaptive management mechanisms will be triggered.</p> <p>Note that active terrestrial nest searches for birds, including avian species at risk, are generally not recommended by ECCC or the province of Saskatchewan (<a href="https://publications.saskatchewan.ca">Publications Centre (saskatchewan.ca)</a>) because they are likely to cause disruption to breeding activities and are largely ineffective for passerines.</p> <p>However, if avian nest searches in simple habitats (as outlined in the <a href="#">Guidelines to avoid harm to migratory birds</a>) are undertaken, then information should be provided on methods and timing for review. Conducting a nest search seven days in advance of works may be too far in advance to detect all possible nests. Nest searches should be conducted as close to the clearing or construction dates as possible. Developing species specific mitigation measures based on habitat potential mapping, prior to nest searches, can reduce construction delays, as advice on these measures would be available for implementation.</p> <p>For certain projects or locations, additional more specialized surveys may be warranted (e.g., radar surveys, or foot-based counts of colonially nesting birds).</p>	The Proponent should develop species specific mitigation measures, and provide these for review. Species specific mitigations should take into account the ecology of individual species at risk, including habitat requirements, nesting/denning or other important landscape features and timing of life stages as they relate to project construction and operation. The Proponent should conduct literature reviews to find proven mitigations for all species at risk within the project area. ECCC is available to discuss these measures with the Proponent.	Please see response to IR-142, IR-159, IR-167-R1 (Round 3).
AD-78	ECCC	Section 9.3.6.4 IR-149-R1B	In their IR response, the Proponent states “English River First Nation and SVS (2022) compiled an IK study documenting current and past land use, knowledge of the land, and participants’ perspectives on potential Project effects, as well as cumulative effects from past mining and other developments. The report identified a wildlife corridor used by several species, including woodland caribou. The corridor runs between Cree Lake (approximately 40km southwest of the Terrestrial RSA and Russell Lake (in the southern portion of the Terrestrial RSA (Feature 1001-09; ERFN and SVS 2022)). The report identified a caribou calving area: Feature 1009-07 covering large portions of the Terrestrial RSA with the exception of the most western, northern, and eastern extents. This area is also described as offering good caribou habitat year-round (ERFN and SVS 2022).”	Since both the mapping provided as part of the EIS and the English River First Nation study indicates that there is calving areas within the RSA, incorporating mitigation measures related to timing of sensory disturbances during calving season into the Caribou Management Framework would enhance the caribou management plan.	See response to IR-149-R1B (Round 3) and commitment 9-36 (in Denison’s Commitments Register, version 3). Additional detail will also be documented as the EMS documentation evolves.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response October 24, 2024
			<p>The Proponent has also provided mapping showing that there are calving areas within the RSA.</p> <p>Calving is an important life history function that occurs within specific biophysical attributes. It is important to mitigate these effects.</p>		
AD-79	ECCC	Section 9.4.1.2, Key Indicators and Measurable Parameters IR-158	The Proponent identified key indicator species for migratory songbirds, waterbirds and upland game birds, but did not provide any justification on why these species were chosen. It is important to understand why a certain species was chosen as an indicator in order to assess whether the that species possesses similar life history characteristics.	<p>During pre-construction, construction and operational monitoring, the Proponent should consider any trends and changes to the avian community, including the key indicator species which are representative of other species that may be more difficult to monitor for implementation of adaptive management. (see IR-159 for additional input).</p> <p>Appendix 9-D provides an assessment of three additional key indicator species (Barn Swallow, Bank Swallows, Horned Grebe). All eight key indicators for avian species at risk should be accounted for.</p>	As outlined in the EIS, monitoring programs specific to avian species include routine monitoring / observations throughout the life of the Project in accordance with the EMS. This will include observations of any bird species, including the bird species at risk.
AD-80	ECCC	9.4.3.2.3 Baseline Studies – Migratory Songbirds Appendix 9-B, Section 2.10.2, Results IR-159	Although the Proponent notes that the supplemental data did not result in a different conclusion in the EIS and would not require updates to the mitigation measures, it was acknowledged that the data did provide further context for the RSA. Interpreting the original baseline data as well as the supplemental data in the context of the Project (i.e. what species were at what densities in which areas/ecosites) provides a more robust baseline with which to compare construction and operational monitoring data. This is particularly important in the context of species’ natural variability.	Even if the supplemental data did not change the conclusions in the EIS, the data is essential for comparison reasons. Data collected during construction and operational monitoring should be compared with baseline data to test predications on impacts from the project, and whether mitigation measures are effective.	Thank you for the advice comment. The information contained in the IR comment and response process is part of the federal record. As outlined in the EIS, monitoring programs specific to avian species include routine monitoring /observations throughout the life of the Project in accordance with the EMS. This will include observations of any bird species, including the bird species at risk.
AD-81	ECCC	Section 9.3.3.3, Baseline Studies IR-143 and 144 Responses from the Proponent	<p>In their IR response, the Proponent notes that “the majority of these data points illustrated in Figure 2-2 and Figure 2-3 in revised draft EIS Appendix 9-F are located beyond the LSA and to the north and east of the Project Area.”</p> <p>ECCC notes that the baseline studies done for the Project were limited in scope and scale, and the map showing telemetry data from the province of Saskatchewan shows caribou use throughout the LSA and RSA.</p> <p>ECCC notes that trail camera, pellet, incidental and telemetry data only provide a small snapshot of actual habitat use.</p>	ECCC advises that the Caribou Management Framework should consider the entire LSA as being used by caribou for all their life functions and that mitigation measures, including offsetting, be developed with the understanding that this Project poses a medium level risk to caribou using the area.	<p>While the response to the round 2 IR-143 and IR-144 did explain baseline caribou observations to address ECCC’s comments, it is important to note that the EIS assumed caribou to be present in the study areas throughout all seasons and life stages. Denison has committed to offsetting with SK ENV (see commitment 9-35 in Denison’s Commitments Register, version 2).</p> <p>The advice comment from ECCC notes the project poses a “medium risk” to caribou but this is not consistent with the conclusions of the EIS and is not aligned with assessment approach framework (refer to Section 5 of the EIS for the approach and methodology of the assessment).</p>
AD-82	ECCC	Section 9.3.3.3, Baseline Studies IR-149-R1A IR-152.	ECCC notes that the Proponent indicates a commitment to continuing to work with the province regarding caribou offsetting through the finalization of the Caribou Management Framework.	ECCC notes that at this time there are not enough details in the Caribou Management Framework for ECCC to provide advice on the appropriateness of the offsetting measures.	Denison’s EIS has concluded there are no significant effects on caribou; this conclusion is not reliant on habitat offsetting as a mitigation measure. Denison has provided the appropriate level of information for the purposes of EA review and has committed to offsetting with SK ENV (see commitment 9-35 in Denison’s Commitments Register, version 3).

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>1</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response October 24, 2024
AD-83	ECCC	Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149	<p>ECCC notes that Figure 2.4 of Appendix 9-F, shows that there is suitable calving habitat in close proximity to the airstrip, including within the LSA just west of the airstrip and along the Wheeler River at the southeast end of the LSA. ECCC notes that information is not yet available on the timing and frequency of air traffic.</p> <p>The Proponent has provided some potential measures likely to be incorporated into operations of the airstrip. The Proponent states that they will use the most direct path, however, important areas for caribou (e.g. calving grounds) may be located along the most direct route. Figure 2.4 of Appendix 9-F, shows that there is suitable calving habitat in close proximity to the airstrip, including within the LSA just west of the airstrip and along the Wheeler River at the southeast end of the LSA.</p>	ECCC advises that mitigation and monitoring should be developed to address sensory impacts as a result of the airstrip. The Caribou Management Framework should incorporate consideration of the proximity of air traffic to important landscape features for caribou, as well as timing of flights during important life stages (e.g. calving).	See response to IR-149-R1B (Round 3) and commitment 9-36 (in Denison’s Commitments Register, version 3). Additional detail will also be documented as the EMS documentation evolves.
AD-84	ECCC	Section 9.3.6.4.1 Section 9.3.7.3.1	The Proponent notes that the size of the SK1 Boreal Shield range is estimated at 18,034,870 ha (ECCC 2020), resulting in an estimated additional Project-related disturbance of 0.001% at the scale of the SK1 Boreal Shield Woodland Caribou Management Unit. The Proponent concludes that the contribution of the Project to cumulative effects on woodland caribou within the SK1 conservation unit are negligible.	Although the Proponent has provided information to show that the Project has negligible impacts at range scale, this Project poses a medium risk to caribou at the local and regional scale due to the proximity of important features for caribou within the LSA and RSA. Mitigations for sensory disturbance during critical life stages such as calving should be developed and included within the Caribou Management Framework. Measures to monitor the effectiveness of implementation are also needed.	<p>We note ECCC’s advice comment speaks to the project posing a “medium risk” to caribou at the local and regional scale; importantly, we note that Denison’s EIS has concluded there are no significant effects on caribou per the assessment approach framework (refer to Section 5 of the EIS for the approach and methodology of the assessment).</p> <p>Please also see response to IR-149-R1B (Round 3).</p>
AD-85	ECCC	Section 9.3.5.2 Appendix 9-E Wheeler River Project Caribou Management Framework	<p>Much of the information presented in the Wheeler River Project Caribou Management Framework is qualitative in nature and does not present specific details regarding a quantitative assessment of impacts following measures to avoid, minimize, restore on-site and determine the offset. This is required in order to understand if offsetting is sufficient to address impacts to caribou.</p> <p>The updated Wheeler River Project Caribou Management Framework indicates that the Proponent will use the SK ENV caribou offset calculator. Without information on the amount of offsetting that will be implemented, ECCC cannot advise on whether the amount is appropriate in the context of the species Recovery Strategy.</p> <p>Although the Proponent has provided an updated draft Caribou Management Framework, information regarding offsetting remains outstanding. The Proponent notes that SK ENV is developing a boreal caribou habitat offset calculator and that the Caribou Management Framework will be finalized using that tool as part of the provincial approvals.</p>	<p>Information is still lacking on the amount of habitat offset required to balance against Project effects. Therefore, the Caribou Management Framework should be updated with outstanding information.</p> <p>The Proponent should consider offsetting effects associated with this Project. However, ECCC is unable to specify an offsetting amount at this time as there was insufficient information provided by the Proponent. ECCC acknowledges that the Proponent has committed to working on their offset plan with the province of Saskatchewan. However, offsetting measures, outputs, and priority locations should be confirmed in draft plans and submitted for review. Without additional information on the Proponent’s mitigation measures, including offsetting measures, ECCC cannot provide advice on whether project effects will be mitigated.</p>	<p>Denison’s EIS has concluded there are no significant effects on caribou; this conclusion is not reliant on habitat offsetting as a mitigation measure. Denison has provided the appropriate level of information for the purposes of EA review and has committed to offsetting with SK ENV (see commitment 9-35 in Denison’s Commitments Register, version 2).</p> <p>Please also see Denison’s response to IR-149 (Round 3) and IR-157 (Round 3).</p>

**Federal Indigenous Review Team (FIRT) – Advice to the Proponent for the Wheeler River Environmental Impact Statement (EIS) November 2023**

\*\* The new [newest Advice to Proponent table](#) is available above

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>2</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response
AD-50	ECCC	Section 2.2.1.4.2, Wellfield Operation Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	Providing a report or memo by the Proponent’s consultant Newmans Geotechnique Inc. as a public record will more effectively explain the “information on the freeze wall integrity and basis for the design, which relies on site field data and lived experience from several exiting [sic] Saskatchewan mining operations”, than a summary (attachment IR-10) of the material presented by Greg Newman during the meeting with the FIRT on April 19, 2023.	The response from the Proponent in IR-10 is accepted based on the meeting between ECCC, Denison and the CNSC, as well as the Proponent’s consultant and the presentation by Greg Newman (Newmans Geotechnique Inc.) as well as the summary of the meeting noted in attachment IR-10. However, the Proponent should provide a public record of the consultant’s memo or a report that explains the details of the freeze wall containment and monitoring that were provided during the April 19, 2023 meeting instead of the summary provided by the Proponent in attachment IR-10.	The April 19, 2023, presentation from Newmans Geotechnique Inc. to the CNSC is provided here as Attachment AD-50.
AD-51	CNSC	Section 8.3.3 and 8.5, Aquatic Environment and Fish health	Denison has committed to additional baseline data gather as part of their response to IR-107.	Also related to IR-120 and IR-125, CNSC staff recommend Russell Lake be included in this baseline collection to increase the robustness of the established baseline in the final EIS.	Acknowledged. Denison will consider this request as it develops the plans for additional baseline collections, as well as the monitoring program design documentation for aquatic environment monitoring that is planned to be part of the licensing submission. It is noted that no aquatic environment effects are predicted to accrue in Russell Lake in relation to any phase of the Project and the concentrations of all water quality constituents are predicted to remain below aquatic protection values.
AD-52	CNSC	Section 8.3.3.1, Methodology and Metrics	Denison has indicated that exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.	Related to IR-121, CNSC staff recommend that Denison add text to EIS to reflect that no gross abnormalities in fish were observed during field work.	The text of revised Draft EIS Section 8.3.3.2 has been revised as recommended to indicate that that no gross abnormalities in fish were observed during baseline field work.
AD-53	CNSC	Section 8.3.8, Monitoring and Follow-up	<p>Section 8.3.8 of the EIS states: "Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development."</p> <p>Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.</p> <p>Denison has committed to inclusion of reference lakes in study designs used to assess changes in fish communities / populations over time.</p>	Related to IR-122, CNSC staff recommend that Denison strengthen discussion of reference lakes, and their use, in EIS.	<p>Additional text (see below) has added to the fifth paragraph of Section 8.3.8 of the revised Draft EIS regarding aquatic environment monitoring program sampling areas and “reference lakes” more specifically, as follows.</p> <p>“Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development conditions, as well as through contemporaneous comparison of “exposure area” versus “reference area” data. In this context an “exposure area” is an area downstream of potential mine influence and a “reference area” is an area outside of potential mine influence. Where possible, the reference area would be located in the same drainage, upstream of mine influence where conditions closely mimic those downstream</p>

<sup>2</sup> Unless otherwise stated, the section noted refers to the draft EIS

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>2</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response
					as is possible and where there is no, or reduced likelihood that exposure and reference fish populations can co-mingle.”
AD-54	CNSC	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use Section 12 Section 14	The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting with Indigenous Nations and communities and are presented in the EIS.	Related to IR-128, Denison should have follow-up discussions with the Ministry of Saskatchewan Highways, Indigenous Nations and communities (including KML and ERFN) and stakeholders regarding adding additional pull-outs to the highway to ensure safety for northern residents.	Acknowledged. We note that the Ministry of Highways and Infrastructure is responsible for construction and maintenance of highways in the province and Denison has no power or authority to construct pull-outs. However, Denison is committed to ongoing engagement throughout the life of the project and can provide input to Ministry of Highways and Infrastructure as applicable.
AD-55	ECCC	Section 9.2.5.2.7, Waste and HazardousMaterials Management	Vehicles and equipment with engines adhering to Tier 4 emission standards should be employed where feasible in order to minimize emissions. Regardless of engine tier used, best management practices should be followed, including proper maintenance of engines and anti-idling measures.	Related to IR-139, the Proponent should commit to following best management practices regarding the use of vehicles and equipment, including proper maintenance of engines and anti-idling measures.	Section 2.8 of the EIS and the commitment register included with this submission outlines Denison’s plan to regularly maintain and inspect equipment and machinery to make sure they are in good working order.
AD-56	ECCC	Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou	The EIS and the IR response did not provide sufficient information to understand how the Regional Study Area (RSA) boundaries for caribou were determined.	<p>Related to IR-137, An assessment typically involves setting a geographic area for the assessment for the direct and indirect effects of a proposed project; this area is sometimes referred to as the Local Study Area (LSA). ECCC advises that the LSA is likely to extend beyond the Project footprint and a 500m buffer. ECCC demonstrated that the application of a 500m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale (Environment Canada, 2011). However, adverse effects of projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individuals of boreal caribou can vary and extend several kilometers depending on project activities and ecological context. The LSA should at the minimum capture the above-mentioned effects.</p> <p>A Proponent will also set a geographic area for the assessment within which the cumulative effects of the proposed Project are possible; this is sometimes referred to as the RSA. Typically the range(s) is(are) the proper scale to assess cumulative effects. However, assessing cumulative effects may require a different approach for large continuous ranges than for smaller discrete ranges. The impact of disturbance that may be concentrated in part of a large continuous range may be masked given the size of the range. For large continuous range it may be relevant to assess cumulative effects at the scale of the range but also at a smaller scale.</p> <p>The Proponent should consult with experts of the relevant jurisdiction in order to determine the local and regional study area, and provide a justification of the extent of the study areas in the impact statement.</p>	<p>The reviewer is also referred to the response to IR-137 and the response to AD-56 should be read in conjunction with it. The following is provided for reference.</p> <p>As per accepted environmental assessment methodology, the spatial boundaries were established to capture the extent of the expected/likely adverse effects, both direct and indirect, on the various valued components, that were expected as a result of the Project.</p> <p>The Project Footprint was delineated as the maximum extent of physical, direct disturbance resulting from the Project.</p> <p>The LSA was delineated to capture the extent of all direct, and most indirect effects of the Project on the wildlife VCs, including woodland caribou.</p> <p>The RSA was delineated to capture the extent of all likely Project effects, in consideration of the life-requisites and behavior of the various VCs being assessed (i.e., a habitat-based assessment) including ungulates (e.g., woodland caribou) which are known to have large home ranges. The RSA was also delineated in the context of the cumulative effects assessment, as it related to the region. Further the RSA is considered representative, as it includes habitat (ecosite types) that are found throughout the SK1 range. In particular, based on the habitat and its potential to support woodland caribou (as classified by the Saskatchewan Ministry of Environment) within the RSA is relatively consistent with the remainder of the habitat in the SK1 range (see Figure 2.1 in Appendix 9-F of the revised draft EIS).</p>

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					<p>These study areas are appropriate, in that they capture the extent of the likely adverse effects of the Project on the VCs, to provide an ecologically relevant determination as to the likely adverse effect on the regional population of all assessed VCs, including woodland caribou (i.e., no dilution of the effects over the entire SK1 range – although this has been provided for context).</p> <p>The 500 m buffer around a physical disturbance was considered in the context of the extent of sensory disturbance, to allow Denison to determine the geographical extent of an effect (i.e., limited to the LSA, limited to the RSA) to allow the appropriate characterization of the effect to inform the determination of significance.</p> <p>Cumulative effects occur when the adverse effects of the Project, overlap in time and space, with the adverse effects from other projects and activities. As such, the RSA is the appropriate scale to appropriately conduct a defensible cumulative effects assessment – i.e., the effects of projects that are beyond the RSA spatial extent would not likely result in residual effects that could act cumulatively with the Project’s effects, and consideration of effects that do not overlap spatially or temporally, are not cumulative, by definition.</p> <p>The Project is likely to add another 0.4% of anthropogenic disturbance (considering the Project Area of 169.6 ha) resulting in up to 1.9% of total anthropogenic disturbance in the Terrestrial RSA. As such, the Project's contribution to the cumulative effect is 0.001% of additional disturbance in the SK1 range, which is below the accepted threshold level of anthropogenic disturbance based on the SK1 range plan (ECCC 2020). The Ministry of Environment has indicated that the current level of anthropogenic disturbance is 53% within the SK1 range, which is below the accepted threshold level of 55% for anthropogenic disturbance for the SK1 range.</p>
AD-57	ECCC	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p>In their response to IR-167, the Proponent states: “Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134.</p> <p>Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing</p>	Related to IR-167, provide details on how vegetation clearing related to site development will be conducted to avoid harm to migratory birds and species at risk (SAR).	<p>The reviewer is also referred to the response to IR-167 and the response to AD-57 should be read in conjunction with it. The following is provided for reference.</p> <p>As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods.</p> <p>However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any</p>



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			<p>monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>ECCC does not recommend active nest searches in most cases and for most species, in part because there is a great degree of difficulty associated with reliably detecting nests and a high likelihood of disturbing or damaging active nests while searching.</p> <p>Exceptions to the general nesting period exist, and these include interannual variation and nest searches for certain species which may breed outside of these general periods. Under the MBCA it is prohibited to destroy a nest with a live bird or viable egg, even if this occurs outside of what might be considered a normal nesting period.</p>		<p>scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snowpack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented.</p> <p>If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate.</p> <p><b>References:</b></p> <p>B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119</p> <p>Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC’s Biodiversity No. 25. Ministry of Environment, Lands and Parks.</p>



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					Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. <a href="https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download">https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download</a> (accessed July 2021).
AD-58	HC	Section 10.1.4.2.1 (p. 10-22)  Appendix 10-A (ERA): Appendix B Table B.9, Ref. 19-2638  Section 6, Table 6.1-1 (p. 6-7)	Section 6 of the Draft EIS contains Table 6.1-1 (p. 6-7), which lists radionuclides as a key indicator for air quality.  Only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.	Related to IR-177, consider rewording Table 6.1-1 to “radon” instead of “radionuclides” to avoid confusion.	Acknowledged. The revision to Table 6.1-1 has been made as suggested.
AD-59	CNSC	Section 10.1.6.1.1, Human Receptors Selection and Characterization	Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.  While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.  In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the project. Considering this, why was the hunter/trapper receptor not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?	Denison has addressed IR-180, but has not considered the suggestion for establishment of additional treatment technologies of COPCs.  CNSC staff maintains that there may be the need to establish additional treatment for effluent should environmental monitoring during operation indicate COPC’s are accumulating in the environment beyond what is anticipated in the EIS.  This is a firm reminder that this will be evaluated as part of the licensing phase of the project, should it proceed.	Acknowledged; it is understood that consideration of treatment technologies will be part of the licensing phase of the Project.
AD-60	CNSC	Section 11, Perceived Risks to Lands and Resources	The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are <i>“perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well-being”</i> (ERFN and SVS 2022a).” (p. 11-11)	Related to IR-207, as Denison continues to work with Indigenous Communities of Interest on community specific monitoring regimes, please provide additional information in the IER on any updates on engagement activities to date that have taken place with KML and ERFN and any other Indigenous Nations and communities who utilize the area, with respect to follow-up monitoring plans that are being developed to support the Project licensing and permitting.  If Denison has made commitments with respect to this, this is information that should also be included in the commitments report.	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.

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			CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEAA 2012). For the mitigation measures intended to address the effects of changes to the environment for Indigenous peoples, the Proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.” These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.		
AD-61	CNSC	Various sections of the EIS, including: Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<p>ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).</p> <p>Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)</p> <p>To address potential concerns specific to Project related effects to wildlife species of interest to the Indigenous Communities of Interest, Denison has committed to collaborating with ERFN and KML on a monitoring regime suited to each of their interests and needs.</p>	Related to IR-129, Denison needs to ensure that the proposed monitoring regime with ERFN, KML and other Indigenous Nations who utilize the area are included in the commitments table for future EIS submissions.	Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-62	CNSC	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p>IR-238 requested that Denison provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.</p> <p>As well, it requested that Denison provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>	Related to IR-238, If Denison has made commitments with respect to engagement activities with Indigenous Nations and communities on potential , this is information that should be included in the commitments report.	Please see response to IR-238 and as noted previously Denison continues to work with its Indigenous Communities of Interest with reserves and residential communities most proximal to the Project, Denison has committed to collaborating with English River First Nation and Kineepik Métis Local on a community specific monitoring regime, suited to each of their interests and needs, in an agreed-upon fashion. Updated information regarding engagement activities is provided in the updated IER and updated commitments register included with the IR response package.
AD-63	ECCC	Appendix 6-C Climate Baseline and GHG Emissions Report	ECCC recommended that the identification of the sources of GHG emissions and quantification of these emissions be described for the post-decommissioning phase, as was done for the other phases. ECCC recommended that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the Strategic Assessment of Climate Change (SACC) and the Draft Technical Guide Related to the Strategic Assessment of Climate	Related to <a href="#">AD-18</a> , ECCC recommends the identification of the sources of GHG emissions and quantification of these emissions be described for the post decommissioning phase. This information will be useful for future development of a net-zero plan.	The Post-Decommissioning phase consists of physical, chemical, and biological monitoring of the site that will be conducted to confirm that the site is chemically and physically stable. Post-Decommissioning extends from the end of physical decommissioning until transfer of the site into the provincial Institutional Control Program or direct release of the land back to the Crown. The Post-Decommissioning monitoring program will be

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			Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment.		<p>designed and conducted in accordance with the provincial and federal regulations and licence conditions.</p> <p>For the purpose of the environmental assessment and the stage at which Project development currently stands, Denison believes the information provided on GHG emissions within the EIS documentation is appropriately focused on the Project phases with greatest activity which contribute to Scope 1 and 2 emissions.</p> <p>As noted previously in response to AD-18, in accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data become available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.</p>
AD-64	ECCC	Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report	<p>ECCC noted that more specific data, such as regional data from provinces, forest companies, or literature may be available. The use of Table 20 of the draft Technical Guide does not apply.</p> <p>ECCC recommended that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands.</p> <p>ECCC recommended that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.</p>	<p>Related to <a href="#">AD-19</a>, ECCC recommends that the Proponent revisit the land use calculation provided in the draft Environmental Impact Statement as the use of Table 20 of the draft Technical Guide for the above ground mass of vegetation species is not appropriate. This table is for above-ground woody vegetation in cropland systems which does not apply in this instance. A simple site survey would determine above-ground biomass on site using basic information such as site class and species. More specific data, such as regional data from provinces, forest companies, or literature may be available, while generic national data is available (e.g., <a href="#">Biomass Estimates for Major Boreal Forest Species in West-Central Canada</a> (publications.gc.ca), <a href="#">Canada’s Forest Biomass Resources: Deriving Estimates from Canada’s Forest Inventory</a> (nrcan.gc.ca)).</p> <p>ECCC reiterates the advice that the Proponent provide information regarding the consideration of biomass that are not above ground, specifically whether soil carbon and wetlands are taken into account.</p> <p>ECCC also restates the advice that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the draft Technical Guide.</p>	<p>It is anticipated the GHG and climate change components of the Project will be re-evaluated once more detailed, site-specific data becomes available; this will be done after the EIS process is concluded and possibly as part of sustainability reporting. This analysis is expected to include more detailed study around overall GHG emissions (including land use changes - forest/vegetative biomass, soil carbon, wetlands), carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.</p>
AD-65	CSNC	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	In response to IR-82, Denison highlights the importance of the S redox couple (S(2-)/S(6+)) near the ore zone.	Related to IR-82, CNSC staff recommend that Denison consider the inclusion of hydrogen sulfide test kits for in-field measurements of H2S to supplement qualitative interpretations (e.g., absence of "rotten egg" odor associated with sulfide) relating to redox conditions.	Acknowledged and Denison thanks CNSC staff for this recommendation. The recommendation will be considered within the context indicated during future planning.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>2</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response
		Appendix 7-C, Section 3.5			
AD-66	ECCC	Appendix 7-C, Numerical Modelling: Post Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p>The Proponent states in both the EIS and their response that a hydraulic conductivity value of 5x10<sup>-6</sup> m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10<sup>-6</sup> to 3x10<sup>-5</sup> m/s (Appendix C), with a geomean of 6.0x10<sup>-6</sup> m/s.</p> <p>In their IR response, the Proponent stated that the hydraulic conductivity used as the model base case (5x10<sup>-6</sup> m/s) is similar enough to the geometric mean value (6x10<sup>-6</sup> m/s) that no consequential change to the model would occur if the geometric mean were to be used. The use of the value of 5x10<sup>-6</sup> m/s as the model base case was not substantiated.</p> <p>ECCC accepts the response to Part 1 of the IR as the Proponent has stated that 5x10<sup>-6</sup> m/s and 6x10<sup>-6</sup> m/s are similar enough hydraulic conductivities that redoing modelling with the geometric mean is not expected to consequentially change outputs for either the PHREEQC or FEFLOW model. However, the reasoning for selecting the value of 5x10<sup>-6</sup> m/s was not clear.</p>	<p>Related to IR-89, while repeat modelling using the geometric mean hydraulic conductivity of 6x10<sup>-6</sup> m/s is not required, include a statement in the EIS to indicate that the geometric mean hydraulic conductivity was not used in the model and providing justification for using the value of 5x10<sup>-6</sup> m/s instead.</p>	<p>The revised Draft EIS text (Appendix 7-C, Section 2.3.1.4 has been updated to report the geomean of the desilicified zone will be updated to 4.8x10<sup>-6</sup> m/s. The previously reported value of 6x10<sup>-6</sup> m/s was erroneous.</p> <p>“A hydraulic conductivity value of 5x10<sup>-6</sup> m/s was uniformly assigned to the model layers representing the Desilicified Zone. This value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10<sup>-6</sup> to 2x10<sup>-5</sup> m/s, with a geomean of 4.8x10<sup>-6</sup> m/s. As within other units, the geomean value was not applied directly, but rather a rounded value slightly higher than the geomean was applied throughout the entire desilicified zone. The value applied within the desilicified zone is considered conservative as it is a factor of 1.9 higher than the most-reliable hydraulic conductivity estimates (i.e., values obtained through pumping tests measured the conductivity as 2.7x10<sup>-6</sup> m/s) and is equivalent to the geomean value.”</p>
AD-67	Health Canada (HC)	Appendix 10-A, Section 3.2.1.3.1, p.3.43-3.44	<p><b>Inappropriate use of an outdated standard in assessing health and environmental effect(s) from short-term exposure to nitrogen dioxide (NO<sub>2</sub>).</b></p> <p>The Draft EIS technical supporting document (Appendix 10-A) appears to misinterpret Health Canada’s 2016 Human Health Risk Assessment for Ambient Nitrogen Dioxide (NO<sub>2</sub>) in setting its screening criteria and evaluating the health impacts from exposure to Nitrogen Dioxide. The document states:</p> <p><i>“Health Canada published a national one-hour maximum acceptable level of 400 µg/m<sup>3</sup> for NO<sub>2</sub> in ambient air using a risk assessment approach (Health Canada, 2016b). This value considers sensitive human populations.”</i></p> <p>This statement is inaccurate.</p> <p>As indicated in Health Canada’s 2016 publication, this value (400 µg/m<sup>3</sup>) refers to the National Ambient Air Quality Objective (NAAQO) for NO<sub>2</sub>, developed in the 1970s. The Canadian Ambient Air Quality Standards (CAAQS) were later developed in consideration of both human health and the environment to replace existing Canada-wide standards, including the NAAQOs, and in many cases are the most stringent Canadian air quality standard, guideline or objective.</p>	<p>The CAAQS are recommended as the most stringent air quality standard for assessing health and environmental effect(s) from short-term exposure to NO<sub>2</sub> in the project.</p> <p>The CAAQS are generally calculated for specific multi-year averages and for a particular statistical form so that extreme and unpredictable events do not drive risk management. However, if the data is not available for comparison to a full CAAQS timeframe, Health Canada suggests using model results for at least one calendar year to allow for a basic comparison with the CAAQS statistical form. The modelling results should be able to indicate the frequency of CAAQS exceedances, which can be used in the discussion as to whether any anticipated human health impacts are anticipated</p> <p>Modelled predictions within an air quality assessment’s study area should be compared to the most stringent air quality standards, guidelines or objectives applicable to the region that may be affected by project activities. In this case, CAAQS are the most stringent levels and CAAQS are not restricted to applications only within the context of the <a href="#">Air Quality Management System</a> (AQMS). Evaluation against the CAAQS may be considered in determining the nature and severity of the project’s impact on air quality levels and the resulting mitigation measures that may be required to maintain good air quality levels or to prevent an exceedance of the CAAQS.</p>	<p>Acknowledged. The reviewer is referred to the response to IR-190 for a discussion of the use / interpretation of the CAAQs in the EIS.</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>2</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response
			The new CAAQS for NO2 also recognizes that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). In other words, NO2 is considered to be a non-threshold substances, meaning that health effects may occur at any level of exposure. Therefore, guideline values should not be construed as limits to which polluting up to is allowed.	<p>As health effects can occur even at levels of exposure below the limits set out in the CAAQS, they should not be viewed as “pollute-up-to” levels. It should be acknowledgeable that health risks exist below the guidelines. In addition, the principles of keeping clean areas clean and continuous improvement are operative, thus proposed mitigation measures should not be confined to meeting the standards, but should also be targeted towards reducing population exposure to CACs associated with the proposed project.</p> <p>This advice is also relevant to IR-190 and may be of use in responding to that request for a comparison of the predicted maximum concentrations to the most protective applicable air quality standards available (i.e., CAAQS).</p>	
AD-68	ECCC	Appendix 16-A Summary of Residual Effects Appendix 16-B Summary of Cumulative Effects	<p>ECCC recommended the inclusion of an assessment of potential GHG mitigation measures throughout all phases of the Project including a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the draft Technical Guide.</p> <p>ECCC also recommended the development of a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.</p>	Related to <a href="#">AD-49</a> , ECCC notes the comment provided by the Proponent stating, “Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances”. ECCC continues to recommend that the Proponent align with best practices by including in the EIS a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination and a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the draft Technical Guide.	The information presented in the Draft EIS meets the requirements of CEEA 2012. Per Denison’s response to AD-49 (Annex 1, page 419/419) the company will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances but is not intending to include this information in the revised Draft or Final EIS.
AD-69	CNSC	Appendix 16-C	<p>The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p> <p>The CNSC’s Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS), also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p>CNSC staff requested in the March 2023 letter to Denison (e-Doc <a href="#">6991467</a>) a Commitments Table for the Wheeler River EIS. This letter requested information of all commitments made by Denison with detailed information such as:</p> <ul style="list-style-type: none"><li>✓ details of the commitment</li><li>✗ which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>✓ where the commitment is referenced (which document, table, etc. and where it can be found)</li></ul>	<p>For the next draft EIS submission, the evergreen Commitments Table should be updated to include:</p> <ul style="list-style-type: none"><li>• which phase(s) of the project will the commitment be carried out (e.g., all phases)</li><li>• how this commitment will be tracked (project EA follow-up program, site-wide programs, etc.) and;</li><li>• all commitments to Indigenous Nations and communities</li></ul>	Please refer to the commitments register included with Denison’s IR response package.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>2</sup>	Context and Rationale	Advice to the Proponent	Denison’s Response
			<p>✖ how this commitment will be tracked (project EA follow-up program, site-wide programs, etc.)</p> <p>Several commitments to Indigenous Nations and communities from the August 2023 submission appear to be missing from this table and should be included in the next submission.</p>		
AD-70	ECCC	Appendix 16-C Summary of Monitoring & Follow-up Programs	ECCC recommended that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Related to <a href="#">AD-48</a> , ECCC acknowledges that the Project will likely be required to report annually per section <b>46</b> of the <b>Canadian Environmental Protection Act</b> as the annual emissions are likely to be over 10,000 tonnes of CO2e. However, ECCC’s suggestion incorporates additional components to align with the goal outlined in Appendix 16-C of the draft EIS to “assess the environmental performance of the project relative to the predictive assessment that has been completed in support of the environmental assessment process”. This would involve comparing actual vs. estimated emissions following the terms of the SACC’s net GHG emissions equation and evaluating the effectiveness of GHG-related mitigation measures.	Greenhouse gas emissions (GHGs) were not included as a valued component in the EIS, and as such, Denison is not proposing to add GHG monitoring to the EA follow-up monitoring to remain consistent with the methodology and scope for an EA completed under CEAA 2012. The annual GHG reporting will provide the required and relevant information to regulators per the Canadian Environmental Protection Act. Denison’s ESG reporting framework will be developed as the Project advances and will be scoped beyond the components of the EIS.
AD-71	ECCC	Conceptual Caribou Management Plan	Section 4.2.1 of the Conceptual Caribou Management Plan states that "The Project components are also west of the known home range of woodland caribou (based on tracking data received by the Ministry of Environment; Figure 4-2), although the absence of data does not mean the absence of caribou and Denison has observed caribou in the area." Calculation of home range is normally based on statistical analyses of telemetry data. Home range cannot be inferred from telemetry points and incidental observations from a map	Related to IR-149, the Conceptual Caribou Management Plan should be corrected to remove the reference to caribou home range.	<p>Acknowledged - Version 2 of the Caribou Mitigation Plan (now titled Caribou Management Framework) has been updated to re-word the sentence highlighted by ECCC.</p> <p>For reference and further information, it is noted that Denison continues to work collaboratively with Saskatchewan Ministry of Environment (MOE) on their requirement for an offset for adverse effects on caribou habitat. Denison has advanced the Project-related Caribou Management Framework within the context of the province’s offsetting framework. The MOE has reviewed the draft framework and has provided Denison a notification of their support. Subject to finalization and provincial acceptance, the framework will provide the means to address/offset all residual adverse effects (i.e., those remaining after the application of the proposed mitigation measures) of the Project on caribou that are under provincial jurisdiction.</p>



**Federal Indigenous Review Team (FIRT) – Advice to the Proponent for the Wheeler River Environmental Impact Statement (EIS) March 2023**

\*\* The new [newest Advice to Proponent table](#) is available above

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-01	Canadian Nuclear Safety Commission (CNSC)	Glossary sections	<p>There are terms used throughout the EIS that may either need defining, or inclusion in the glossary.</p> <ul style="list-style-type: none"><li>“Bounding”, “bounding case” and “bound” are used frequently throughout the EIS to describe the scope of the assessment. For example, p. 2-6 the EIS States: “Denison has bound the environmental assessment above the deposit...”</li><li>“Laydown”. P. 2-54 states: “During Construction, Denison plans to create a laydown area next to the future domestic landfill to temporarily store construction waste. Examples of materials include clean wood, plastics, metal, and concrete. The construction laydown area will not be lined, but it will have a berm surrounding the area to minimize run-on and runoff.”</li><li>“Deflagration” (p. 2-22)</li><li>“Speed of sound” The EIS states: “Deflagration means the material burns slower than the speed of sound, thus no shock waves are generated. Propellant permeability enhancement methods reach injection pressures of up to 8,000 psi and are near instantaneous over periods of milli seconds...” (p. 2-22) - Explain briefly what is meant by “speed of sound”</li><li>“Dries” (p. 2-65): “the main dries will be located in the processing plant”</li><li>“Scarified” 2-84 Laydown areas will be scarified, covered with 0.5 to 1.0 m of stockpiled overburden, and vegetated with native, self-sustaining species.</li><li>“Furblock” (p. 4-29)</li><li>“Cutlines” (p. 4-101)</li></ul>	Add this terminology to either one of the early glossaries, or when describing the methodology, in order to help readers understand these terms (particularly non-technical readers, such as Indigenous peoples and members of the public).	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-02	CNSC	General	Mining solution and lixiviant are used interchangeably throughout the EIS. When both are used periodically, may be difficult for a member of the public to recognize that these are one in the same (mining fluid seems more often used).	Be consistent in how this is referred to, in order to ensure it’s clear to readers that these are one and the same.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-03	CNSC	Throughout the Executive Summary (ES) and draft EIS	<p>Errors in formatting and grammar were identified throughout ES and EIS. Some examples are underlined below:</p> <ul style="list-style-type: none"><li>“often referred to as “the final uranium product <u>yellowcake</u>” (ES, p.16 )</li><li>“Whitefish <u>Lake,;</u>” (ES, p.47)</li></ul>	Please correct these and any other formatting, spelling or grammatical errors.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.

<sup>3</sup> Unless otherwise stated, the section noted refers to the draft EIS

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
			<ul style="list-style-type: none"><li>“Forest fires are common throughout most of northern Saskatchewan, however, and are an important natural disturbance of northern boreal forest ecosystems” (p.72)</li><li>“Other comments that the process reminded them of fracking, which carried a negative connotation...” incomplete sentence (EIS, p. 2-3)</li><li>“During this phase, water taking will mainly be used by the processing plant and wellfield remediation and to support the potable water plant and wash bay.” (EIS, p. 8-29)</li><li>“In McGowan Lake, meanmercury concentrations in Northern Pike” (EIS, p. 8-224)</li><li>“Flows and water levels in lakes and rivers within the LSA will realize some adverse change (reduction) as a result of overprinting drainage areas reporting specifically to Whitefish Lake and water taking from this same waterbody.” (8-38)</li><li>“Residual effects characteristics specific to Fish Health are defined in Table 8.5-6 with evaluation of residual effects provided in ” (EIS, p. 8-242)</li><li>“Potential Project residual effects on the Fish Health VC are primarily related to c the controlled” (EIS, p. 8-249)</li><li>“...resulting in a moderate level of uncertainty.” (EIS, p. 9-47)</li><li>“...the assessment. Error! Reference source not found. Provides a summary of unique identification numbers referenced within Section 10.1.” (10-10)</li><li>“Kineepik Métis Local #9 have also note how the Project...” (EIS, p. 11-57)</li><li>“But do not compose the same volume of consumption” (EIS, p. 11-56) – should this be comprise?</li><li>“ Phoenix Infrastructure. In total, approximately 284 ha” (EIS, p. 11-156)</li></ul> <p>Please note, this list is not exhaustive.</p>		
AD-04	CNSC	Section 2.2.1 Mining (p. 2-4 to 2-5)	An arial view could be useful to help a reader understand the proposed freeze wall earlier in section 2 (e.g., The shape, whether it surrounds the deposit). This is unclear but there are good images further down in the EIS (i.e., Figure 2.3-1 on p. 2-78).	Consider adding image to Section 2.2.1, similar to or containing aspects of Figure 2.3-1.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-05	Transport Canada (TC)	Sections 2.2.3.2, 2.2.3.10, 2.2.5.1, 2.3.1.6, 8.3.4.2.2, 11.1.4.4.2,	The two water crossings over Kratchkowsky Creek and Hart Creek and the water intake and effluent discharge/intake pipeline and diffuser at Whitefish Lake may be subject to the <i>Canadian Navigable Waters Act</i> (CNWA). However, these works may be exempt from the CNWA, if they meet the requirements of the Minor Works Order.	<p>*This advice pertains to the regulatory phase.*</p> <p>It is recommended that the Proponent self-assess each work using TC’s Project Review Tool as follows: <a href="https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet">https://npp-submissions-demandes-ppn.tc.canada.ca/projectreview-outildexamenduprojet</a></p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				<p>If the works do not fit the Minor Works Order, the Proponent has the option to either submit an application for approval to the NPP, or use the public resolution process, as these are all unscheduled waterways. The full text of the Minor Works Order is available here: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html">https://laws-lois.justice.gc.ca/eng/regulations/SOR-2021-170/page-1.html</a>.</p> <p>Background information on the NPP, the Minor Works Order, the application for approval process and the public resolution process are available here: <a href="https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp">https://tc.canada.ca/en/programs/navigation-protection-program/apply-npp</a></p>	
AD-06	Environment and Climate Change Canada (ECCC)	Section 2.2.3.8, Project Description	<p>In this section it is stated that: “The third step of the Industrial Wastewater Treatment Plant (IWWTP) is anticipated to further neutralize and improve the remaining water quality proposed to be achieved with further pH adjustments through agitated tanks and a clarifier with negligible solids generation expected at this stage. Several additional technologies including ion exchange are being evaluated as part of an ongoing Best Available Technology Study to be complete as part of future permitting.” ECCC would be interested in reviewing this study when it becomes available.</p> <p>Considering that the third step of the effluent treatment process in the IWWTP is still undergoing development, ECCC cannot make final conclusions regarding the efficacy of the treatment process. When final treatment technologies have been evaluated and selected, ECCC would like to review this information to allow for release to the environment.</p>	ECCC requests the opportunity to review the Best Available Technology Study and selected treatment technologies for the IWWTP when the report becomes available.	The BATEA information for the IWWTP will be included in Denison’s application to the CNSC for a license to operate. As such, ECCC can direct their review request for review to the CNSC.
AD-07	TC	Section 2.2.5.3	<p>With respect to the proposed airstrip, under the <i>Aeronautics Act</i>, the proposed airstrip would be considered an “aerodrome”, which is defined as:</p> <p>“aerodrome means any area of land, water (including the frozen surface thereof) or other supporting surface used, designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.”</p> <p>Aerodromes, including the one proposed by Denison, are subject to the <i>Aeronautics Act</i> and the Canadian Aviation Regulations (CARs).</p>	<p>*This advice pertains to the regulatory phase.*</p> <p>The proponent must notify the Minister of Transport of the proposed airstrip (aerodrome). This notification, being a summary report to the Minister of Transport, is required by section 307 of the CARs (CARs 307). CARs 307 also requires Denison to undertake consultation in the prescribed manner before it constructs the proposed aerodrome at the mine site. Details of the consultation are to be included in the above-mentioned summary report to the Minister of Transport.</p> <p>CARs 307 identifies the requirement to consult to include anyone seeking to undertake a prescribed aerodrome work at a certified or non-certified aerodrome, whether it is the creation of a new aerodrome or, at an existing aerodrome, lengthening an existing runway or making a new one. The Regulation also provides minimum expectations for how the consultation should be conducted, including timelines, who to notify and under what circumstances. The intent of the Regulation is to compel</p>	Acknowledged and Denison will address this in the regulatory phase as highlighted.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				<p>consultation in advance of an aerodrome work that will result in sustained and regular impact on interested parties as identified in the Regulation.</p> <p>As the proposed aerodrome will not be within 4 kilometres of a city or built-up area, under CARs 307, the proponent is required to consult the following interested parties:</p> <ul style="list-style-type: none"><li>(i) the Minister of Transport,</li><li>(ii) the providers of air navigation services,</li><li>(iii) the operator of a certified or registered aerodrome located within a radius of 30 nautical miles from the location of the proposed aerodrome work,</li><li>(iv) the authority responsible for a protected area located within a radius of 4 000 m from the location of the proposed aerodrome work,</li><li>(v) any local land use authority where the proposed aerodrome work is to be carried out, and</li><li>(vi) the owner of any land bordering the land on which the proposed aerodrome work is to be carried out.</li></ul> <p>Proponents are encouraged to share their plans with the local land use authority before the consultation period. The local land use authority may have information about other nearby projects or developments that could impact on the proponent's plans.</p> <p>In summary, regarding the airstrip (aerodrome), the proponent must complete the consultation and file the summary report with the Minister of Transport, prior to commencing construction of the aerodrome.</p> <p>Further details can be found at: <a href="https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01">https://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/FullText.html#s-307.01</a>.</p> <p>TC recommends that the proponent contact TC's Aerodromes Group at <a href="mailto:CASPNR-SACRPN@tc.gc.ca">CASPNR-SACRPN@tc.gc.ca</a> before starting the consultation, to ensure it is completed in accordance with CARs 307.</p>	
AD-08	CNSC	Figs. 3.4-1, 4.3. 1, and where applicable throughout the EIS	Some maps in the EIS do not contain highway numbers.	Please consider including the highway numbers on the maps early in the Draft EIS when laying out the project location so the reader can become familiar with road network within northern Saskatchewan when discussions take place.	Thank you for the advice comment. This will be addressed once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-09	CNSC	Section 4, including Figures 4.3.1 and/or 4.3.2 and where	The maps included in the EIS in sections do not have any Treaty boundaries. First Nation Treaties should be included on the map. Not all First Nations reserves, and boundaries are included on the map such as Cree Lake and Slush Lake, please include on map and consider adding others from the NAD.	It is recommended that Denison update the maps in these sections to include Treaty Boundaries and community locations are included on the Project location map in Figure 4.3.2 and other maps throughout the entire EIS where applicable.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
		applicable throughout the EIS.			
AD-10	CNSC	Section 4	Overall, CNSC believes that Denison is abiding by the communications strategies and products identified in their PIDP, but would be interested in additional information that is available.	While CNSC staff are satisfied that the proponent meets the requirements with this EIS, further clarity and detail on the strategic planning behind these communications activities would be beneficial and would further support the overall goals of the Project’s engagement activities.	Acknowledged. Further details on the Public Information Program and Public Disclosure will form part of the documentation submitted in support of the CNSC licensing for the Project.
AD-11	CNSC	Section 4  Indigenous Engagement Report (IER)	There is a summary of what engagement activities will occur moving forward. However, it is not clear which engagement activities/meetings will occur during the different stages of the EA/ project life cycle. Please provide additional details upon submission of the Final EIS.	Denison should consider clarifying in the updated IER which engagement activities will occur during each stage of the project moving forward as per Reg Doc 3.2.2 before submitting the Final EIS.	The engagement activities as outlined in the draft EIS are reflective of the iterative nature of engagement with respect to the Project.  At the time of the filing of the final EIS, Denison will describe the status of engagement and future expected engagement activities to occur, which will continue to be aligned with the requirements of Reg Doc 3.2.2.
AD-12	CNSC	Section 4  IER	Information included in the EIS Section 4 and IER regarding engagement activities, communication and issues and concerns raised will need to be updated when the next version of the EIS is submitted. The EIS and IER will need to be updated to include information from Fall of 2022 until approximately two months prior to the submission date of the next EIS.	When re-submitting the EIS, ensure that the engagement log, issues and concerns tables and information about engagement activities done to date have been updated. No action needed only advice to update this section before submission with most up to date engagement activities including any that take place with other Indigenous Nations and communities not included in the Draft EIS.	Acknowledged.
AD-13	CNSC	Section 4  IER	Denison states that validation of VC selection was completed with ERFN, the Northern Village of Beauval, the Northern Village of Pinehouse Lake, and the Northern Hamlet of Patuanak (hereafter Beauval, Pinehouse, and Hamlet of Patuanak, respectively). The EIS states that this was completed through a shared online survey. The EIS also indicates that YNLR was also included in this process.	How has Denison validated VC selection with the other Indigenous Nations and communities that have showed interest and if so, by what methods (survey’s, engagement, meetings, review of Draft sections etc.?) Did Indigenous Nations and communities select any VC’s that were not included in the EIS and if so why not?  Please elaborate and provide more details in the EIS on any other methods used including engagement sessions that were completed with Indigenous Nations and communities, through in-person community workshops, VC selection approval through early review of Draft EIS sections.	Section 4 of the draft EIS describes the approach taken related to the Indigenous and non-Indigenous Communities of Interest in relation to the Wheeler River Project. Denison has engaged with these entities regarding the validation of the VC selection.  Denison has not undertaken VC validation activities with other Indigenous Nations or communities that have shown interest in the Project, owing to the systematic approach to engagement Denison has been following. This approach is consistent with the methodology presented to the CNSC by Denison in early 2020, for which confirmation was received in mid-2020 and reflected in the draft EIS.  All activities undertaken in relation to engagement on VCs are currently described in the EIS; there are no additional details to add.  Denison can confirm that it is unaware of additional or new VCs brought forward by other Indigenous Nations or communities that are not suitably captured within the current draft EA approach.
AD-14	CNSC	Section 4.3.1, Pg 246	On this page, Denison states that MN-S is “currently structured with a President, an Executive, a Provincial Metis Council, Regional Presidents, and Local Presidents. The wording of ‘Regional	Please update all wording of “Regional President” to “Regional Director” when referring to MN-S.	Thank you for the advice comment. This will be corrected in the final EIS.

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			President’ is incorrect and should be changed to say, ‘Regional Director’.		
AD-15	ECCC	Sections 5.3.4 (Table 5.3-3); 8.1.3.3 Climate Change; 8.1.3.4 Climate Change Influenced Extreme Events; Table 15.4-1: Summary of Potential Effects of Short-term Extreme Weather Events on the Project and Associated Mitigation; Section 15.5 Climate Change.	<p>The Proponent indicates that the Project’s full lifetime is roughly 40 years (including the post-decommissioning phase) and that climate conditions are important design considerations for a number of sensitive aspects of the Project. Potential future climate changes and their potential effects on the Project and Valued Components (VCs) are described in various sections of the draft EIS. Notably, in Section 15.5.2, ensemble mean projections are provided for several climate variables for two future time periods and emissions scenarios (RCP 4.5 and 8.5). In Section 8.1.3.4, the Proponent describes possible future changes in short-duration precipitation extremes (based on Intensity Duration Frequency or IDF curves from the IDF_CC tool) and indicates that an increase in their frequency and magnitude may occur over the Project lifetime “... and may require consideration for greater storage and conveyance capacity for Project water management infrastructure” (p.8-41).</p> <p>The Proponent indicates that aspects of the Project are being designed to meet standards based on design values that appear to be derived from observed (i.e. historical) climate conditions (e.g. water management infrastructure; see Table 15.4-1). In Section 15.5.3, they indicate that an adaptive management approach will be used to address some aspects of future climate change as necessary. For example, page 15-19 of the draft EIS states that: “Denison will develop an Emergency Preparedness and Response Program for the Project to address forest fires and extreme weather that may occur. If unforeseen effects on the Project occur from longer and more severe forest fire seasons associated with climate change, or increased frequency or severity of extreme weather (e.g., ice storms, snowstorms, flooding), Denison will apply adaptive management that includes monitoring <b>climate factors so that they can proactively mitigate or prevent adverse climate effects on the Project.</b>” (Emphasis added).</p>	<p>ECCC recommends that when considering potential future climate change and relevant effects on the Project, the Proponent consider the range of variability from the ensemble of models (not just the ensemble mean). ECCC also recommends that the Proponent consult the 2019 Canadian Standards Association Guidance on Intensity Duration Frequency for Canadian Water Resources practitioners , which provides examples of alternative methodologies to estimate future return values for design as needed.</p> <p>In terms of adaptive management, ECCC recommends that the Proponent clearly outline what climate factors will be monitored to mitigate or prevent adverse climate-related effects. This should include information on when and how the climate factors would be monitored and under what circumstances particular adaptive management approaches would be applied.</p>	<p>Please see response to IR-15, IR-103, IR-104, IR-235, and IR-236.</p> <p>The probable maximum precipitation (PMP) value of 493 mm selected for design of water management infrastructure, such as ponds, is similar to total annual precipitation (456 mm from Key Lake station, and 483 mm from 1981-2020 climate normals).</p> <p>The selected PMP is well above (&gt;5 times higher): 1) current/measured 24-hour maximum precipitation, 2) modelled 1 in 100 year 24-hour return for current conditions, 3) modelled 1:100 year 24 hour return for a future (2020-2050) period, 4) the predicted maximum 1-day precipitation under different emissions scenarios for the future (including RCP8.5 in the 2021-2050 period).</p> <p>For comparison to the <b>design PMP of 493 mm</b>:</p> <ul style="list-style-type: none"><li>- the measured maximum 24-hour precipitation from Key Lake station was <b>42.9 mm</b> and <b>72 mm</b> from 1981-2020 climate normals.</li><li>- the modelled existing/current 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>79.9 mm</b> and at the Key Lake area was <b>56.4 mm</b>.</li><li>- the modelled future (2020-2050) climate 1 in 100 year, 24 hour return using the IDF_CC Tool for the Wheeler River Project site was <b>88.6 mm</b> and at the Key Lake area was <b>62.0 mm</b>.</li><li>- the predicted future climate (2021-2050) under the highest CO2e emissions scenario (RCP 8.5) shows maximum 1-day precipitation of <b>25.9 mm</b>.</li></ul> <p>The PMP is much higher (&gt; 5 times higher) than the observed and predicted 24-hour maximum precipitation and the 1:100 year 24 hour return. Completing the design using a large PMP provides confidence that the water management infrastructure will be sufficient and function under future climates as it relates to potential changes in precipitation.</p>
AD-16	CNSC	Section 5.10 (p.70) and throughout the EIS	<p>In section 5.10 of the ES, where the seven scenarios are listed, formatting is inconsistent. Likelihood is in quotes in some places, but not in all.</p> <p><b>Not significant</b> is bolded inconsistently throughout the EIS.</p> <p>As well, in many cases noted as “not significant”, where others note “are not expected to have a significant effect”.</p>	<p>Suggest making formatting consistent if going to use quotes and bolding to highlight sections of the text.</p> <p>Also, validate that use of “not significant” and “are not expected to have a significant effect” are consistently used (where appropriate).</p>	<p>Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.</p>



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AD-17	ECCC	Appendix 6-A Air Quality Technical Supporting Document A.10	Some of the off-road vehicles have an emission rating of Tier 2 but in Appendix 6-A Section A.10 the Proponent claims that “for non-road diesel combustion, Tier 4 emission factors were assumed”. Choosing an engine with a lower Tier will increase emissions in NOx significantly and the Proponent should be using the best available technologies to minimize environmental impacts.	ECCC recommends that the Proponent choose engines that meet the most stringent emission standards to the extent possible, which are Tier 4 for the compression-ignition engines, during all phases of the Project.	Please see response to IR-139.
AD-18	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	<p>Understanding Project emissions is important to inform analysis of a Project’s potential impact on Canada’s emissions targets and climate change commitments.</p> <p>ECCC notes that Section 4.0 and Appendix C: Greenhouse Gas Emissions Calculations of Appendix 6-C identifies the source of emissions and quantifies them in the construction, operation, and decommissioning phases of the Project, in accordance with the Draft Technical Guide Related to the SACC (Draft Technical Guide). While ECCC recognizes that the emissions will be relatively small in the post-decommissioning phase, the identification and quantification of the emissions in this phase is not found in the draft Environmental Impact Statement (EIS). The post- decommissioning phase is expected to last 15 years, likely going past 2050.</p> <p>The draft EIS does not discuss emission intensities of the Project, only the grid electricity. The draft EIS also does not discuss the Project’s potential impacts on Canada’s climate targets.</p>	<p>ECCC recommends that the identification of the sources of Greenhouse Gas (GHG) emissions and quantification of these emissions be described for the post-decommissioning phase, as done for the other phases.</p> <p>ECCC recommends the Proponent include discussion on the emission intensities of the mining of the product, following the guidance of the SACC and the Draft Technical Guide.</p> <p>ECCC recommends that the Proponent discuss the potential impacts that the Project may have on Canada’s ability to meet its climate-related targets, following the guidance of the SACC and the Draft Technical Guide.</p>	<p>The Post-Decommissioning phase only includes monitoring (physical, chemical, and biological) and regulatory site inspections. These activities are not expected to generate any significant GHG releases. Notwithstanding, the calculated GHG emissions estimates for Construction, Operation and Decommissioning are expected to be sufficiently conservative to capture any incidental GHG releases during monitoring and inspection activities.</p> <p>The EIS anticipated an annual average production rate of approximately 4,082 metric tonnes of U<sub>3</sub>O<sub>8</sub> and an annual net GHG releases of 30,702 metric tonnes CO<sub>2</sub>e over the operations phase of the project. The annualized GHG intensity during operations is estimated at 7.5 tonnes of CO<sub>2</sub>e / tonnes of U<sub>3</sub>O<sub>8</sub>.</p> <p>Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.</p> <p>Also see response for AD-19 (second paragraph).</p>
AD-19	ECCC	Appendix 6-C, Climate Baseline and GHG Emissions Report	<p>The draft EIS lacks information related to estimates of impact on carbon sinks and emissions from land-use changes. As land use shifts from a vegetated site prior to development, to an industrialized site, removal of vegetation and peat will have impacts on carbon sinks and construction emissions.</p> <p>Section 6, Appendix 6-C, 4.1.2 Land Use Change states that site-specific information of above-ground mass of vegetation was not available and default data from Table 20 of the Draft Technical Guide were applied. The default data is contained in this table is not applicable in this case, as they represent aboveground woody vegetation in cropland systems.</p> <p>ECCC recognizes that the usage of the median value of 0.51 for the carbon content is reasonable.</p> <p>From the information given in the draft EIS, it does not seem that the soil carbon was taken into account. In the absence of detailed information, the Proponent assumed that the area cleared would also be excavated (and drained in the case of wetland areas) which</p>	<p>Land Use Change</p> <p>Regarding the lack of site-specific information of above-ground mass of vegetation, an initial site survey on-site using basic information such as site class and species would assist in determining the above-ground biomass. More specific data, such as regional data from provinces, forest companies, or literature may be available, and generic national data is available (e.g., Fo148-1-2E.pdf (publications.gc.ca), 4775.pdf (nrcan.gc.ca)).</p> <p>ECCC recommends that the Proponent also consider biomass that are not aboveground and confirm whether soil carbon is taken into account, as well as wetlands.</p> <p><i>Carbon Sinks</i></p> <p>ECCC recommends that the Proponent provide a quantitative and qualitative description of the Project’s impact on carbon sinks, following the guidance of the SACC and the Draft Technical Guide.</p>	<p>Limited site-specific data were available to characterize land use change and impacts on carbon sinks. As such, the use of default values from the SACC/IPCC in conjunction with some limited habitat/vegetation data (extracted from Chapter 9.2 Terrestrial Environment – Vegetation and Ecosystems, Listed Plant Species and Wetlands) was employed and is considered reasonable at this stage of the assessment. Please note that additional information on the land use change GHG calculations can be found in Appendix 6-C Climate Baseline and Greenhouse Gas Emissions Report.</p> <p>In accordance with our discussions with the CNSC, Denison is committed to re-assessing the GHG and climate change components of the EIS and other elements of the SACC once more detailed, site-specific data becomes available (i.e., detailed feasibility and engineering studies). This is expected to include more detailed study around overall GHG emissions, carbon sinks and mitigation options, best available technologies / best environmental practices, climate resiliency, net-zero carbon planning and offsetting.</p>

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			would create significant additional emissions from soil disturbances and drainage.  Section 4.1.2 also states the Project involves clearing an area of approximately 169.6 hectares. There are no estimates on the impact on carbon sinks related to the Project.		
AD-20	NRCan	Section 7.3.1, Physical Geography	Drumlins and eskers in the region trend Northeast to Southwest as opposed to northwest to southeast as written on page 7, line 18. Correct orientations are used on page 7, line 23.	NRCan recommends revising the text. Please refer to 250 000 scale Surficial Geology Lines from Quaternary mapping, CSRS NAD83 Zone 13, Saskatchewan Geological Survey 2017.	Acknowledged. The typo in the draft EIS, Section 7.3.1 will be corrected in the final EIS. In Section 7.3.1. the text will be updated to say the following: “The most important associated topographic features in the region are the northeast to southwest trending drumlins and eskers...” See also response to IR-54.
AD-21	NRCan	Section 7.3.2.3, Metacrystalline Basement Rock	Pegmatite missing from list of basement rock types.	NRCan suggests addition of pegmatite to the list of basement tock types as shown on Figure 7.3-6.	Denison will update the final EIS per NRCan’s suggestion.
AD-22	NRCan	Section 7.3.3.1, Aquifer Properties, Section 7.3.2.3, Metacrystalline Basement Rock, Appendix 7A, 2.0, 2.3.1, 2.3.2	The terms “metacrystalline” and “metagranitic gneiss” are not frequently used terms in scientific literature. Gneiss is, by definition, a metamorphic rock.	NRCan suggests revision to “Crystalline Basement rocks” or “Basement metamorphic rocks”, and “granitic gneiss” as used in Figure 7.3-6. Please refer to Oxford Dictionary of Earth Sciences.	Denison will update the final EIS per NRCan’s suggestion.
AD-23	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Orogeny is the process, orogen (or orogenic belt) is the feature produced by orogeny.	NRCan suggests replacing “Tran Hudson Orogeny” with Trans Hudson Orogen”.	Denison will update the final EIS per NRCan’s suggestion.
AD-24	NRCan	Appendix 7A, 2.3.1, Metacrystalline basement rock	Quartzite is by definition a metamorphic rock, and the term is used later without the meta-prefix.	NRCan suggests replacement of the term “meta-quartzite” with “quartzite”.	Denison will update the final EIS per NRCan’s suggestion.
AD-25	NRCan	Appendix 7A, 2.3.4, Athabasca Group Sandstones and Conglomerates	Sands are unlithified, whereas you are referring to grain sizes in this case.	In Table 2-1, NRCan suggests replacing the term “sands” with “grain sizes” under MFc and MFb descriptions.	Denison will update the final EIS per NRCan’s suggestion.
AD-26	NRCan	Appendix 7A, 2.3.5, Overburden	Typo on page 2, line 7: “A grain size sample was collected in GWR-033 from approximately 9 m below ground surface, and the same consisted of 8.8% clay (less than 4 µm).	NRCan suggests revision of “same” to “sample” and clay to “clay-sized” grains.	Denison will update the final EIS per NRCan’s suggestion.
AD-27	CNSC	Section 8.2.1.3 – Spatial and Temporal Boundaries	It is noted that McGowan Lake is an identified reference lake for the Key Lake Mill site. With the establishment of the Wheeler River mine, effluent would be flowing into McGowan Lake, which could potentially interfere with Key Lake’s environmental monitoring program by compromising McGowan Lake’s baseline conditions.	The CNSC advises Denison to communicate with Cameco to ensure they are aware of this situation. Coordination between the two companies may be necessary to ensure Key Lakes environmental monitoring program is not compromised. It is recommended to	Denison will communicate with Cameco through the Saskatchewan Mining Association to highlight the timing of the start of the Project as it may relate to Cameco's use of regional lakes for reference lake purposes. McGowan Lake will no longer be suitable as a reference lake for Cameco once the Wheeler River Project starts operating,

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			Depending on the loading of COPC’s into McGowan Lake and resultant water concentrations, it may no longer be accepted as an acceptable reference lake for use by Key Lake. This would require Cameco to modify their monitoring program at the Key Lake Mill.	discuss this potential issue with Cameco ahead of time to determine the best path forward.	since it will be downstream of treated effluent release. Alpha Lake (LA-9 in Denison's aquatic baseline studies) will likely be outside of any influence from Denison's activities.  Please note that Denison has previously been in communication with the Saskatchewan Ministry of Environment, Environmental Protection Branch regarding the baseline study work Denison completed as part of the Environmental Assessment process and the potential changes to McGowan lake (a Cameco's reference lake) from the proposed Wheeler Project. Reference: Email from Janna Switzer (Denison) to George Bihun (MOE) on May 12, 2020.
AD-28	ECCC	Section 8.2.4.2.3  Appendix 10-A, Section 3.1.1.2	<p>Tables 8.2-9 and 8.2-10 in Section 8.2.4.2.3 Part II_S8 Aquatic Environment and Table 3-1 in Appendix 10-A Section 3.1.1.2 demonstrate predicted maximum effluent concentrations of Constituents of Potential Concern (COPCs) and maximum predicted receiving environment concentrations.</p> <p>The final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short-term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guideline, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe. While uranium is not a Schedule 4 substance with prescribed concentration limits under the Metal and Diamond Mining Effluent Regulations (MDMER), the MDMER requires the characterization of uranium concentrations in effluent under Schedule 5, and requires that all mine effluent released from final discharge points be non-acutely lethal.</p> <p>Under Schedule 5 Section 9(d) of the MDMER, the Proponent will likely be required to conduct selenium fish tissue sampling if average annual concentrations of selenium in effluent equals or exceeds 5 ug/L.</p>	Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non-acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.	Denison fully understands its obligations with respect to the MDMER and will comply with the MDMER end of pipe effluent discharge criteria.
AD-29	CNSC	Section 8.3.3  Figures 8.3.5 etc. 8.5-4	It does not appear that aquatic baseline sampling maps for Russell Lake have LAB 1 and 2 locations showing the baseline sampling locations within Russell Lake. (Figures 8.3.5). Please update the Figures throughout aquatic environment section to include of the baseline sampling studies/ locations within Russell Lake.	Please update maps and sections in EIS to reflect aquatic baseline studies that were completed.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-30	CNSC	EIS sections 8.4.3.2.4 Benthic Invertebrate Community and 8.4.7.6 Climate Change Considerations	ECCC EEM guidance recommends the use of multiple reference areas as it offers the greatest statistical power to detect a meaningful difference between a reference area and an exposure area and can also give an indication of variability among reference areas. It is also important to incorporate multiple reference locations into the study design to aid in designing against spatial confounding factors.	Considering climate change may change the lake conditions from baseline conditions, and that there is already natural variability between lakes that will be used as reference lakes and exposure lakes, it could become difficult to show changes to sediment/benthic invertebrates are not due to project activities, therefore there is a recommendation to ensure the current baseline	Changes in landscape influence and lake conditions are not limited to those brought about by climate change. The preparation of a study design under the MDMER EEM program strives to ensure that a single reference area or multiple reference areas are as representative of a control condition as possible. Best practice is to undertake an analysis of candidate reference areas using the existing baseline information and investigate their utility as controls

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			<p>Section 3 of the Aquatic Environment Baseline Study Report details the similarities between benthic invertebrate communities by using the mean Bray-Curtis index between sampling locations and the median reference condition for the lake group size. It's not clear in the EIS if there are any issues expected to be able to use this data to compare project effect locations to references sites into the future, as some sampling locations are currently not very similar to the reference sites.</p> <p>In addition, climate change could affect the sediment and benthic communities in the future. The EIS states “the frequency and magnitude of extreme precipitation events have the potential to change water levels and flows in the RSA, which may affect sediment transport, deposition, and therefore benthic invertebrate habitat. Changes to average and upper and lower bounds of ambient temperatures may also affect aquatic habitat, which in turn may affect benthic invertebrate communities. Climate change over the life of the Project (i.e., 35 to 40 years) will be monitored as part of the Project’s environmental monitoring programs, and influences on water quality, sediment quality, and benthic invertebrates will require adaptive management to mitigate any potential effects of the Project that may be exacerbated by climate-related changes on the aquatic environment”. It is recommended to ensure that appropriate number/location of reference sites are sampled to enable any changes to sediment or benthic invertebrate communities that may be due to climate changes, and not project effects, are able to be assessed.</p>	<p>data is adequate, and to consider if additional data, and addition of additional reference stations, will be needed moving forward.</p>	<p>prior to project development. A preliminary EEM study can be completed that will allow for a Before-After-Control-Impact study design, that will provide the ability to monitor change not only in the exposure areas, but in the reference areas, thereby allowing for a reasonable assessment of potential mine related impacts.</p>
AD-31	CNSC	Section 8.4.6.1, Residual Effects Characterization	<p>The EIS states “Local Indigenous communities have expressed direct concern with respect to mercury. Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment. However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment.” Based off concerns from Indigenous communities, and the fact that phosphate is a COPC in the effluent, and elevated concentrations of mercury were measured near the Kratchkowsky Lake bottom, adding methylmercury to the environment sampling plans may be beneficial.</p>	<p>Please consider adding methylmercury to the environment sampling plans (such as fish dorsal muscle) in order to confirm there are no unexpected effects of the project on levels, and to satisfy stakeholder concerns.</p>	<p>Refer to response to IR-100.</p>
AD-32	CNSC	Section 9.1.8.3, Appendix 10-A (ERA) section 3.2.1.5	<p>It appears there is no consistency between the assessment of soil quality in the ERA and the baseline soil sampling program presented in the EIS. The baseline program includes 10 soil permanent sampling locations (Appendix 9-B, section 2.5). Sampling at these</p>	<p>Please clarify how baseline measured data on COPC concentrations in soil is considered in the current and future iterations of the ERA.</p>	<p>Baseline measured soil data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline.</p>

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			<p>locations is proposed to be continued during the Operation Phase, and monitoring data will be compiled and reported annually/periodically (EIS section 9.1.8.3).</p> <p>Conversely, the ERA estimates and predicts concentrations of COPC in soil based on atmospheric deposition. Furthermore, the location of ecological receptors in the ERA (Figure 5-2) is different from the permanent soil sampling plot locations (Appendix 9-B, Figure 2.5-1). It is unclear why measured baseline soil quality data were not discussed in the ERA and whether future monitoring data will be considered in the ERA to verify accuracy of predicted COPC concentrations</p>		<p>The baseline soil concentrations used in the model are provided in Section 3.5.1 and Table 3-8 of Appendix A in Appendix 10-A (ERA).</p> <p>The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.</p>
AD-33	CNSC	Section 9.3.3.1.2	<p>Indigenous knowledge is summarized with regard to moose, including:</p> <ul style="list-style-type: none"><li>• Calving sites close to the Wheeler River, with lots of muskeg in the area. A moose calving area is located in the Terrestrial RSA, southwest of the Project Area.</li><li>• A wildlife corridor is used by moose, running between Cree Lake (outside and to the west of the Terrestrial RSA) and Russel Lake (in the southern portion of the Terrestrial RSA).</li></ul> <p>It is unclear how this information is incorporated into the residual effects assessment.</p>	<p>Please clarify how Indigenous knowledge on moose calving sites and corridors in the RSA is incorporated into the residual effects assessment for the key indicator “moose”.</p>	<p>The sites identified by IK were explicitly considered in the impact assessment as indicated by their identification as overlapping with the Terrestrial RSA as noted in the question. However, the areas were not expressly discussed in the residual effects assessment because there is no anticipated spatial overlap of those areas with direct or indirect Project effects.</p> <p>The Indigenous Knowledge provided by ERFN and SVS (2022) identifies a moose calving site (Feature 1001-08) ~ 2 km southwest, and a wildlife corridor ~6 km south of the Project Area (as depicted in Figure 4. Map B, page 16 of ERFN and SVS 2022). Both areas are within the Terrestrial RSA but outside the Wildlife LSA. The reference to “Calving sites close to the Wheeler River...” refers to a broad area that is 45 km east of the Project Area, well beyond interactions with the Project Area.</p> <p>The presence of the areas identified through IK was acknowledged in Section 9.3.3.1.2 (Information from Indigenous Knowledge, Local Knowledge, and Engagement) in Part II, Sec. 9 of the Draft EIS. The assessment (Sec. 9.3.4.2) considered alteration and/or habitat loss at the LSA and RSA scale. Section 9.3.4.2.1 (pg. 9-210) summarizes the effects on moose habitat as follows: “Habitat alteration through sensory disturbance effects (such as noise, dust deposition, and artificial light) is expected to result in reduced habitat quality and effectiveness near Project components and infrastructure reaching beyond the Project Area into the Wildlife LSA....”</p> <p>Further, Sec. 9.3.6.2.1 (Alteration and/or Loss of Habitat, pg. 9-230) identifies that an area within a 500 m radius of the Project Area will be influenced by the Project and likely make the habitat within that area less suitable for use by moose. Therefore, the effects of the Project on moose calving have been appropriately assessed and are expected to be contained within the Wildlife LSA. That affected area</p>



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
					does not overlap with the moose calving site or the wildlife corridor identified by IK.
AD-34	CNSC	Appendix 9-B	<p>Baseline studies for birds are restricted to short time frames in one year only, for example:</p> <ul style="list-style-type: none"><li>Breeding Songbird Point Count Call Survey (June 7 and 17, 2017)</li><li>Aerial Waterfowl and Raptor Stick Nest Survey (June 15 and 16, 2017)</li></ul> <p>The Canadian Wildlife Service (2022) recommends:</p> <ul style="list-style-type: none"><li>Consider the potential effects of projects on birds throughout the year and document the distribution and abundance of birds in all seasons. Some species may be under-represented in existing data bases due to temporally restricted periods of detectability.</li><li>Explicitly target species at risk and other focal species.</li><li>Conduct at least two years of field surveys as a national standard for major projects, so that temporal variability can be considered in future comparisons to baseline data.</li></ul> <p><b>Reference:</b> Canadian Wildlife Service. 2022. Guidance Regarding Data Needed to Support Assessment of Project Effects on Birds. Environment and Climate Change Canada, Gatineau, Quebec. 80 p.</p>	Please consider conducting surveys following CWS’s recommendations or provide an explanation as to how current baseline data for birds is sufficient to characterize the existing environment.	The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site. However, to supplement the species data that were collected as part of the baseline field program, Denison is willing to acquire additional information on species presence in the RSA from existing sources, specifically from the Saskatchewan Breeding Bird Atlas (Birds Canada). However, collection and consideration of this information is not expected to affect the findings and/or conclusions stated in the draft EIS as the assessment was habitat-based to address all species.
AD-35	CNSC	Section 10, IMPACT MODEL	Denison discusses details of the IMPACT model but has not provided scenario(s) used to facilitate review.	Please consider providing CNSC with the IMPACT model scenario file(s) in the spirit of regulatory cooperation.	The intent of Appendix A to Appendix 10-A is to provide the inputs used for the IMPACT model as well as all of the characteristics for human and ecological receptors. Where site-specific data were not used in the model it can be assumed that default values from CSA N288.1-20 were used in the IMPACT model. As such, Denison does not intend to provide the scenario files.
AD-36	English River First Nation (ERFN)	Section 10.1.3.2, Traditional Foods Diet (p. 10-15)	<p>The EIS States: "The ERFN is comprised of seven reserve lands across Saskatchewan" (p. 10-15)</p> <p>While this is accurately reflecting a source document, the source document is incorrect.</p>	Please update to "The ERFN is comprised of seven historical settlements that have now grown into 19 different reserves across Saskatchewan"	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-37	CNSC	Section 10.1.9, Human Health Summary and Appendix 10-A – 4.4.1 Risk Estimation	The Human Health section of the EIS, as well as the ERA, indicates that there is an exceedance for selenium for the fisher/trapper receptor, with the Project estimated to contribute to the majority of this exceedance (0.93 of the HQ). While the assessment is conservative by assuming an increase intake rate of fish solely sourced from Russel Lake, the precautionary principle should be considered to ensure in reality the HQ for selenium remains below 1, even under conservative assumptions.	<p>Please conduct of effluent, water, and aquatic organism monitoring (as already suggested in EIS) to confirm HQ’s are highly conservative in the EIS modelling and receptors remain protected.</p> <p>Should it be determined Se concentrations are increasing in the environment at such a rate as there may be in impact to the environment or human health, installation of a selenium removal circuit into the effluent treatment process should be considered. The proponent should ensure that the proposed wastewater treatment system design incorporates the capability for expansion</p>	Denison acknowledges that a robust effluent and environmental monitoring program will be developed to confirm all EIS modelling predictions. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.



Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
				or upgrades in alignment with the precautionary approach, pollution prevention, and continuous improvement.	
AD-38	CNSC	Appendix 10-A (ERA)	<p>It is unclear if measured or modelled COPC concentrations in blueberry were used in the calculations of human receptor dose. Similarly, it is unclear if measured or modelled COPC concentrations in lichen and blueberry were used in the calculations of ecological receptor dose.</p> <p>CSA N288.6-22, Clause 7.3.6 states that “Measured concentrations of COPCs should be used, where possible, in the exposure assessment.” Please see the Clause for further information.</p>	Please clarify if measured or modelled COPC concentrations in blueberry / lichen were used in the calculations of human and ecological receptor dose.	Measured baseline lichen data were used in the ERA to characterize the existing environment. The IMPACT model was used to predict the Project contributions for the Project phases above baseline. Measured baseline blueberry data were used for model calibration to determine if there was good agreement between measured data and modelled data. The IMPACT model was used to predict both baseline and Project contributions for blueberries. The ERA will be revised according to the periodic review requirements in CSA N288.6-22 which will reflect ongoing data collected from monitoring programs.
AD-39	CNSC	Appendix 10-A (ERA), Table 2-2	<p>Table 2-2: Estimated Home Ranges of Selected Terrestrial Ecological Receptors</p> <p>Based on the reference McLoughlin et al. (2016), the Home Range for Woodland Caribou is indicated as “Expected = 80 km2” which represents the mean range sizes pooled over the two study years for calving/post-calving. The indicated Minimum (67 km2) and Maximum (267 km2), however, do not relate to the calving/post-calving stage, which is not clearly stated in Table 2-2. In contrast, these values are actually mean range size values for autumn/rut and early winter, respectively, as described in the source document on Page 83 (McLoughlin et al., 2016). It should be noted that in terms of true minimum and maximum, the source document states that individual home ranges, based on up to two years of GPS locations, varied in size from 16.2 km2 to 1363.9 km2 (Page 82 of McLoughlin et al., 2016).</p> <p>Reference: McLoughlin et al. 2016. Population dynamics and critical habitat of woodland caribou in the Saskatchewan Boreal Shield. Interim Project Report, 2013–2016. Department of Biology, University of Saskatchewan, Saskatoon. 162 pp. Available online at <a href="http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf">http://mcloughlinlab.ca/lab/wp-content/uploads/2019/06/2013-2016-SK-Boreal-Shield-Caribou-Project-Interim-Report-Nov-18-2016.pdf</a></p>	Please provide clear details on the source of the home range values listed in Table 2-2.	Denison acknowledges the comment and will add clarification in Table 2-2 of Appendix A in Appendix 10-A that the minimum represents the autumn/rut and the maximum represents the early winter.
AD-40	CNSC	Appendix 10-A (ERA) section 3.2.1.5	Although the soil type selected in the ERA for modeling of atmospheric deposition to soil is sandy soil, organic soils have been delineated and characterized (section 9.1.3.3 of the EIS) as valued component (i.e., “Organic Matter/Peat”). It is unclear if the soil quality modeling performed in the ERA is protective for soil types other than sandy soil.	Please clarify if COPC modeling based on sandy soil is protective of organic/peaty soil and provide justification.	The majority of the soil in the Project Area and LSA is considered sandy soil. Section 9.1.3.2 of the EIS states "Mineral soils are associated with upland sites and (in all likelihood) anthropogenically disturbed land that, together, correspond with >99% of the Project Area and 91.5% of the LSA (Figure 9.1-8). The predominate mineral soils within the RSA have been classified as Sandy Dystric Brunisols (Smith et al. 2011)." Organic matter/peat was included as a VC in the EIS because of the concern regarding drying and losing biological function through groundwater interactions, and not in

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
					terms of assessment of soil quality. Additionally, Section 9.1.3.3 of the EIS acknowledges that organic soils is limited in the Project Area. As such, this comment is considered not applicable.
AD-41	CNSC	Appendix 10-A (ERA), Table 5-5	<p>Table 5-5: Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model</p> <p>The exposure pathway for phytoplankton is stated as “direct contact in sediment”, however, phytoplankton live suspended in the water column. It is acknowledged that in the IMPACT modelling report, phytoplankton is described with an occupancy factor of 1 in water (Table 2-5).</p>	Please add the pathway “direct contact in water” to Table 5-5 and revise all calculations accordingly.	Table 5-5 will be revised to state “direct contact in water” for phytoplankton. No calculation changes are needed.
AD-42	CNSC	Appendix 10-A (ERA), Table B.12	<p>Table B.12: Sample Calculation – Adult Recreational Fisher/Hunter (McGowan Lake) Dose and Risk Calculations for Selenium</p> <p>The source for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry is stated as “Table C.5”, however, this table could not be located.</p>	Please provide the referred-to Table C.5 or an alternate source of information for the Terrestrial Plant Ingestion Dose for Labrador tea and blueberry.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-43	CNSC	Appendix 10-A (ERA), Environmental Risk Assessment for Wheeler River Technical Support Document	<p>The ERA is prepared by Ecometrix and submitted to Denison Mines. It is unclear if the ERA submitted has been reviewed and accepted by the proponent (Denison Mines).</p> <p>CSA N286-12 clause 9.5.5 specifies that “the selected supplier’s technical documents that are required to be submitted shall be reviewed and accepted”.</p> <p>Meeting these CSA N286-12 requirements will ensure that the proponent has control of the purchased services as a future licensee applicant.</p>	Provide clarifications if ERA documents have been reviewed and accepted by the proponent.	See response to IR-202 which indicates that Denison reviewed and accepted the ERA. This text will be added to Appendix 10-A.
AD-44	CNSC	Section 11	It is not clear whether all of the interested Indigenous Nations and communities were engaged on the results and findings of the Heritage Resources Impact Assessments (HHRIA) or just ERFN?	CNSC staff would appreciate an update on any engagement activities that have taken place with regards to any of the HHRIAs for the Project, or any site or thing that is of historical, archaeological, paleontological or architectural significance as requested by other Indigenous Nations and communities to date.	<p>Denison confirms that the results of the Project-related HRIAs were discussed with ERFN, as they expressed interest in further understanding the nature of the work undertaken.</p> <p>The Saskatchewan Ministry of Parks, Culture and Sport, Heritage Conservation Branch (HCB) administers The Heritage Property Act. Regulatory approval as per section 63 of The Heritage Property Act (GS 80) was granted for the Project for the two separate HRIAs (HCB File No. 16-2102, December 14, 2017 and HCB File No. 19-933 February 12th, 2020).</p> <p>The results of the HRIAs were included and formed part of the draft EIS. Comments made by Indigenous communities on this section of the EIS will therefore be responded to accordingly by Denison, where appropriate.</p> <p>Additionally, as noted in Section 11.3.2, “The Heritage Resource</p>

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
					Management Plan (HRMP) was informed by engagement with ERFN, who recommended that the HRMP should include a mechanism to involve Indigenous communities where appropriate (21-EN-ERFN-591.1; 21-EN-ERFN-591.2) (see Appendix 11-B).”  The mechanism to involve Indigenous communities has been included in the HRMP and allows for general notification to Indigenous communities should an artefact be found, which provides flexibility to engage all appropriate Indigenous nations accordingly.
AD-45	CNSC	Section 11.1.4.5.2. Perceived Suitability/Safe Use of Resources (p. 11-59)	The EIS States: “Section 2.6.1 in Section 2 describes the extensive review of mining methods that led to the decision to adopt the ISR mining method.” (p. 11-59).  This reference is not correct, as this section does not contain a review of the mining methods.	Please update this to reflect the appropriate section.	Thank you for the advice comment. This will be addressed, as possible, once the EIS is updated following the conclusion of the information requirement (IR) process.
AD-46	TC	Section 14.6.7.2	Transport Canada would like to clarify that although the proponent may use a third party to assist in developing emergency response assistance plans (ERAPs), it is the proponent’s responsibility to submit the ERAP application(s) to Transport Canada, per Section 7(1) of the <i>Transportation of Dangerous Goods Act, 1992</i> as follows:  Emergency response assistance plan  7 (1) No person shall import, offer for transport, handle or transport dangerous goods in a quantity or concentration that is specified by regulation — or that is within a range of quantities or concentrations that is specified by regulation — unless the person has an emergency response assistance plan that is approved under this section before (a) importing the dangerous goods; (b) offering the dangerous goods for transport; or (c) handling or transporting the dangerous goods, in the case where no other person is required to have an emergency response assistance plan under paragraph (a) or (b) in respect of that handling or transporting.	*This advice pertains to the regulatory phase.*  Transport Canada notes that the sentence highlighted in yellow below is incorrect and should be revised or removed. While a contractor could assist the proponent to develop the ERAP(s), it is the responsibility of the proponent to apply to Transport Canada for approval of the plan(s).  14.6.7.2 Design and Mitigation Considerations  Principal traffic risk mitigation measures include: <ul style="list-style-type: none"><li>• traffic control measures such as speed limits;</li><li>• travel management plans;</li><li>• spill and emergency response planning; and</li><li>• driver training.</li></ul> Additionally, Denison considered several provisions to make sure that the effects of a terrestrial release of hazardous materials are as low as practicable. In addition to transportation mitigations listed for Scenarios 1 and 2, the following provisions were considered.  • The <i>Transportation of Dangerous Goods Act, 1992</i> (Government of Canada 2019) outlines the requirements for entities that transport dangerous goods to establish emergency response assistance plans. These plans list specialized personnel and equipment that are required for responding to an incident. It is expected that a contractor responsible for the transportation of uranium concentrate, fuel, and hazardous chemicals would develop these plans.	Acknowledged. Section 14 will be updated in the final EIS to clearly state that while a contractor could assist Denison to develop the ERAP(s), it is Denison’s responsibility to apply to Transport Canada for approval of the plan(s).

Ref. #	Department	Reference to EIS, appendices, or supporting documentation <sup>3</sup>	Context and Rationale	Advice to the Proponent	Denison Response
AD-47	Health Canada (HC)	Appendix 14-A (p. 8-9)	<p><b>Context:</b> No emergency response plan has been provided within the draft EIS, which states that emergency response plans will be developed in the future (Section 14 Appendix 14-A, p.8-9).</p> <p><b>Rationale:</b> For any emergency event, Health Canada considers the protection of human health as a primary consideration in the development of emergency preparedness and response plans. This includes monitoring for human health impacts and the provision of health-related guidance. Further, this will be a requirement of the licensing process.</p> <p>The proponent should ensure that the emergency response plans consider the protection of all relevant potential human receptors that could be impacted by an onsite or project-related off-site accident involving the release of chemical and/or radiological substances.</p>	<p>It is recommended that Denison develop an emergency response plan in consultation with potentially affected communities and stakeholders that includes, but is not limited to, the following:</p> <ol style="list-style-type: none"><li>1. All relevant contact information of the communities, especially related to km 160 of Hwy 914, which is the location of a cultural camp that has been established by the English River First Nation and km 67 of Hwy 914 that is a gathering location for the Kineepik Metis Local associated with the Northern Village of Pinehouse.</li><li>2. Description of the mechanisms for communication with communities in case of an emergency.</li><li>3. Description of the partnership with and the training of local communities and local responders (see Section 14 Appendix 14-B, p.1).</li><li>4. Description of mutual aid agreements with neighboring industries/municipalities, where appropriate.</li></ol>	<p>Denison acknowledges the comment and thanks Health Canada for the recommendations as to the development of its Emergency Response Plan.</p> <p>As noted in the draft EIS, Denison has committed to the development of an Emergency Preparedness and Response Program as a component of its Environmental Management System (EMS). The objectives of the program are generically consistent with the recommendations that have been provided and Denison, as it has demonstrated to date, is committed to meaningful engagement with communities of interest and will solicit input and advice during all aspects of program development.</p> <p>For reference it is noted that as it concerns its EMS framework documentation hierarchy it is expected that three levels of documentation will be developed – Programs, Plans and Procedures. The emergency preparedness and response documentation will follow this hierarchy and input from interested parties will be solicited during all phase of program/plan/procedure development. Denison intends to develop this documentation as it advances through the licensing phase of Project realization.</p>
AD-48	ECCC	Appendix 16-C, Summary of Monitoring and Follow-up Programs	Appendix 16-C does not include consideration of any monitoring and follow-up programs regarding GHGs.	ECCC recommends that the Proponent consider developing a GHG follow-up program to measure and compare actual GHG emissions against the draft EIS estimates, including reporting the Project’s actual emissions and updating the emissions estimates as needed.	Denison anticipates being subject to ECCC’s reporting requirements for emitters over 10,000 tonnes CO2e and the information is collected under section 26 of the Canadian Environmental Protection Act. This was noted in the draft EIS, Section 2.5 Greenhouse Gas Emissions.
AD-49	ECCC	Appendix 16-A Summary of Residual Effects  Appendix 16-B Summary of Cumulative Effects	ECCC notes that GHG mitigation measures have not been considered for the Project. Furthermore, the Project’s lifetime is expected to extend into 2050 and beyond. Consistent with the information requirements of the SACC, and aligning with Canada’s commitment to achieve net-zero GHG emissions by 2050, the Proponent should provide a credible plan that describes how the Project will achieve net-zero emissions by 2050.	<p>ECCC recommends that the draft EIS include an assessment of potential GHG mitigation measures throughout all phases of the Project. This could include a Best Available Technologies / Best Environmental Practices (BAT/BEP) Determination, as described in Section 3.2 of the Draft Technical Guide.</p> <p>ECCC also recommends that the Proponent provide a credible Net-Zero Plan on how to achieve the target of 0 kt CO2 eq/year, for the year 2050 and beyond, following the guidance of the SACC and the Draft Technical Guide.</p>	<p>GHGs were not included as a VC or KI in the draft EIS and as such, there are no specific GHG-related mitigation measures in Appendix 16. However, many of the mitigation measures for the VC Air Quality related to combustion products would also be associated with a reduction in the Project’s Scope 1 emissions. As noted in the draft EIS, Section 2.5, at this stage in the Project Denison will look for opportunities to optimize energy management and improve the energy intensity of the Project where practical. Also see response for AD-19 (second paragraph).</p> <p>Denison will consider the option of preparing a climate resiliency assessment with consideration to best available technologies / environmental practices (BAT/BEP) as well as a net-zero plan as the Project advances. Section 2.5 of the EIS provides a summary of the anticipated GHG releases and a comparison to the nation- and province-wide GHG emissions. The project is expected to contribute less than 0.0043% to the nation-wide annual average. Given this very low contribution, the project is not expected to impact Canada’s ability to meet its climate-related objectives and targets.</p>

Annex 6

Federal Indigenous Review Team (FIRT) Review of Denison Responses to Information Requests (IRs) and Supporting Documents Received February 10, 2024

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale (March 2023)	Information Requirement (IR) (March 2023)	Rationale for Status (October 2024)	Status	Denison Response to CNSC Comments, October 18, 2024
IR-01	-	English River First Nation (ERFN)	Current use of lands and resources for traditional purposes	General	<p><b>Context:</b> Denison has not gone far enough in terms of learning from and incorporating information from ERFN provided in the <i>Traditional Knowledge Study and Health and Socio-Economic Study Report</i>. It appears Denison put a disproportionate amount of reliance on the views and interests of one ERFN land user. While we applaud the efforts of Denison to seek feedback from ERFN land users directly and to work closely with such land users, ERFN’s rights and interests in the region of the Project (and the potential of the Project to adversely impact such rights and interests) extend well beyond that of just one land user.</p> <p><b>Rationale:</b> It is important for the Proponent and regulators to understand that while the rights and interests of individual ERFN members are important to consider, the Elders and elected leaders of ERFN represent the collective rights and interests of ERFN as a Nation. The results of the scoping study indicated that ERFN holds firmly established rights to the area where the planned project is located. Numerous studies conducted over several decades have examined ERFN's relationship and connection to land use and occupancy of the region where the proposed mine is located from traditional land use, subsistence harvesting, ecological, and sociocultural and economic perspective.</p>	<p>The draft EIS should be revised to reflect the totality of ERFN TK and land use information.</p> <p>Denison and CNSC must continue to work with ERFN to ensure that impacts on ERFN rights are appropriately and fully considered, mitigated, and accommodated.</p>		Accepted	n/a
IR-02	-	Canadian Nuclear Safety Commission (CNSC)	Mitigation Measures	General  Appendix 16-C	<p><b>Context:</b> Denison’s 2019 Wheeler River Terms of Reference states: “The EIA will also discuss the monitoring programs required to demonstrate regulatory compliance and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.”</p> <p>The CNSC’s <a href="#">Generic Guidelines for the Preparation of an Environmental Impact Statement (EIS)</a>, also state: “The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the Proponent intends to implement them and the environmental outcome the mitigation is designed to address.</p> <p><b>Rationale:</b> The EIS and the Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information. It is not clear which monitoring programs will be employed to demonstrate regulatory compliance, and compliance with the commitments Denison has made to its Indigenous and non-Indigenous Stakeholders.</p>	<p>CNSC staff expect Denison to provide a comprehensive list of commitments along with the next version of the EIS, including any commitments made to Indigenous Nations and communities and other stakeholders (As committed in the Wheeler River Terms of reference, and as noted in the November 28<sup>th</sup>, 2022 email from CNSC staff to Denison: <i>Future Submission of a Commitments Table for Wheeler River EIS</i>).</p>		Accepted	n/a
IR-03	-	CNSC	Site preparation	Section 1.3.2 Temporal Boundaries  Appendix 10-A (ERA)	<p><b>Context:</b> The EIS and TSD-ERA provide assessment on the Project timeframe, including construction, operation, and decommissioning phases.</p> <p><b>Rational:</b> The site preparation phase is not included in the timeframe (EIS and TSD-ERA). As per REGDOC 2.9.1, the sub-section 4.1.1 Complexity of the environmental risk assessment requirements states that “The applicant or Licensee shall identify facility characteristics and activities that may interact with the environment during</p>	<p>Please provide an assessment of those facility characteristics and activities that may interact with the environment during the site preparation phase, along with an assessment of their potential effects, in order to reflect the entire lifecycle or provide a rationale for its exclusion.</p>		Accepted	n/a



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale (March 2023)	Information Requirement (IR) (March 2023)	Rationale for Status (October 2024)	Status	Denison Response to CNSC Comments, October 18, 2024
					the relevant phase of the facility or activity’s lifecycle (for example, site preparation, construction, operation, and decommissioning.”				
IR-04	-	Environment and Climate Change Canada (ECCC)	Fish and fish habitat	Section 2, Project Description Section: Glossary	<p><b>Context:</b> The Proponent defines ‘clean waste rock’ as “Waste rock generated as sandstone cuttings and core from drilling activities associated with well and freeze hole development that does not have uranium containing materials”.</p> <p>ECCC notes that the use of the term “Clean Waste Rock” could be misunderstood to mean that the waste rock is devoid of any contaminant. Even when the waste rock referred to as “clean waste rock” does not contain uranium materials, it could contain other metals or contaminants that could have adverse environmental effects. It is also not clear whether the “clean waste rock” is characterized for Acid Rock Drainage/Metal Leaching (ARD/ML) given that some portion of the basement rock is to be drilled out to anchor the freeze walls and may have ARD/ML potential.</p> <p><b>Rationale:</b> The current definition of ‘clean waste rock’ in the draft EIS could lead to inappropriate handling and disposal if it is assumed to be devoid of any metals or other contaminants that might negatively affect the environment.</p>	Provide a clear and more detailed definition of the term ‘clean waste rock’.		Accepted	n/a
IR-05	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 2.2.1.2	<p><b>Context:</b> Water volumes for mud/diamond drilling is listed as minimal as the mud will be re-used. The mud is identified as a mixture of water, clay, and environmentally friendly polymers that clean out the cuttings and help to keep the drilling bit cool.</p> <p><b>Rationale:</b> Although the mud for drilling will be re-used, there could be environmental impacts should there be an accident while drilling.</p>	Please identify the components of the environmentally friendly polymers for the drilling mud and potential environmental impacts should the mud not be recovered.		Accepted	n/a
IR-06	-	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>feasibility of meeting remediation targets.</li><li>groundwater flow conditions and validation of flow models.</li><li>mobilization of contaminants (e.g., Al, Se or V).</li><li>potential for free gas evolution/two-phase flow.</li><li>identifying composition of lixiviant and production solutions.</li><li>success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li></ul>		Accepted	n/a



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					<p>And that “The applicant or Licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.</p> <p><b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.</p>	<ul style="list-style-type: none"><li>site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>			
IR-06	IR-06-R1	CNSC	Geology and groundwater	Section 2.2.1.4, Wellfield for In Situ Recovery Mining	<p><b>Context:</b> This Section of the EIS indicates that a tracer test was completed in 2021 and a feasibility field test was initiated in 2022. No information from these tests is included in the EIS and no reporting timelines are provided.</p> <p><b>Rationale:</b> Guidance from the IAEA (2001) and best practices highlighted by regulatory regimes in other countries such as the United States (IAEA, 2016) and Australia (Geoscience Australia, 2010) indicates that single and multi-well trial (feasibility) testing for mining and remediation techniques should be carried out before a licence for full-scale operations can be granted. This is part of the requirement for Proponents to demonstrate to government authorities that all potential risks have been considered during the life of operation and post-remediation of the mine.</p> <p>Additionally, Section 8.5.2 of the Generic EIS Guidelines states: “Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and the directions of groundwater flow”,</p> <p>And that “The applicant or Licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems”.</p> <p>Outcomes from the tracer test inform model parameters such as effective porosity (see IR-78), dispersion, and dispersivity (see IR-96). The wellfield leach tests and remediation trails ultimately inform environmental monitoring during site activities, and the source term for the groundwater model. This source term represents the</p>	<p>1. Please provide a summary of the results of field tests (i.e., tracer tests, wellfield leach tests, and remediation trials) in the EIS, or provide a technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS.</p> <p>2. Please indicate how outcomes from these field tests inform the design of In Situ Recovery. This information should include:</p> <ul style="list-style-type: none"><li>feasibility of meeting remediation targets.</li><li>groundwater flow conditions and validation of flow models.</li><li>mobilization of contaminants (e.g., Al, Se or V).</li><li>potential for free gas evolution/two-phase flow.</li><li>identifying composition of lixiviant and production solutions.</li><li>success despite presence of &gt;2% carbonate minerals (siderite, FeCO3) in the ore zone (see Table 4-3 of Appendix 7-A).</li><li>site-specific data to parameterize, validate, and refine solute transport models (hydraulic conductivity, effective porosity, dispersivity, diffusion, etc.).</li></ul> <p>3. Please provide further information of proposed operations including % recovery, uranium concentrations, optimal liquid/solid ratios, anticipated reagent consumption, etc.</p>		Accepted	n/a

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					contaminants which flow through the desilicified zone into Whitefish Lake, which represents a source of contamination considered in the ERA.  <b>References:</b> [1] International Atomic Energy Agency (IAEA). 2001. Manual of Acid in Site Leach Uranium Mining Technology. IAEA-TECDOC-1239. Vienna. 283 p. [2] International Atomic Energy Agency (IAEA). 2016. In Situ Leach Uranium Mining: An Overview of Operations. IAEA Nuclear Energy Series No. NF-T-1.4. Vienna. 76 p. [3] Commonwealth of Australia (Geoscience Australia). 2010. Australia’s in situ recovery uranium mining best practice guide. ISBN 978-1-921672-95-8. Canberra. 33 p.				
IR-07	-	ECCC	Fish and fish habitat	Section 2.2.1.4.2, Wellfield Operation  Section 2.2.1.4.2.2, Secondary Containment of Mining Solution – Pumping	<b>Context:</b> The description in Sections 2.2.1.4.2 and 2.2.1.4.2.2 refer to the differential rates of injection and withdrawal, which implies that more solution will be withdrawn through the recovery well than volume of mining solution injected. According to the description of the site, a freeze wall will create a barrier between the uranium deposit to be mined and outside the isolated area to prevent inflow of groundwater from the sandstone outside the freeze wall. Secondly, it was indicated that the basement rock below the uranium deposit will prevent infusion of groundwater from below.  The Proponent stated that inward hydraulic gradient will be created by recovering more solution than is being injected. In general, the wellfield will operate to draw a minimum of 1% more solution out of the wellfield compared to solutions injected in. This will help avoid increased subsurface pressures from injection pressure build up within the deposit.  <b>Rationale:</b> It is not clear where the extra groundwater will come from that will sustain this differential rate of injection and withdrawals as the freeze wall and bedrock basement will isolate the injection well from groundwater.  If it is assumed that there is limited amount of groundwater present in the sandstone layer above the uranium deposit, that amount of groundwater in the sandstone layer is finite and will be exhausted at some point. Therefore, it is not clear where the extra groundwater will come from. If the extra volume of water is not accounted for in the modelling, that would ultimately affect the volume of water that ends up in the receiving environment and likewise the amount of contaminants contained.	Clarify where the extra groundwater will come from to sustain this differential rate of injection and withdrawals during operation and if this extra water has been accounted for in the model and the amount of water that ends up in the receiving environment.		Accepted	n/a
IR-08	-	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.1.4.2.2 Project Description	<b>Context:</b> This section describes how an inward hydraulic gradient will be created within the mining area as a secondary containment method for control of mining solution. While the process is described, there is no information on contingency measures in place for pump failure or system maintenance solutions. There is also no information on how quickly the hydraulic gradient, and therefore secondary containment, would be compromised if any pumps stopped working. It is also unclear how primary containment (i.e., well design) failure, such as	Provide further information regarding how the inward hydraulic gradient system functions, with particular focus on how the hydraulic gradient and secondary containment will be maintained if any wells or pumps were compromised.		Accepted	n/a

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					physical/mechanical issues compromising casings, would affect the creation of the hydraulic gradient and secondary containment as well.  <b>Rationale:</b> It is important to have contingency planning in place in the event that there are any issues with the hydraulic gradient and secondary containment system for control of the acidic mining solution.  There is no information in this section on how the hydraulic gradient (i.e., secondary containment) would be maintained if a well or pump (i.e., Primary containment) experienced problems.				
IR-09	-	CNSC	Geology and Groundwater	Section 2.2.1.4.2.2	<b>Context:</b> This section indicates that mining solution within the mining area can primarily be controlled by maintaining an inward hydraulic gradient. The inward hydraulic gradient will be created by recovering more solution than is being injected.  <b>Rationale:</b> If, for some reason, the recovered solution is much more than that being injected, an excessive drawdown could be created. If, by accident, mining solution is leaking into the upper sandstone aquifer through crack in injection/recovery well casing at the same time, it would be challenging to remediate the upper sandstone aquifer in dry conditions (due to excessive drawdown).	Please clarify if any measure will be implemented to avoid excessive drawdown and develop contingency measures to address such accident.		Accepted	n/a
IR-10	-	ECCC	Fish and fish habitat	Section 2.2.1.4.2.3, Tertiary Containment of Mining Solution - Freeze Wall	<b>Context:</b> The Proponent stated that as a tertiary means of containment for the mining area, the uranium deposit is proposed to be surrounded by a freeze wall that extends from the surface to the basement rock, isolating the mining area from regional groundwater. Current plans are for the freeze wall to be a minimum of 10 m thick, be installed 25 m away from the uranium deposit, and extend 30 m into the basement rock (Figure 2.2-6).  As explained in Section 2.2.1.4.2.2, mining solution will be injected into the ore zone under pressure and will likely react, not just with the uranium in the ore zone, but also the binding or cementing material in the sandstone. This means that some portion of the sandstone above the uranium layer and perhaps some portions of the freeze wall will dissolve, thereby creating more void than just the thickness of the uranium layer or horizon. The void may affect the integrity of the freeze wall as containment.  <b>Rationale:</b> It is not clear how the Proponent will monitor the freeze wall to verify whether portions of the freeze wall are being dissolved in the mining process and how it plans to verify the integrity of the freeze wall as a containment for the mining solution. In addition, if the dissolution reaction of the uranium ore is exothermic, then the heat generated may also affect the integrity of the freeze wall.	1. Explain how the integrity of the freeze wall will be maintained as a means of containment that prevents migration of the mining solution out of the ore zone into the receiving environment.  2. Demonstrate that the mining solution injected under pressure will not compromise the integrity of the freeze wall as a containment.  3. Demonstrate how both exothermic and chemical reactions of the mining solution used to dissolve the uranium ore will not compromise the integrity of the freeze wall as a containment.  <b>Technical Discussion Required:</b> Yes. ECCC would like to better understand the chemical constituents that compose the mining solution and the chemical reactions that it will cause.	The Proponent’s response is accepted. Please also see AD-50 in the Advice to Proponent table.	Accepted	n/a
IR-11	-	ECCC	Change to an environmental component due	Section 2.2.3 Project Description	<b>Context:</b> It is unclear how much contact water may be produced during the drilling of the mine well field during the construction phase of the proposed Project. Figure 2.2-14 indicates that no water will be produced during the drilling process in the construction phase. In Section 2.2.1.2 both mud rotary drilling and diamond drilling	Provide further information on potential wastewater produced during the construction phase from drilling processes, and if proposed infrastructure can contain any water produced.		Accepted	n/a

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			to hazardous contaminants		<p>are proposed for the creation of wells. Both processes require water, however only mud rotary drilling produces liquid mud that is then reused in the drilling process.</p> <p><b>Rationale:</b> It is unclear if the liquid mud produced during drilling can be reused indefinitely with further water additions, or if this eventually becomes the clean sand grain cutting and how it will be disposed of (i.e., liquid or solid waste). If the mud produced from drilling is classified as liquid waste and disposed of as contact water, it is not clear if this is accounted for in the site water management plan and water balance during the construction phase. Contact water from well drilling during the construction phase has not been quantified or accounted for in Figure 2.2-1, and therefore it is unclear if proposed infrastructure during the construction phase has the capacity to contain this waste stream in addition to the waste streams currently outlined in Figure 2.2-1.</p>				
IR-12	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description	<p><b>Context:</b> There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and non-contact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans.</p> <p>In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2-16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events.</p> <p><b>Rationale:</b> In order to be able to understand site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant</p>	<ol style="list-style-type: none"><li>1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment.</li><li>3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event.</li><li>4. Provide additional information on culvert designs and conveyance capacity for PMP events.</li></ol>	<p>In a supplementary submission provided by Denison on July 9<sup>th</sup>, 2024, much of the information requested has been provided.</p> <p>Table 1 of round 3 attachment IR-12 is a screening of constituents of potential concern (COPCs) in water catchments. For the “Camp” catchment, risks to the aquatic environment from nutrients is described as “<i>None expected.</i>” However, sewage spills occur occasionally at camps and would release nutrients which could reach the aquatic environment.</p> <p>Also in Table 1, a management/mitigation often referred to is, “<i>A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.</i>” No further details were found on how wash bay water will be handled such that it does not pose a risk to the aquatic environment.</p> <p>The Proponent is relying on its spill response plan to handle any spills from the freeze plant and substation as well as the camp. Section 14 of the EIS, Accidents and Malfunctions, does not discuss these hazards. Given the stated reliance on the spill response plan for brine and sewage spills on site, it will be important that the plan explicitly address brine and sewage spills.</p> <p><u>In order to resolve this IR, Denison are expected to:</u></p> <ul style="list-style-type: none"><li>• Include nutrients from sewage as a contaminant of potential concern for the Camp Watershed in Table 1 of round 3 attachment IR-12 or provide justification why there are no risks to the aquatic environment from nutrients from the camp.</li><li>• Clarify how wash bay water will be handled, given that it may potentially contain contaminants.</li></ul> <p><i>The following outstanding issue will be further assessed as part of licensing technical reviews, prior to the granting of a Licence:</i></p> <ul style="list-style-type: none"><li>• Denison will be expected to incorporate information provided in this supplementary submission in the Spill Response Plan.</li></ul>	Not Accepted	<p><b>Note: For the complete history of the FIRT’s responses to this IR, refer to Appendix A below. Any attachments associated with the IR response in this table are available in Appendix A.</b></p> <p>In response to this IR, the Site Water Management Plan has been updated using track changes; see Attachment IR-12, IR-12-R1A, and IR-112-R1B (Round 3) below in Appendix A. Briefly for context, nutrients as a COPC related to sewage in the Camp Watershed have been incorporated into Table 1, and clarification with respect to the wash bay water management has been provided.</p> <p>In addition, responses to the CNSC’s round 4 comment related to nutrients, the wash bay, and commitments for the Spill Response Plan are also provided here.</p> <p><b><u>Nutrients:</u></b></p>

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					concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.		See also AD-75 in the Advice to Proponent table.		<p>The domestic wastewater treatment plant pond stores treated domestic wastewater prior to conveyance to the process water pond that reports to the industrial wastewater treatment plant (IWWTP). To clarify, the accidents and malfunctions assessment (EIS Section 14) considered four scenarios that could introduce COPCs to the environment from site “ponds and retention berms” (see Table 3-13, Appendix A or EIS Appendix 14-A), including overtopping, flooding and containment failure – the domestic wastewater treatment plant pond would fall into this generic “ponds and retention berms” category. The “ponds and retention berms” scenarios were deemed low risk or risks were deemed to be as low as reasonably practical (ALARP), given design and other mitigations.</p> <p><b><u>Wash Bay:</u></b></p> <p>Described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the</p>

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									<p>process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP where it will be treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.</p> <p>For the purpose of the site water management strategy, water derived from the wash bay is by definition “contact water”.</p> <p><b>New Commitment:</b> Denison concurs that it will incorporate information provided in this supplementary submission in the Spill Response Plan during licensing. This commitment is reflected in the updated commitment register (see commitment 2-35) that is provided as part of the EIS submission.</p>
IR-12	IR-12-R1A	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<p><b>Context:</b> Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern (COPCs) directly from mining operations infrastructure. However, it still has the potential to contain deleterious substances from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills, fire management practices, and snow removal practices. The <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER) pursuant to the <i>Fisheries Act</i> requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. This includes deleterious substances in non-contact water from all site infrastructure including the airstrip, roads, and camp area.</p> <p><b>Rationale:</b> All mine effluent and seepage that contains deleterious substances must be discharged through a final discharge point. This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices. The Proponent has not included how non-contact water runoff from site infrastructure will be captured within site water management planning. To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the capture of non-contact water.</p>	<ol style="list-style-type: none"><li>1. Update site water management plans to include management of potentially deleterious substances contained in non-contact water from all site infrastructure.</li><li>2. Provide updated estimates of water volumes to be drained and managed from overall site infrastructure (including runoff from roads, airstrip, camp area, etc.) during the different Project phases. Include updated information on water treatment flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.</li></ol>	To be resolved as part of IR-12.	Accepted	n/a



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IR-12	IR-12-R1B	ECCC	Water Quality - Change to an environmental component due to hazardous contaminants	Section 2.2.3, Project Description  Proponent response to IR-12	<b>Context:</b> The Proponent has clarified that there is no infrastructure in place for management of non-contact water from site infrastructure that may contain COPCs, including but not limited to roads, the airstrip, and the campground.  <b>Rationale:</b> To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the type of infrastructure and its location for the capture of non-contact water.	Provide a map marking the locations of proposed surface drainage structures for runoff collection including collection ditches, culverts, diversion ditches, perimeter berms, collection ponds and other similar structures.	See also AD-73 in the Advice to Proponent table.	Accepted	n/a
IR-13	-	ECCC  CNSC	Fish and fish habitat	Section 2.2.4, Waste Management  Section 2.2.7.7, Borrow Area  Section 2.3.1.3 Site Preparation and Earthworks	<b>Context:</b> The Proponent indicates that a borrow area is planned for an area northeast of the processing plant. The borrow material or overburden will be used during construction for roads, airstrip, pads, and in the batch plant for concrete production needs, during Operation for ongoing maintenance of various Project components and during decommissioning for fill and cover material. Suitable construction fill material will be sourced from the proposed borrow area and any suitable clean sandstone generated during freeze wall and well drilling (Section 2.2.7.7).  It was also noted in Sections 2.2.1.3 and 2.2.14 that the freeze wall will be established by drilling over 300 vertical holes from surface to the basement rock. The freeze holes will extend 30 m into the basement rock and will produce waste rock from basement rock (Figure 2.2-6). However, there is no information whether the waste rock from basement rock would potentially be acid generating and/or metal leaching. This means that all the extra 30 m of basement rock should also be characterized for potential ARD/ML to determine use or appropriate disposal.  <b>Rationale:</b> ECCC notes that the Proponent did not indicate whether the borrow material and the drill out part of the sandstone layers and basement rock will be tested for Acid rock drainage/metal leaching (ARD/ML) potential before they will be used during construction, operation and decommissioning. ARD/ML is an environmental hazard that will have an adverse effect on waterbodies frequented by fish.  Potential acid generating and metal leaching waste rock could pose negative impacts on the environment if they are not managed adequately.	Please provide: 1. Information on whether the waste rock from the basement rock is potentially acid generating and metal leaching; a. Confirm that any borrow material to be used for construction will be characterized for potential ARD/ML. b. Confirm that the part of waste rock recovered from the basement rock, will also be tested for potential ARD/ML.  2. Criteria for segregating the potential acid generating and metal leaching waste rock, if it exists, from clean waste rock; and,  3. A plan to manage the potential acid generating and metal leaching waste rock, if it exists.	Denison has captured their commitment to develop the waste rock segregation criteria and to develop appropriate mitigations and management for potentially acid generation (PAG) material in version 2 of the Commitments Register (ID 2-33), so this IR has been accepted.	Accepted	n/a
IR-14	-	CNSC	Wastes and Decommissioning	Section 2.3.3.1.3 Decontamination, Demolition, and Disposal (p. 2-82)  Table 4.3-2: Key Issues and Concerns from English River First Nation (p. 4-33)	<b>Context:</b> The EIS states “Concrete foundations will be left in place. Any portions of concrete foundations remaining above grade will be levelled and rebar will be cut-off at grade. Large slabs will be perforated on a 2-m grid to permit drainage. Concrete slabs will be covered with 0.5 m of development rock or locally stockpiled till.” (p. 2-82)  Further, Denison notes that “Concern about responsible authority for restoring the environment, including contaminants when mining concludes. How long will it take to have the environment fully restored and, if Denison is no longer the operator, how will this be completed?” (p. 4-33). This comment status is noted as <i>Complete</i> .	How has the proposal to leave these foundations in place been received by the Indigenous Nations and communities during engagement sessions? Have engagement activities influenced Denison’s planned decommissioning approach? Describe in additional detail how the comment from p. 4-33 has been addressed and how this has been received by those who expressed this concern?	Denison has captured their commitment related to addressing concerns from Indigenous Nations and communities on their decommissioning approach within the Preliminary Decommissioning Plans in version 2 of the Commitments Register (ID 4-5), so this IR has been accepted.	Accepted	n/a

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					<b>Rationale:</b> Permanent structures will remain following decommissioning, according to the excerpt above. It’s unclear how engagement activities influenced Denison’s planned decommissioning approach, or how the comment above has been addressed or received.				
IR-15	-	ECCC	Fish and fish habitat	Section 2.2.3.4 Project Description Section 8.1.3.4.2, Aquatic Environment	<b>Context:</b> In Section 2.2.3.4 it is stated that the estimated PMP event for Project infrastructure planning is 483.3mm. In Section 8.1.3.4.2 it is stated that the PMP is 489.3 mm.  <b>Rationale:</b> It is unclear which value is the correct PMP value and if Project infrastructure has been planned correctly.	Provide the correct PMP value and verify that Project infrastructure has been designed utilizing the correct value.		Accepted	n/a
IR-16	-	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<b>Context:</b> The EIS and technical supporting documents do not provide sufficient justification for the selection of the proposed wastewater treatment systems for the industrial wastewater treatment plant or the domestic wastewater treatment plant.  In addition, it is not clear how the upper bound of the industrial wastewater treatment plant effluent quality was obtained.  <b>Rationale:</b> Draft REGDOC-2.9.2 formally documents the CNSC’s expectations to Licensees for controlling releases to the environment. For proposed new facilities, these expectations include conducting a best available technology and techniques, economically achievable (BATEA) Assessment, and determining key parameters necessary to support the EIS. These include identifying: <ul style="list-style-type: none"><li>• environmental release targets to inform the design of wastewater treatment systems to constrain the quantity and concentration of contaminants and physical stressors released into the environment,</li><li>• the best available technology and techniques through an options analysis; and</li><li>• the anticipated influent characteristics, overall treatment efficiencies, and maximum predicted design release as the output of the assessment.</li></ul> Consideration of the principle of pollution prevention and BATEA is also a requirement of REGDOC-2.9.1.  CNSC staff have met with Denison to discuss the expectations in draft REGDOC-2.9.2.	Please provide a summary of the BATEA assessment to justify the selection of the wastewater treatment plant system.  As part of the summary, please identify the anticipated environmental release targets used to inform the design, as well as the maximum predicted design release concentrations and loadings to the receiving environment. The maximum predicted design releases should be used in the ERA to demonstrate protection of people and the environment.		Accepted	n/a
IR-17	-	CNSC	Human health with respect to hazardous contaminants	Section 2.2.3.8	<b>Context:</b> It is also acknowledged that Denison stated in meetings with CNSC staff that Denison intends to propose final release targets to the CNSC as part of the licence application submission.  <b>Rationale:</b> It is not clear in the submission whether Denison has considered whether any applicable technology-based performance standards exist in Canada or internationally, and would be relevant as effluent discharge targets, in order to ensure principles of pollution prevention are applied. Consideration of this would	Denison should harmonize their proposed Effluent Release Targets with the technology-based performance standards that exist in the Metal and Diamond Mining Effluent Regulations where applicable, or other suitable international regulations.		Accepted	n/a

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					<p>help ensure that the proposed effluent discharge targets harmonize with existing federal, provincial/territorial, and/or municipal requirements. For example, there are release limits for radium-226, TSS, and pH outlined in the federal Metal and Diamond Mining Effluent Regulations, which have been demonstrated to be achievable in the uranium mine and mill industry.</p> <p>In addition, countries like the United States, where in-situ recovery has been conducted in the past, have specific technology-based limits. These are known as New Source Performance Standards and are identified in US Code of Federal Regulations (US CFR) 40, Chapter 1, Subchapter N, Part 440 – Ore Mining and Dressing Point Source Category. It is not clear whether these have been considered in Denison’s assessment. These should be considered when identifying suitable achievable technologies.</p>				
IR-18	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.2.3.9, Project Description  Appendix 8-E	<p><b>Context:</b> In Table 2.2-1 the upper bound Industrial Wastewater Treatment Plant (IWWTP) effluent quality final discharge targets for Constituents of Potential Concern (COPCs) are provided. General parameters (e.g., temperature, pH, etc.), and several Schedule 4 Substances with maximum authorized concentrations (lead, nickel, suspended solids, and un-ionized ammonia) under the Metal and Diamond Mining Effluent Regulations (MDMER) have not been provided in this table. There are several COPCs (aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese) for effluent characterization under Schedule 5 Section 4 of the MDMER that have not been provided in this table. Additionally, no information on water quality guidelines has been provided in this table.</p> <p>Furthermore, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the Canadian Council of Ministers of the Environment (CCME) water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p><b>Rationale:</b> ECCC requests the Proponent include the general water quality parameters that influence water quality thresholds, parameters in Schedule 4 and Schedule 5 Section 4 of the MDMER, and their respective water quality guidelines for consideration and transparency.</p> <p>Discharges from the proposed Project will alter water quality in the immediate receiving area, and this may include some sublethal effects on aquatic biota, which must be minimized. It remains the Proponent’s responsibility to adhere to the MDMER to ensure that effluent at the end-of-pipe from all final discharge points be non- acutely lethal and meet requirements for prescribed deleterious substances under Schedule 4 of the regulations.</p>	<ol style="list-style-type: none"><li>1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.</li><li>2. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 4 Substances under the MDMER with maximum authorized concentrations: lead, nickel, suspended solids, and un-ionized ammonia.</li><li>3. Update Table 2.2-1 and Appendix 8-E to include missing Schedule 5 Section 4 parameters required for effluent characterization under the MDMER: aluminum, mercury, iron, nitrate, thallium, phosphorus and manganese.</li><li>4. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E.</li><li>5. Describe additional mitigation measures that can be considered to minimize impacts to aquatic biota from uranium concentrations in effluent.</li></ol>	<p>In a supplementary submission provided on July 5<sup>th</sup>, 2024, Denison provided responses to the following outstanding requests:</p> <ol style="list-style-type: none"><li>1. Update Table 2.2-1 and Appendix 8-E to include all general parameters required for environmental effects monitoring: pH, temperature, hardness, alkalinity, and conductivity.</li><li>2. Update Table 2.2-1 and Appendix 8-E to include the following missing Schedule 5 Section 4 parameters required for effluent characterization: aluminum, iron, nitrate, thallium, and manganese. Provide further explanation if this information is not available.</li><li>3. Include all acute and chronic water quality thresholds for each parameter in Table 2.2-1 and Appendix 8-E. Include information on the concentrations of modifying environmental factors (i.e. pH, hardness, etc.) used to calculate these guidelines as footnotes.</li><li>4. Provide a clear commitment to ECCC for continued consultation on developing effluent discharge targets including a review of final_predicted effluent discharge targets once available.</li></ol> <p><i>This IR is resolved for the purposes of the EA process. The outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a licence.</i></p> <p>For item one, the effluent conductivity and TDS presented are not plausible, as explained in the FIRT’s May 31<sup>st</sup> draft comments. As the conclusions of significance for the EA are not influenced by this error, the correct effluent conductivity and TDS will be assessed during the BATEA assessment required for licencing, and predictions will be updated by Denison as needed. It is recommended that conductivity not be used as a surrogate for TDS while monitoring, until the conductivity-TDS relationship is corrected.</p> <p>Follow up for item three is addressed in IR-108 and IR-115.</p>	Accepted	n/a

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							To address item four, the Proponent will have to follow the guidance and requirements in REGDOC-2.9.2 to develop effluent discharge targets. The CNSC will engage with ECCC during this process as necessary.		
IR-19	-	ECCC	Change to an environmental component due to radiological contaminants	Section 2.2.4 Project Description	<p><b>Context:</b> In this section, it is proposed that the IWWTP precipitate pond will have a single geosynthetic composite liner system, which is used for ponds/pads that only store non-radioactive materials.</p> <p>However, from Section 2.2.3.9 on industrial wastewater treatment, it is unclear if the precipitates from the stage three neutralization process that are pumped to the IWWTP precipitates pond will have any residual radioactivity.</p> <p><b>Rationale:</b> For the protection of the surrounding environment, it is important that any ponds/pads that are expected to store radiological contaminants be designed to have proper controls (i.e., liners with monitoring systems) in place.</p>	<p>1. Confirm the characterization of the precipitates that are to be stored in the IWWTP precipitate pond.</p> <p>2. If radiological constituents are expected within those precipitates, update the draft EIS to ensure the proposed geosynthetic liner system for the IWWTP precipitate pond will be adequate to ensure the protection of the surrounding environment.</p>		Accepted	n/a
IR-20	-	NRCan	Fish and fish habitat	Section 2.3.3.1.1 Appendix 7-C	<p><b>Context:</b> The Proponent's objective for mining area remediation is to restore the groundwater within the confines of the freeze wall to an acceptable remediation target (EIS, sec. 2.3.3.1.1). The Proponent's acceptable decommissioning objectives for groundwater quality are provided in EIS Table 2.3-3 and in Table 3-5 of Appendix 7-C. These objectives were based on laboratory core flood tests performed by flushing samples of ore with groundwater and groundwater amended with sodium hydroxide or sodium bicarbonate. The composition of the remediated groundwater observed in the core flood tests serves as the source term for the post-decommissioning reactive transport modeling presented in section 4 of Appendix 7-C.</p> <p><b>Rationale:</b> In NRCan's opinion, it is important for reviewers to be able to assess the level of remediation achieved in order to reach the Proponent's decommissioning groundwater quality objectives. Therefore, the Proponent should provide complete water quality data for the pregnant lixiviant that remains in the ore zone after the end of mining and prior to any remediation.</p>	NRCan requests that the Proponent revise Table 3-5 of Appendix 7-C to show the water quality in lixiviant remaining in the ore zone at the end of mining, prior to remediation activities.		Accepted	n/a
IR-21	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 2.3.3.1.3, Project Description	<p><b>Context:</b> The decommissioning process for the wellfield and associated infrastructure is discussed, however there is no information provided on the potential risk for subsidence of the ground above the depleted uranium deposit. After the uranium has been dissolved and pumped to the surface, a cavity will be formed in the area where the uranium used to exist. This could destabilize the overlying substrates, causing the ground at the surface to sink in the future. There is currently no information regarding this risk, and how it may alter the overlying environment, surface water features, runoff, or existing nearby waterbodies.</p> <p><b>Rationale:</b> From a surface water and sediment quality perspective, it is important to understand how potential subsidence in the future post-decommissioning may affect the existing environment. It is currently unclear if there is any risk to the aquatic environment if subsidence were to occur and alter existing waterbodies, create new surface water features, or if there will be any risk to the</p>	Provide further information on the potential risks from subsidence including the probability of occurrence, how it may affect surface water features, and if there exists any risk to the planned decommissioning of waste management infrastructure.		Accepted	n/a

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					decommissioned onsite industrial landfill and industrial wastewater treatment plant precipitate pond.				
IR-22	-	NRCan	Fish and fish habitat	Section 2.10  Appendix 2-C, section 1.1.1.4	<p><b>Context:</b> With respect to the choice of In-Situ Recovery (ISR) mining solution, two alternatives were assessed: alkaline and acidic lixivants (Appendix 2-C, sec. 1.1.1.4). In the consideration of technical and economic feasibility of the alternatives (Table 2, Appendix 2-C), the Proponent concludes that: Option 1 (alkaline) is not technically feasible based on the uranium deposit geochemistry. Option 2 (acidic) is technically and economically feasible based on the uranium deposit geochemistry and ability to dissolve uranium. Accordingly, the alkaline alternative was not carried forward into the Environmental Assessment (EIS, Table 2.10-1; Appendix 2-C, Table 3).</p> <p>While acidic ISR solutions are widely used internationally (e.g., Kazakhstan), in the United States, where the environmental regulatory regime is more strict, alkaline solutions have been used exclusively since 1970.</p> <p><b>Rationale:</b> In NRCan's opinion, the Proponent should provide a more thorough technical justification for adopting an acidic ISR lixiviant.</p>	In the Alternative Means Assessment (Appendix 2-C), NRCan requests that the Proponent provides a more thorough technical justification for selecting an acidic ISR lixiviant rather than a less environmentally problematic alkaline leach used exclusively in the USA.		Accepted	n/a
IR-23	-	CNSC	Alternative Means	Section 2.10.2 Alternative Means  Appendix 2-A PD Engagement Tables  Appendix 2-C Alternative Means Assessment (p. 3)	<p><b>Context:</b> There are multiple rows in the Indigenous Tables for Appendix 2-A where comments and concerns raised by Indigenous Nations and communities and other members of the public were taken into consideration in the Alternative Means Assessment. However, it is unclear how these were considered.</p> <p>A few examples:</p> <ul style="list-style-type: none"><li>16-EN-DesNd-101.1: Interested in any future business opportunities that may be available as Denison advances their Wheeler River Project.</li><li>16-EN-ERFN-100.15: In that territory near the Wheeler River there are a lot of spawning and calving areas for moose, caribou; those creeks are for whitefish spawning. There's lots of heavy muskeg there. A lot of us have been there, and we'd like to know there'll still be access to the area.</li><li>6-EN-ERFN-100.17: Today because of climate change, things are starting to happen that normally didn't happen. Even the permafrost is now further down. In the Wheeler River area, where there's some permafrost, have your environment guys seen a change? Will there be a change? These are some of the questions that need to be answered in order to come out with a positive spin.</li></ul> <p><b>Rationale:</b> Appendix 2-C, Alternative Means assessment, states (p.3): "Engagement with Interested Parties naturally included alternatives means and the engagement input was included in the evaluation of alternative means. Refer to the references list below and <i>Appendix 2-A Engagement Database Summary – Project Description</i> for details of engagement information referenced in this alternative means assessment."</p>	Please explain how comments and concerns collected during Denison's engagement sessions were considered or influenced the alternative means assessment. Please include this information in the EIS and/or it's appendices.		Accepted	n/a



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					It is unclear in section 2.10.2 of the EIS, Appendix 2-A or Appendix 2C how the comments documented by Denison have been considered or influenced the alternative means assessment.				
IR-24	-	CNSC	Alternative Means	Section 2.10.2 Alternative Means	<p><b>Context:</b> While Appendix 2-C (Alternative Means Assessment) is detailed and includes all aspects of the Alternative means assessment that are required, the summary of the analysis and conclusions in Section 2.10.2 of the EIS lacks the level of detail required to understand the methodology used, and how Denison arrived at these conclusions.</p> <p><b>Rationale:</b> As noted in the Agency’s <a href="#">Operational Policy Statement on Addressing “Purpose of” and “Alternative Means” under the CEAA 2012</a>: “If a preferred means is selected, the analysis and the rationale for the choice should be explained from the perspective of the Proponent, and be documented in the EIS in sufficient detail to provide context for public and technical comment periods during the project EA, and ultimately to allow the decision maker to understand the choice.”</p>	<p>Please summarize the analysis of the alternative means assessment within the body of the EIS, in sufficient detail that a reader of the EIS has adequate information to understand the methodology used, and how Denison arrived at these conclusions.</p> <p>*Note: In addition to the adding text to summarize, Table 6 in Appendix 2-C could be useful to understanding table 2.10.1 in the EIS.</p>		Accepted	n/a
IR-25	-	CNSC	Current use of lands and resources for traditional purposes	Section 3, Sections 4, Section 5, Section 11 (and all other applicable once Métis Knowledge Use Study is completed)	<p><b>Context:</b> The EIS states that Denison is currently negotiating an agreement with MN-S and no traditional land use information is included throughout the EIS given no agreement was signed or Traditional land use information was shared at the time the EIS was being drafted.</p> <p>As noted in the EIS Denison has committed that: “As information becomes available from the agreed-upon process between the Métis Nation – Saskatchewan and Denison, it will be incorporated into the final EIS.” (p. 11-36)</p> <p><b>Rationale:</b> More information is required to better understand the issues and concerns, valued components, and current use of lands and resources for traditional purposes by MN-S near the Project area.</p> <p>Requirements are detailed in CNSC’s Generic EIS Guidelines, section 8.9: Indigenous land and resource use.</p>	<p>Please update the revised Draft EIS to reflect the integration of the Métis Use and Knowledge Study in the Draft EIS where applicable, when this study is completed and provided to Denison.</p> <p>In addition, please include an updated Issues and Concerns table that includes relevant information from the MN-S as a result of engagement activities and relevant MN-S studies in the next version of the EIS, as appropriate.</p> <p>Should this information not be made available to Denison at the time of revising the draft EIS, the next version of the EIS and the response to this IR should provide a status update on discussions and engagement with MN-S and next steps.</p>		Accepted	n/a
IR-26	-	CNSC	Precautionary principle and approach	Section 3.4.8 Lands Taken Up from an Indigenous Perspective (p. 3-14)	<p><b>Context:</b> Denison states: “Discrepancies among IK and western scientific information provide an opportunity for Denison to take a precautionary approach. Examples of concrete actions to address uncertainty in cases where IK and LK have differing conclusions on predicted Project effects include addressing uncertainty through monitoring and follow-up programs and communicating results of those monitoring and follow-up programs to demonstrate they have been responsive to the IK shared.” (p. 3-14)</p> <p><b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “In documenting the analyses included in the EIS, the Proponent will demonstrate that all aspects of the Project have been examined and planned in a careful and precautionary manner in order to avoid significant adverse environmental effects.</p>	<p>Please clarify how the precautionary principle, and the Privy Council Office’s, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making</a> has been considered and incorporated into the EA described in the EIS.</p>		Accepted	n/a



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					A document by Canada’s Privy Council Office, <a href="#">A Framework for the Application of Precaution in Science-based Decision Making About Risk, sets out guiding principles for the application of precaution to science-based decision making.</a> ” (Section 2.5)				
IR-27	-	CNSC	Cumulative Effects Analysis	Section 3.4.8	<p><b>Context:</b> During an outreach and engagement trip by CNSC in October 2022, an abandoned exploration camp adjacent to the proposed Wheeler River site was observed. This site has not been identified within the EIS as part of the cumulative effects assessment. As noted in section 3.4.8, KML has also raised concerns with Denison related to abandoned camps and industrial waste left with no programs for clean-up.</p> <p><b>Rationale:</b> Section 9.4.3 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> states that “The applicant shall assess any residual adverse environmental effects of the Project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area.”</p>	Please specify why abandoned exploration camps and industrial waste aren’t taken into consideration when completing cumulative effects assessment.		Accepted	n/a
IR-28	-	CNSC	Current use of lands and resources for traditional purposes	Section 4, IER and engagement appendices, including: Appendix 2-A Appendix 6-B Appendix 7-B Appendix 8-A Appendix 9-A Appendix 10-B Appendix 11-A Appendix 12-A Appendix 13-A Appendix 14-B	<p><b>Context:</b> The summary of issues tables do not appear to include all of the key issues identified by the Indigenous Nations and communities.</p> <p>For example, some Indigenous Nations and communities have shared concerns with respect to accident prevention and overall safety on the Key Lake road (Highway 914) due to increased traffic, impacts on treaty rights and section 35 rights due to cumulative impacts, and decommissioning, that were not captured in the issues and concerns and summary tables in Section 4.3.2 and in the IER.</p> <p>The tables in the engagement appendices include a column titled “Response (From Denison)”. The “Response” column does not include responses, but instead points the reader to where this comment or concern was considered. When navigating to the sections referenced, it is often unclear how this information was considered or influenced the assessment.</p> <p><b>Rationale:</b> Additional detail is required in order to ensure the key issues are all identified and to understand the status of validation for each issue raised and the response provided.</p>	<p>1. Update the summary of issues and concerns tables to include all relevant issues and concerns raised by each of the Indigenous Nations and communities to date, including concerns raised in the Indigenous Knowledge studies provided, additional engagement, and Draft EIS comments.</p> <p>2. Please include a column in the issues and concerns tables to clearly articulate the specific mitigation/monitoring measures that Denison have committed to, or any other measures, in order to address the concerns raised by each Indigenous Nation and community during the engagement process to date.</p> <p>3. Denison must demonstrate that each Indigenous Nation and community has validated that the summary of issues and concerns table reflects their understanding or agreement, and/or a path forward to complete the validation throughout the EIS and the updated IER.</p> <p>Validation must be complete by the time the technical review is complete, prior to submission of a final EIS. Should Denison not be able to fully address issues, concerns or feedback raised by any Indigenous Nation or community, through mitigation and monitoring measures, this should be documented, and a rationale provided.</p> <p>4. Update the response column of the Engagement tables to describe how these were considered in the sections referenced. Consider renaming this column to reflect the nature of the content (i.e., how the information was considered).</p>	<p>This response has been accepted. Denison has provided fully updated information as of January 2024.</p> <p>It will be expected that a fully updated IER and issues and concerns tables for each Nation as per the original IR, be provided in future submissions, for CNSC staff awareness of progress on this work. This includes updates on the validation from all Nations and communities, or updated paths forward to validation, if applicable.</p> <p>Note: In the IER Denison provides this information in charts categorized by Nation and in the Appendix 4-B of the EIS, Denison instead includes one large chart with the concerns categorized by key topic. CNSC would recommend using only one method for both the IER and EIS, preferring the format used in the IER by Indigenous Nation and/or community.</p>	Accepted	n/a

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IR-29	-	CNSC	Current use of lands and resources for traditional purposes	Section 4.3.2 and IER	<p><b>Context:</b> In this section, Denison includes the engagement with BNDN and includes a summary of issues and concerns table for the Nation. Within the history of interactions (Section 4.3.3.2.1).</p> <p><b>Rationale:</b> Denison states that they have been providing information on the Project to BNDN in 2019, 2021 and again in 2022 and that Denison and BNDN have not responded to date in order to advance further engagement and dialogue.</p>	Please ensure updated information of any additional engagement activities that Denison has completed with BNDN related to understanding their current and traditional land use and potential interests near the proposed project is provided.		Accepted	n/a
IR-30	-	CNSC	Indigenous physical and cultural heritage	Section 4.3.2.1.3, Table 4.3.2	<p><b>Context:</b> Concerns were raised during engagement sessions that “Elders are not being consulted as most of the engagement has been through online means and without a translator”.</p> <p><b>Rationale:</b> There’s no indication that a translator has been employed to engage with Elders since 2021 in the engagement Table 4.3.2.</p>	How has Denison adapted engagement with Elders from the ERFN since receiving this comment on March 31, 2021?		Accepted	n/a
IR-31	-	CNSC	Indigenous Engagement	Section 4.4.2.1.3, Key Engagement Activities (p. 4-88)	<p><b>Context and Rationale:</b> Regarding the following: “An open house for the general public was planned to be hosted in 2022 on preliminary effects and mitigation, but due to concerns identified by MN-S about hosting a public open house in a community with a significant Métis population, this meeting was postponed by Denison. Denison looks forward to rescheduling the meeting in collaboration with the MN-S.” (p. 4-88)</p>	Please provide an update on the evolution or progress of this engagement with local communities, following collaboration with MN-S (or otherwise).		Accepted	n/a
IR-32	-	CNSC	Current use of lands and resources for traditional purposes	Section 5.3  Section 9.0 Terrestrial Environment	<p><b>Context:</b> Some sections of the EIS (such as Fish and Fish Habitat, Indigenous Lands and resource use) indicate that Indigenous and/or local knowledge was considered when defining the spatial boundaries. However, this is not included in other sections, such as Terrestrial Environment.</p> <p><b>Rationale:</b> Section 5.2.2 of CNSC’s Generic EIS Guidelines require that spatial boundaries be defined by considering, but not limited to, the following criteria: Community and Indigenous traditional knowledge, ecological and technical considerations.</p>	<p>Please provide any additional details about how any comments or concerns raised were considered in defining the spatial boundaries with Indigenous Nations and communities with respect to spatial boundaries, for the Terrestrial Section and which specific Indigenous Nations and communities were engaged on these topics and how their input and knowledge was incorporated into the EIS.</p> <p>If already presented in the EIS text body, please indicate where this information can be found or link to Section 4 of the EIS or in the IER.</p>		Accepted	n/a
IR-33	-	CNSC	Residual Effect Characterization	Section 5.8.1, Definitions for Residual Effects Characterization and Significance  Section 5.8.1.1, Residual Effects Characteristics  Section 8, Table 8.3-9: Fish and Fish Habitat -	<p><b>Context:</b> Denison uses specific criteria (Residual Effect Characteristics: Direction, magnitude, geographic extent, duration, frequency, reversibility, context and likelihood) and associated ratings (e.g., adverse/positive, low/moderate/high) for the predicted effects assessment. However, it is unclear whether an aggregation method was used in order to determine whether impacts will be significant or not significant, depending on the combination of rating categories (i.e., weightings that were calculated, use of decision rules).</p> <p>For example, medium term and long term are both used to represent the same time category: “Effects are expected to last between 3 to 38 years (i.e., effects expected during Construction through to the end of post-Decommissioning).” (See table 8.4-13 on p. 8-200 compared to table 8.4-12 on p. 8-199 and table 8.5-9 on p. 8-246).</p>	<p>If an aggregation method was used and ratings (e.g., High, medium, low) were weighted, what weightings were used, how were these calculated? Please also describe any decision rules that informed the determination of significance.</p> <p>If no aggregation was used, how did Denison ensure that results were consistent, given the varying rankings for each of the key criteria, and varying combination?</p> <p>Regarding inconsistencies in ratings, please use consistent terminology for same rating.</p>		Accepted	n/a

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				Surface Water Quality	<p><b>Rationale:</b> The Generic Guidelines state: “The method used to describe the level of the adverse effect should be transparent and reproducible.”</p> <p>In Table 8.3-11, duration was moderate, but again uses same rationale. There is no 'moderate' in Table 8.3-8, and by the same rationale, this should be medium-term to be consistent with definitions provided and summary Table 8.3-12.</p> <p>It was noted that all three tables should be deemed medium-term based on definitions of ratings outlined in Table 8.3-8. Frequency was also showing up as "continuous" and "continuously" in these tables.</p>				
IR-34	-	CNSC	Cumulative Effects Analysis	Section 5.9.2.2 (p. 5-41)	<p><b>Context:</b> Denison identifies the Gryphon deposit as a project that is not reasonably foreseeable. The direct quote from the EIS indicates that the “Development of the Gryphon deposit as an underground mine was evaluated at the prefeasibility level in 2018 but has not advanced to feasibility study or EA. Denison has not announced an intent to proceed with the development of the Gryphon deposit.” (p. 5-41)</p> <p><b>Rationale:</b> The guidance <a href="#">Assessing Cumulative Environmental Effects under the CEAA, 2012</a> defines <i>Reasonably Foreseeable</i> as a “physical activity [that] is expected to proceed, e.g. the Proponent has publicly disclosed its intention to seek the necessary EA or other authorizations to proceed.”</p> <p>In a press release by Denison Mines (2018: <a href="#">Denison announces decision to advance Wheeler River Project following positive PFS results</a>), Denison publicly disclosed intention to seek the necessary EA for Gryphon to proceed: “After careful consideration of the risks and opportunities associated with permitting and concurrent advancement of project engineering activities, the Company has decided to submit a PD and initiate the EA process in early 2019 for the Phoenix ISR operation, and to bring the Gryphon operation forward, at a later date, as required to achieve the PFS plan of Gryphon first production by 2030.”</p> <p>Further, Denison’s <a href="#">Wheeler River Webpage</a> references a “start of pre-production activities for the Gryphon operation in 2026”</p>	Please update the cumulative effects assessment in the EIS to include the Gryphon deposit as a Present or Reasonably Foreseeable Project.		Accepted	n/a
IR-35	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 6, Chemicals of Potential Concern	<p><b>Context:</b> The use of petroleum products (e.g., propane, gasoline, and diesel) at the Denison Mines Wheeler River site is associated with vehicles and periodic operational testing of emergency generators as well as stationary pumps for emergency power or fire water systems. Thus, the air emissions will contain acrolein.</p> <p><b>Rationale:</b> This chemical of potential concern (COPC) poses potential risks to human health via inhalation, but acrolein appears to have been missed or deemed insignificant. However, its consideration in the assessment will provide information on the significance of the associated risk.</p>	Please consider acrolein in the assessment or provide a rationale for its exclusion.		Accepted	n/a

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IR-35	IR-35-R1	Health Canada (HC)	Change to an environmental component due to hazardous contaminants  IR-35 Response from Denison	Section 6, Chemicals of Potential Concern	<b>Context:</b> Potential health risks from long-term exposure to acrolein were not considered in the Proponent’s response to IR-35.  <b>Rationale:</b> No annual predicted concentrations for acrolein were provided in the draft EIS or in the response to IR-35. Concentrations were modelled for short-term exposure (1h and 24h) only in the draft EIS and compared to the 1-hour and 24-hour Ontario Ambient Air Quality Criteria for acrolein. It is Health Canada (HC) guidance to assess both potential short and long-term health effects. The predicted annual concentrations for acrolein should be compared against chronic reference concentrations (e.g., the USEPA Reference Concentration (RfC) <sup>1</sup> (0.02 µg/m <sup>3</sup> ) and the Tolerable Concentration (TC) from Environment and Climate Change Canada and Health Canada’s Priority Substances List Assessment Report <sup>2</sup> (0.4 µg/m <sup>3</sup> )).	Use predicted annual concentrations and available chronic reference concentrations to account for potential health risks from long-term exposure to acrolein to support the decision to screen out acrolein as a COPC from further assessment.	This IR has been accepted. In a June 27 <sup>th</sup> , 2024 supplementary submission, updates were made to Table 3-10 in the Revised DRAFT EIS (January 2024; Appendix 10-A - Environmental Risk Assessment) to include the predicted maximum annual concentration for acrolein at the fence line, as noted in Denison’s Response to IR-35.	Accepted	n/a
IR-36	-	CNSC	Other	Section 6, Table 6.1-11 Baseline External Gamma Monitoring	<b>Context:</b> For one of the exposures in the summary table for baseline external gamma monitoring (Table 6.1-11), the cell states "Destroyed in Field".  <b>Rationale:</b> No rationale or indication as to why or how it was destroyed is provided.	Please provide any additional info available as to how equipment was destroyed.		Accepted	n/a
IR-37	-	CNSC	Air Quality	Section 6.1.1.1, CALPUFF model	<b>Context:</b> "The Saskatchewan Ministry of Environment (SK MOE) has developed the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) to assist Proponents in conducting air dispersion modelling assessments in a consistent manner. The guideline defines the recommended approach for dispersion modelling assessments in Saskatchewan, including model selection, emission source characterization, and the determination of compliance criteria to apply."  <b>Rationale:</b> Saskatchewan air quality guideline requires consultation on use of CALPUFF model, where it states" The ministry acknowledges that there will be situations where specialized air dispersion models such as CALPUFF, CALQ3HCR and others may be applicable. The use of specialized models requires consultation with the ministry” OR “Pre-consultation with the ministry must be undertaken prior to the facility conducting specialized modelling (p. 3)." It is not clear if Denison Mines consulted with Saskatchewan MOE on use of CALPUFF model.  Noted that Section 6.1.4.2 is again referring to Saskatchewan MOE guidance for justification, but no indication that they consulted with them (a requirement).	Please confirm and provide a summary of the consultation with the Saskatchewan MOE on the use of CALPUFF model for the Wheeler River EIS as per provincial air quality guidelines.		Accepted	n/a
IR-38	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.1, Potential Interactions Between the Project and Valued	<b>Context:</b> In this section, the Proponent identifies primary interactions between Project activities and air quality valued components and their associated key indicators. These primary interactions may result in an adverse effect on the valued component. Among the primary interactions are the use of emergency generators in a backup role should there be an interruption of the provincial electrical grid.	Provide an evaluation of a worst-case scenario of grid power interruptions (i.e., average aggregate length of power outages) during the winter months for this section of the electrical power grid.		Accepted	n/a

<sup>1</sup> [https://iris.epa.gov/static/pdfs/0364\\_summary.pdf](https://iris.epa.gov/static/pdfs/0364_summary.pdf)

<sup>2</sup> [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/acrolein/acrolein-eng.pdf)

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				Component / Key Indicators	However, it is not evident what is the anticipated frequency and duration of interruption to grid power.  <b>Rationale:</b> The Proponent states in the conservative operation scenario that while the site will be powered from the provincial grid at the operations stage, the back-up power generators were assumed to be operating under emergency conditions as a worst-case scenario. ECCC acknowledges the positive impact of extending the electrical grid to the Project site with resultant reduction in generator emissions. The impact of an interruption in grid power would be greatest during the winter months when energy use would be greatest and surface-based temperature inversions, which vertically trap emissions, would be strongest.				
IR-39	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 6.1.4.2, Potential Project-Related Effects	<b>Context:</b> In this section, the Proponent discusses the approach taken for air dispersion numerical modelling. Using their CALMET data set, the Proponent’s CALPUFF model runs indicated exceedances for 24- hour total suspended particulates, 24-hour particulate matter (PM10), 1-hour nitrogen dioxide, and 24-hour uranium concentrations. However, there is no mention of possible diurnal and seasonal occurrences of the exceedances.  <b>Rationale:</b> Adequate assessment of the modelling results requires knowledge of the temporal characteristics for the exceedances. For example, wintertime exceedances may be due to strong temperature inversions, especially during the overnight to morning hours. These strong inversions are challenging for numerical models to capture. Exceedances during warmer months may be due to specific wind directions, which transport emissions directly to downwind receptors.	Provide additional information on any diurnal and seasonal influences of the modelled exceedances.		Accepted	n/a
IR-40	-	CNSC	Air Quality	Section 6.1.6.2.1, Air quality significance determination	<b>Context:</b> Significance determination was not conducted for air quality due to interconnectedness with other assessment endpoints.  <b>Rationale:</b> It is not clear where and how these air quality assessment endpoints were factored into the assessment.	Please provide additional information to demonstrate where and how these air quality assessment endpoints were factored in.		Accepted	n/a
IR-41	-	CNSC	Air Quality	Section 6.1.6.2.2, Background concentrations	<b>Context:</b> The EIS states that "Conservative regional background concentrations from the Saskatchewan Air Quality Modelling Guideline (SK MOE 2012a) and based on the La Loche monitoring station were used for particulate matter, NO2, SO2, and CO. The La Loche monitoring station is located near anthropogenic sources, while the Project is in a remote area removed from anthropogenic sources."  <b>Rationale:</b> If La Loche monitoring station is located near anthropogenic sources and the Project is not, use of this data is not a conservative or realistic representation of background.  For a realistic approach, background data considered should be upper 95th percentile (or max if n<10) from an area representative of project location  For a conservative approach, background data from an area located even further	Please provide additional rationale to justify the appropriateness of La Loche monitoring station concentrations as background for project location.		Accepted	n/a



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					<p>from anthropogenic sources (if this exists) should be used, or an upper limit of background less than upper 95th should be applied as the background.</p> <p>Upper limit of background is used to screen out COPCs or often subtracted from total to ascertain relative contribution / impact from source, so using a higher upper limit may result in COPCs screening out or appear to have a lower relative contribution. If background was added to source, then approach used would be conservative. If this is the case, confirmation and reference to where this is discussed in methodology should be provided.</p>				
IR-42	-	HC	Physical stressors (noise and vibration)	Section 6.2.4.2.2, (p. 6-66)  Section 6, Section 6.2.9, (p. 6-72)	<p>Nighttime noise impacts are not adequately considered for human receptors.</p> <p><b>Context:</b> The EIS states in Section 6.2.9 that, “While the predicted sound levels were less than the guideline values, the increase from baseline was predicted to be noticeable” (p. 6-72). No information is provided on individual noise events occurring during the nighttime period.</p> <p><b>Rationale:</b> While the increase from baseline is predicted to be noticeable, it is important to also consider that changes to the characteristics of the sound from baseline (e.g., a change in frequency, changes in sound modulation, increased impulsiveness or tonality, or a shift in noise from the daytime to being more at night) may cause noise to be even more noticeable. Consult <a href="#">ANSI S12.9-2005/Part 4</a>, clause A.1.3 for further information.</p> <p>In particular, consideration should be given to potential impacts on sleep, where adverse impacts are reported to begin when sound levels inside bedrooms exceed 30 dBA for continuous noise sources and 45 dBA LAmax for discrete noise events (<a href="#">WHO, 1999</a>).</p>	<p>1. Provide a description of the project- related nighttime noise sources that may impact human receptors as well as a qualitative discussion of the resulting potential impacts on perception considering not only changes in sound levels but also sound characteristics (e.g., tonality, impulsivity).</p> <p>2. Confirm whether individual nighttime noise events exceeding 45 dBA LAmax outdoors (or 30 dBA indoors) are expected to occur more than 15 times over the nighttime period at any nearby potentially noise-sensitive human receptor location(s). This may be of particular concern if some construction and/or operations activities occur during sleeping hours.</p>		Accepted	n/a
IR-43	-	HC	Physical stressors (noise and vibration)	Section 6.2.5, (p. 6-66)  Section 6.2.5, (p. 6-71)	<p>Mitigation measures for project-related noise were not identified for the Construction phase.</p> <p><b>Context:</b> The mitigation measures provided in Section 6.2.5, including a complaint management system is also to be implemented as part of the EMS, are only proposed for the operations phase.</p> <p>However, construction activities are predicted to last more than one year. Construction noise will involve the use of equipment operating at the site, construction of surface facilities, drilling, and partial operation of the freeze plant. It will also include regular truck trips and air traffic for personnel changes.</p> <p><b>Rationale:</b> It is unclear if listed mitigation measures also apply to the construction phase (or only to the operations phase).</p>	<p>1. Clarify whether mitigation measures and the proposed EMS apply to the Construction phase. If not, identify mitigation measures for noise impacts related to Construction phase activities, and consider applying the EMS to the Construction phase and implementing the community complaints and response procedure from the beginning of construction activities.</p> <p>2. Health Canada suggests that construction noise lasting longer than 1 year be assessed as operational noise, and that noise mitigation measures be applied also to the construction phase. Special consideration should be given to mitigation measures for construction noise that occurs at night, in order to minimize impacts on sleep (i.e., avoiding tonal or impulsive noise sources at night).</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of Appendix H of Health Canada (2017), which identifies additional construction noise</p>		Accepted	n/a



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						mitigation measures that could also be considered to reduce project- related noise.			
IR-44	-	HC	Physical stressors (noise and vibration)	Section 6.2.8, (p. 6-71)	<p>The noise complaints resolution and response procedure is not sufficiently described in the EIS.</p> <p><b>Context:</b> Section 6.2.8 discusses Monitoring and Follow- up. The Proponent indicates: “The EMS will also include a community complaints and response procedure” (p. 6-71).</p> <p><b>Rationale:</b> Details have not been provided regarding how the complaints would be received, addressed or what the timelines will be for providing a response or resolution. It is important to provide information to potentially affected communities in advance of particularly noisy activities. Community consultation and advanced notification of noisy activities has been shown to reduce complaints (see <a href="#">Health Canada, 2017</a>).</p>	<p>1. Provide the details of the noise complaints resolution and response procedure as per <a href="#">Health Canada (2017)</a>.</p> <p>2. Consider conducting community consultations and/or implementing an advanced community notification system to pro-actively reduce the probability noise-related impacts and complaints.</p>		Accepted	n/a
IR-45	-	HC	Change to an environmental component due to hazardous contaminants	Section 6 Air Quality Technical Supporting Document Section 6.3.1	<p>The carcinogenic risks of diesel exhaust from the Project should be assessed.</p> <p><b>Context:</b> Section 6.3.1 discusses modelled predictions of exceedances for Particulate Matter (PM). TSD p. 22 states: “concentrations of 24-hour PM2.5 are also elevated around the standby generators at the freeze plant, which emit fine particulate matter from combustion of diesel fuel". However, diesel particulate matter is not evaluated for the whole project in the air quality model or the air quality assessment.</p> <p><b>Rationale:</b> Health Canada has determined that diesel exhaust is carcinogenic in humans which is consistent with the conclusion of the International Agency for Research on Cancer (IARC), and that diesel exhaust is associated with significant population health impacts in Canada.</p> <p>To characterize the carcinogenic risk of diesel exhaust from a project, HC has published a report (2022)<sup>1</sup> which provides a quantitative assessment of the relationship between ambient PM2.5 exposure and lung cancer risk. Specifically, this report quantifies the increase in risk of lung cancer mortality (over the baseline rate in the Canadian population) due to PM2.5 exposure.</p> <p>This quantitative assessment is considered appropriate to characterize risks from diesel PM given the contribution of diesel exhaust to ambient PM2.5 in Canada, and that the carcinogenicity of diesel exhaust has generally been evaluated based on the respirable PM fraction<sup>1,2,3</sup>.</p> <p><b>References:</b> [1] HC. 2022. Lung Cancer and Ambient PM2.5 in Canada: A Systematic Review and Meta-analysis. Available at: <a href="https://publications.gc.ca/site/eng/9.907038/publication.html">https://publications.gc.ca/site/eng/9.907038/publication.html</a></p>	<p>1. Evaluate the carcinogenic risk of all potential diesel exhaust from the Project based on the approach proposed by Health Canada (2022). Additional guidance (Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation”) is provided as an appendix to this comment table.<sup>i</sup></p>		Accepted	n/a

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					<p>[2] HC. 2016. Human Health Risk Assessment for Diesel Exhaust. Available at: <a href="http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf">http://publications.gc.ca/collections/collection_2016/sc-hc/H129-60-2016-eng.pdf</a></p> <p>[3] IARC. 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. <a href="https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015">https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-IdentificationOf-Carcinogenic-Hazards-To-Humans/Outdoor-Air-Pollution-2015</a></p>				
IR-46	-	HC	Physical stressors (noise and vibration)	Appendix 6-A Table A-1	<p>Low-frequency noise and associated potential human health effects were not assessed.</p> <p><b>Context:</b> Some equipment that may emit low-frequency noise (LFN) have been listed in Table A-1: Assessment Scenarios and Sound Level Data (Section 6 Appendix A); however, no information describing potential impacts of this type of sound on nearby human receptors are presented.</p> <p><b>Rationale:</b> Low frequency noise can be associated with the introduction of noticeable vibrations and rattles in nearby structures. Research indicates that annoyance related to noise is greater when low-frequency noise is present (ISO 1996-1:2003). As sound environments are usually characterized using A-weighted decibel levels (dBA) that reflect the frequencies most audible to the human ear, the impacts of low- frequency noise may need to be assessed separately.</p>	1. Clarify whether any project-related activities (construction, operation and/or decommissioning) may produce LFN that could impact off-site human receptors. Evaluate LFN in the noise assessment, if and where applicable. See Appendix C of <a href="#">Health Canada (2017)</a> for a discussion of LFN.		Accepted	n/a
IR-47	-	ECCC	Air Quality	Appendix 6-A, A.1	<p><b>Context and Rationale:</b> Verification of the following calculation is required for assessing predicted emissions of dust from general construction. It appears the result of 0.70 ton/acre/month is incorrect and should instead be 0.314 ton/acre/month.</p> <p>Appendix 6-A, Appendix A, A.1 (p. A4) TSP Emission Factor for General Construction:</p> <div><math display="block">EF\ (TSP) = 0.11\ \frac{ton}{acre\ month} \times 1.2\ \frac{ton}{acre\ month} \div 0.42\ \frac{ton}{acre\ month}</math><math display="block">= 0.70\ \frac{ton}{acre\ month}</math></div>	Explain how the emission factor total suspended particulates (EF (TSP)) result was obtained or rectify if it is incorrect and update the draft EIS to reflect the correction.		Accepted	n/a
IR-48	-	HC	Physical stressors (noise and vibration)	Appendix 6-E, Figure 6.2.3, p. 6-57	<p>Noise-sensitive receptors are not included on noise contour maps.</p> <p><b>Context:</b> Noise-sensitive receptors are identified in the acoustic model report in Section 6 Appendix 6-E but not presented on any maps in the atmospheric and acoustic sections of the main report (Figure 6.2-3).</p> <p><b>Rationale:</b> The noise assessment typically includes a map illustrating modelled noise levels from the Project at receptor locations in the study area.</p> <p>Certainty regarding the presence of human receptors in the regional study area is also recommended in order to assess cumulative impacts.</p>	1. For more clarity, identify noise-sensitive receptors on Figure 6.2-3: Noise Assessment Study Area as well as on contour maps showing the baseline and predicted noise levels.		Accepted	n/a

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IR-49	-	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The Noise Source Characterization is incomplete.</p> <p><b>Context:</b> Section 3.0 of the Draft EIS Section 6 Appendix 6- E discusses Source Characterization. There is no detail regarding potential tonal or impulsive noise sources in Section 3.0.</p> <p><b>Rationale:</b> The draft EIS should include a description of sound source characteristics (e.g., tonal, impulsive, highly impulsive) in order to properly inform the quantitative noise assessment and which assumptions/adjustments need to be applied and to properly evaluate impacts of project noise on health of affected receptors.</p>	1. Identify any tonal, regularly impulsive, highly impulsive, or high-energy impulsive noises likely to be produced during project activities that could be audible at noise sensitive receptors. Furthermore, describe the timing (e.g., hours of night-time activities), frequency and duration of noise events, and their sound characteristics, including frequency spectrum. See <a href="#">Health Canada (2017)</a> for details.		Accepted	n/a
IR-50	-	HC	Physical stressors (noise and vibration)	Appendix 6-E, 4.0 Table A.1	<p>The description of noise modelling does not document or justify the use of sound level adjustments.</p> <p><b>Context:</b> ISO Standard 9613-2 has been used for the sound level modelling; however, it is unclear if all applicable adjustments have been considered as per ISO 1996-1:2016 (Table A.1).</p> <p><b>Rationale:</b> When modelling techniques are used to estimate present (baseline) or future (construction and operational) sound levels, these techniques and any accompanying assumptions, including the use of sound level adjustments, it is important to provide appropriate documentation and justification.</p> <p>Note that in situations where more than one source characteristic adjustment is applicable (e.g., impulsive or tonal), only the higher of the adjustments is used. However, all time-of-day adjustments and the quiet rural area adjustment are to be added to the highest of the applicable source adjustments.</p>	1. Clarify whether ISO-1996-1:2016 has been considered in the modelling to account for any applicable sound level adjustments. Adjustments should be considered when calculating Ln (night- time sound level) and Ldn (day-night sound level). In addition, if applicable, adjustments can be applied depending on the noise characteristic (impulsive, highly impulsive, etc.), and because the Project location is considered to be in a quiet rural area. See: ISO 1996-1:2016 and Health Canada (2017) for details.		Accepted	n/a
IR-51	-	CNSC	Geology and Groundwater	Section 7, Figure 7.8-1  Appendix 7-C	<p><b>Context:</b> Figure 7.8-1 (p. 7-107, main EIS report) shows monitoring well cluster outside of the freeze wall.</p> <p><b>Rationale:</b> It is not clear what the targeted hydro-stratigraphic units of each monitoring well cluster are. In addition, it is not clear how the establishment of the freeze wall and any leakage from the brine solution will be monitored. If there is any “window” within the freeze wall (i.e., the freeze wall is not continuous), is there any way to identify that?</p>	<p>Please clarify the targeted hydro-stratigraphic units of each monitoring well cluster in Figure 7.8-1 (p. 7-107, main EIS report).</p> <p>Please clarify how the establishment of a continuous freeze wall will be monitored.</p>		Accepted	n/a
IR-52	-	ECCC	Fish and fish habitat	Section 7, Geology and Groundwater  Appendix 7	<p><b>Context:</b> According to the Proponent, “an acidic or low pH mining solution will be used to leach uranium ores from the ground. Mining solution may be a mixture of sulphuric acid, hydrogen peroxide, ferric sulphate, and freshwater (from shallow groundwater well or surface waterbody) or recycled water.</p> <p>Wellfield will consist of a combination of injection and recovery wells, in the general the arrangement of one recovery well in the center surrounded by four injection wells (5-spot pattern) with about 5 to 10 m between wells. The final wellfield is expected to include approximately 300 wells over an area measuring 90 m wide x 750 m long”.</p>	<p>1. Explain why 3D hydrogeology and contaminant transport numerical modelling of the injection and extraction wells was not presented.</p> <p>2. Alternatively, provide simulation results and a sensitivity analysis for the injection and extraction of the acidic solution in the mining area.</p>		Accepted	n/a

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					<p>As the components/contaminants mentioned in the description of the hydrogeologic contaminant transport processes above may be transported to Whitesfish Lake through groundwater, the injection and recovery wells should be included in the model.</p> <p><b>Rationale:</b> The hydrogeologic contaminant transport processes described above are an important part of the proposed Project and it is not clear why numerical modelling results and a sensitivity analysis for the above processes was not presented.</p>				
IR-53	-	CNSC	Geology and Groundwater	Section 7.3, Table 7.3.-2  Appendix 7-C	<p><b>Context:</b> The field-based hydraulic conductivity values (referred to as K values hereafter) in Table 7.3-2 (p. 7-32, main EIS report) indicate that the K value ranges of upper and lower sandstone aquifers have a significant overlap with those of the intermediate sandstone aquitard.</p> <p>However, the calibrated K value in Table 2-2 (p. 2.7, Appendix 7-C)) for the intermediate sandstone aquitard is close to the lower end of the field-based K value range, while the calibrated K values for the upper and lower sandstone aquifers are close to the upper end of the field-based K value range.</p> <p><b>Rationale:</b> It is not clear how representative the calibrated K values are of the field-based K values for each hydro-stratigraphic unit, and if the significant difference between the K values for the upper and lower sandstone aquifers and those for the intermediate sandstone aquitard is supported by the geological properties of the corresponding stratigraphy units.</p> <p>It is stated in the report (p. 7-36, main EIS report) that “Vertical fracture or fault zones that hydraulically connect the Local (upper) and Semi-Regional (lower) groundwater flow regimes are present throughout the Athabasca Basin”. But fractures and fault zones are not explicitly considered in the model. There is possibility that these features could increase the hydraulic connection between the upper and lower sandstone aquifer.</p>	Please provide additional information to support the representativeness of the calibrated K values (for example, use graph to present the measured K values and the calibrated K values).	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>Please include figure(s) (y axis representing depth below ground, x axis representing K, different length of vertical line segment representing different packer testing intervals, etc.) showing the field measured K values, as well as the calibrated K value for the upper sandstone aquifer, intermediate aquitard, and lower sandstone aquifer. This would help demonstrate the distribution of field measured K values and representativeness of calibrated K values.</p>	Accepted	n/a
IR-54	-	CNSC	Geology and Groundwater	Section 7.3.1	<p><b>Context:</b> EIS states: “The most important associated topographic features in the region are the northwest to southeast trending drumlins and eskers....” This is not the trend shown on the provided maps, nor described elsewhere in the report, e.g., Section 7.3.2.1</p> <p><b>Rationale:</b> Inaccurate information in the EIS</p>	Please update the EIS where required to accurately describe the topographical features.		Accepted	n/a
IR-55	-	NRCan	Fish and fish habitat	Section 7.3.3.1;  Appendix 7-A, sections 3.4, 3.5, 3.8, 4.2;	<p><b>Context:</b> According to the Proponent's conceptual hydrogeological model (EIS, sec 7.3.3, Figure 7.3-7, Table 7.3-2; Appendix 7-A, sec. 3.4, Table 3-4), the horizontal hydraulic conductivity of the Intermediate Sandstone (Iss) aquitard is 8.4 E-09 m/s based on field measurements. The Proponent further assumes a 10:1 anisotropy ratio for the unit (Appendix 7-A, sec. 3.5.1) such that its estimated vertical conductivity is 8.4 E- 10 m/s. Based on this information, structural geology and groundwater quality data, the Proponent concludes that the connectivity between</p>	In the "Parameter Uncertainty Assessment" for the numerical groundwater flow model (Appendix 7-C, sec. 2.8), NRCan requests that the Proponent develop a calibrated numerical model with an alternate conceptualization of the Intermediate sandstone as a "leaky" aquitard with a horizontal hydraulic conductivity on the order of 1 E-07 m/s and a much lower anisotropy ratio. This should involve modifying the model		Accepted	n/a

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				Appendix 7-C, section 2.8	<p>the Upper sandstone aquifer and the Intermediate Sandstone aquifer (sic) is limited (EIS sec. 7.3.3.3; Appendix 7-A, sec. 4.4). While acknowledging the paucity of conductivity data and the Proponent's attempt to mitigate this by leveraging collateral information on fracture frequency and clay content (Appendix 7-A, sec. 3.3.1), NRCan considers that the hydraulic conductivity assigned to the Iss aquitard is unrealistically low and inconsistent with the following lines of evidence: a) The conductivity value for the Iss is based on the geometric mean of 18 field measurements, 12 of which are from the same borehole (WR-695) located in the Gryphon zone, beyond the domain of the numerical model (Appendix 7-A, Appendix C, Table C-1). If the conductivity data were weighted equally, with one value per borehole, the geometric mean would be approximately 1.5 E-07 m/s, or two orders of magnitude higher; b) The Proponent notes that vertical fracture or fault zones that hydraulically connect Upper and Lower aquifer systems are present throughout the Athabasca Basin including in the Phoenix area (EIS, sec. 7.3.3.2.2; Appendix 7-A, sec.3.8.1); c) The Proponent notes that groundwater chemistry data (major ions) corroborate the presence of structurally controlled vertical hydraulic connections between the Upper and Lower aquifer systems (EIS, sec. 7.3.3.2.2, sec. 7.3.3.3; Appendix 7-A, 4.3.3); d) Groundwater chemistry data (Appendix 7-A, sec. 4.2, Table 4-1) also indicate the presence of detectable levels of "bomb" tritium (indicating recharge waters &lt; 50 years old) in the Lower Sandstone Aquifer (GWR-025, GWR-008, GWR-033) and in the Iss (GWR-009, GWR-034), outside the area of U mineralization. This is also evidence of vertical hydraulic connection through the Iss. In summary, whereas the Proponent conceptualizes the Iss as a very low-permeability unit with localized vertical hydraulic connection (WS Shear), NRCan interprets the Iss as a "leaky" aquitard with pervasive fracture-controlled and much higher vertical hydraulic conductivity.</p> <p><b>Rationale:</b> The significance of NRCan's alternative interpretation of the Iss hydrostratigraphic unit is that deep groundwaters, including mining-impacted waters, may represent a greater proportion of baseflow discharge to Whitefish Lake than the 1% currently estimated in the Proponent's groundwater flow model (EIS, sec. 7.4.2.1, p.7-51; Appendix 7-C, sec. 2.6.3).</p>	lateral boundary conditions to allow for groundwater inflow/outflow across the entire thickness of the Athabasca Sandstone Group rather than just the Lower Sandstone aquifer.			
IR-56	-	CNSC	Geology and Groundwater	Section 7.3.3.2	<p><b>Context:</b> It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.”</p> <p><b>Rationale:</b> It is not clear why the exploration boreholes have not been decommissioned.</p>	Please clarify why the exploration boreholes have not been decommissioned and the timeline to decommission the boreholes according to appropriate guidelines/procedures. If it is not decommissioned before the ISR operation, what is the potential impact of the unplugged boreholes on the mining solution migration?		Accepted	n/a
IR-57	-	NRCan	Fish and fish habitat	Section 7.3.3.2 Appendix 7-A,	<p><b>Context:</b> The Proponent's conceptual model of groundwater flow in the Local Study Area (EIS, sec 7.3.3, Figure 7.3-7) involves an unconfined Upper system hosted by overburden and the Upper sandstone aquifer, and a Lower confined system hosted</p>	In section 2.5.2 of Appendix 7-C (Calibration Results), the Proponent should demonstrate that the numerical groundwater flow model reproduces quantitatively or at least		Accepted	n/a



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				sections 3.1.2 and 3.7  Appendix 7-C, section 2.5.2	<p>by the Lower Sandstone Aquifer. The Intermediate Sandstone aquitard acts as a confining unit. Vertical heads gradients are directed downwards west of the Phoenix deposit and upwards beneath surface water receptors including Whitefish Lake (EIS, sec. 7.3.3.2).</p> <p>Using head data from nested monitoring wells (Appendix 7-A, sec. 3.1.2, Table 3-1) the Proponent calculates upward gradients in cluster WR-607, between the Lower Sandstone aquifer and the Upper Sandstone aquifer. In cluster LA-5, an upward gradient is calculated between the Upper Sandstone and the overburden unit (Appendix 7-A, Table 3-5). In areas west and south-west of the Phoenix deposit, groundwater is estimated to flow downward under a vertical gradient of approximately 0.015 m/m (Appendix 7-A, p.3-15).</p> <p><b>Rationale:</b> In NRCan's opinion, the Proponent's interpretation of vertical head gradients in the LSA is not fully accurate. For the "Up-Gradient" monitoring well cluster, the tabulated head data (Appendix 7-A, Table 3-1) and data logger hydrographs (Appendix 7-A, Appendix B) indicate a downward gradient (0.014 m/m) from the overburden unit to the Intermediate Sandstone and an upward gradient (0.056 m/m) from the Lower Sandstone to the Intermediate Sandstone. Head data from the "NW" monitoring well cluster indicate a similar pattern of downward (0.016 m/m) and upward (0.014 m/m) gradients converging in the Intermediate Sandstone. In the "Downgradient" and "SE" monitoring well clusters, head observations and data logger hydrographs indicate downward gradients from the shallow aquifer system but essentially equal heads in the Intermediate and Lower Sandstones. This more complex picture of groundwater flow systems in the LSA does not appear to have been captured in the Proponent's conceptual model. Given the importance of the baseline hydrogeological regime for predicting the transport and fate of COPCs in the post-decommissioning period, the Proponent needs to demonstrate that the numerical groundwater flow model accounts for observed vertical head gradients.</p>	qualitatively the vertical head gradients calculated from observations in the nested monitoring well clusters (Appendix 7-A, Table 3-1).			
IR-58	-	ECCC	Fish and fish habitat	Section 7.3.2.4, Ore Deposit	<p><b>Context:</b> The Proponent states that the Phoenix ore bodies are long and narrow (approximately 25 to 50 m wide) and are located within or near a graphitic pelite unit. Hydrothermal alteration associated with the ore zone is a discontinuous envelope of clay alteration and a sulphide-cemented rock zone that extends into the overlying sandstone and the underlying basement (Figure 7.3-3). This black, clay-rich zone is approximately 3 m thick on average and locally hydraulically isolates the ore zone from the overlying sandstones and underlying weathered basement rock.</p> <p><b>Rationale:</b> As indicated by the Proponent, a 3 m black clay rich zone isolates the ore zone from the overlying sandstones and underlying weathered basement rock. It is, however, unclear whether this discontinuous clay layer will prevent downward migration of uranium-bearing solution into the Paleo-weathered basement rock or horizontal flow along the unconformity surface to escape into the environment. Escape of uranium-bearing solution into the environment will have a negative effect on the receiving environment.</p>	<p>1. Verify that there will be no downward migration of mining solution into the paleo- weathered basement rock or that there is no flow along the unconformity surface.</p> <p>2. If downward migration of the mining solution occurs, explain how it will be mitigated.</p>		Accepted	n/a



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IR-59	-	CNSC	Fish and fish habitat	Section 7.4 Assessment of Project-related Effects, Figure 7.4-2 (p. 7-56)	<b>Context:</b> Figure 7.4-2: Simulated Change in Groundwater Discharge and Flow through Whitefish Lake Over the Life of the Project appears to be missing information.  <b>Rationale:</b> Legend is included below the image, but the Legend box is blank. The green dotted line is not represented by anything in the legend.	Please update this Figure to ensure it is complete, and that features are properly indicated in the legend.		Accepted	n/a
IR-60	-	NRCan	Fish and fish habitat	Section 7.4.2.1  Appendix 7-C, section 5.2.1, Appendix B	<b>Context:</b> In the discussion of the limitations of the numerical groundwater flow model (Appendix 7-C, sec. 5.2.1), the Proponent invokes the well known modeling principles of "Occam's razor" and "Parsimony" which guided the parametrization of hydraulic conductivity in model layers. The Proponent states that hydrogeologic property values were applied uniformly for, among other units, the Lower Sandstone aquifer beyond the immediate area of desilicified materials. However, in the layer parametrization for the Lower Sandstone aquifer (Appendix 7-C, Appendix B, Figure B-5), NRCan notes a large zone of enhanced conductivity (1 E-05 m/s) extending south from Kratchkowsky Lake, which contrasts with the value (2 E-07 m/s) assigned elsewhere outside the desilicified zone. NRCan also notes the extremely detailed parametrization of hydraulic conductivity in the clay cap overlying the ore zone where borehole control is dense (Appendix 7-C, Appendix B, Figure B-6).  <b>Rationale:</b> In NRCan's opinion, these model features appear to violate the principle of "Parsimony" and require greater justification supported by field observations.	NRCan requests that the Proponent provide justification based on field evidence for the multiple hydraulic conductivity zones assigned to the Lower Sandstone aquifer and the clay cap above the ore zone.		Accepted	n/a
IR-61	-	CNSC	Geology and Groundwater	Section 7.4.2	<b>Context:</b> There is no discussion of potential induced seismicity from mining processes.  <b>Rationale:</b> Induced seismicity may lead to a loss of process as identified for natural seismicity.	Please provide information on the potential mining-induced seismicity.		Accepted	n/a
IR-62	-	ECCC	Fish and fish habitat	Section 7.4.2, Potential Project-related Effects	<b>Context:</b> The Proponent indicates that the mining area includes: <ul style="list-style-type: none"><li>the 'active mining area', which is the target ore zone;</li><li>a zone extending between 11 and 13 m above the active mining area that represents the maximum vertical height over which the injected mining fluids will migrate upwards from the ore zone during active mining; and</li><li>a zone extending 50 m vertically upwards from the active mining area (that incorporates the active mining area and the 11 to 13 m zone defined in the previous bullet) that was selected to account for potential upset conditions.</li></ul> <b>Rationale:</b> It is not clear to ECCC how the Proponent would be able to limit the mining solution migration within 11 & 13 m above active mining as the maximum vertical height over which the injected mining fluid will migrate. As the mining fluid will be injected under pressure into zones with possible presence of fractures, the pressure may also cause additional fractures and given that the solution is warm/hot will possibly dissolve the other cementing material in the sandstone above, making it difficult to accurately predict where the solution will migrate to.	1. Explain plans to limit the upward migration of mining solution into the overlying layer to 11 and 13m above the ore zone.  2. Explain what impacts will occur if the mining solution migrates beyond the predicted height.		Accepted	n/a

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IR-63	-	CNSC	Geology and groundwater	Section 7.4.2.1, Potential Effect #1: Groundwater Quantity – Construction to Decommissioning  Appendix 7-C, Section 2.7, Groundwater Conditions During Mine Operations	<b>Context:</b> The numerical groundwater model described was calibrated to observed water level and stream baseflow data. Table 7.4-3 in the EIS indicates that Denison recognizes the potential for freeze wall operation to impact groundwater quantity. To simulate this impact, the model was adapted to reduce recharge (to 50%) within the freeze wall area, reduce hydraulic conductivity associated with the vertical freeze walls, and simulate pumping within the freeze wall area. Recovery from pumping and effects on discharge to groundwater discharge to Whitefish Lake are discussed in the potential effects section.  <b>Rationale:</b> Although this assessment considered drawdown of the water table and discharge to Whitefish Lake, the discussion did not address the potential effects of operating the freeze wall on the local and semi-regional groundwater regimes. What would the pathway be for groundwater to pass around the freeze wall? What is the basis for the parameters selected, e.g., 50% recharge and lower hydraulic conductivity for freeze well? These factors need to be considered when evaluating the potential impacts of freeze well operations on groundwater flow conditions and corresponding receptors.	Please provide a more fulsome discussion on the impact of freeze wall operations on local and semi-regional groundwater regimes and potential receptors. Please provide the rationale for assumptions made for key model parameters (e.g., selection of 50% recharge, hydraulic conductivity value used to represent freeze wall). In addition, please discuss the potential pathways for groundwater flow around the freeze wall, complete with figures demonstrating these pathways.		Accepted	n/a
IR-64	-	ECCC  CNSC	Fish and fish habitat	Section: 7.4.2.2, Potential Effect #2: Terrain Morphology and Stability – Operation  Appendix 7-A, Appendix K (p. 12)	<b>Context:</b> The Proponent stated that the geological assessment predicted maximum vertical displacement in altered sandstone immediately above the mining area (17.5 cm). A very minor change in elevation at ground surface (of less than 7.5 cm) was predicted within a discrete and localized area overlying the ore body. The modelling work is considered to provide a worst-case bounding scenario. If subsidence were to occur over the lifetime of the Project, or in the years following mining, the extent of vertical displacement is not expected to exceed that predicted in the modelling, which is based on an assumed volume extraction.  <b>Rationale:</b> ECCC notes that the thickness of the ore zone has an average thickness of 5 m with a range of 2 to 17 m, and is 25-50 m wide and that the overburden rock above the ore zone measures about 400 m. Therefore, it is not clear how the Proponent determined that the surface expression of a subsidence on the surface if it occurs will be limited to 7.5 cm and localized. A subsidence greater than 7.5 cm, implies that the void in the ore zone will be narrower, and will affect the amount of water migrating through the zone.  It was the recommendation of the consultant who conducted the work in Appendix K that more accurate material properties should be used for future modelling.	Explain: <ul style="list-style-type: none"><li>Will this be revisited with updated data based on extraction feasibility results?</li><li>How will the surface expression of a subsidence will be limited to 7.5 cm and localized?</li></ul> <b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent consider implementing remediation measures immediately after mining to prevent subsidence from occurring in the first place.		Accepted	n/a
IR-65	-	CNSC	Geology and Groundwater	Section 7.4.2.2	<b>Context:</b> It is stated the maximum subsidence is 7.5cm based on modeling with an assumed volume extraction. Has subsidence from dewatering/pumping and from lack of inflow of groundwater due to freeze wall been considered?  <b>Rationale:</b> Surface facilities and wells may be impacted if there is unaccounted for subsidence.	Please provide additional details for any dewatering/pumping induced subsidence.		Accepted	n/a

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IR-66	-	CNSC	Geology and Groundwater	Section 7, Table 7.5-1, Row 1, Column 6	<b>Context:</b> Column 6 in Table 7.5-1 indicates the mitigation measures for a valued component. For Row 1, Geology, there is no description of mitigation measures but only that contingency plans will be developed if based on monitoring.  <b>Rationale:</b> Subsidence may impact wells and surface infrastructure.	Please provide additional details on monitoring and contingency plans related to the geological environment (e.g., subsidence), including triggers for implementing such plans.		Accepted	n/a
IR-67	-	CNSC	Geology and groundwater	Section 7.6.2.1 (Remediation Objectives)	<b>Context:</b> Metallurgical testing, including batch reaction, coreflood testing and column tests are mentioned frequently throughout Sections 2 and 7 of the EIS. Outside of the composition of restored solutions from coreflood tests #2B and 3C, results from these various tests are not reported in the EIS or any associated Appendices.  <b>Rationale:</b> The results from metallurgical testing are important to a number of items discussed in the EIS, including (but not limited to): evolution of hydrochemistry during remediation, source of salts in Lower Sandstone Aquifer porewaters, process plans, industrial wastewater treatment, estimating composition and volume of process precipitates, and composition of mining fluids and leachate. In particular, the EIS posits that mining area decommissioning objectives are achievable based on metallurgical testing and provides these objectives in Table 2.3-3. CNSC staff need to understand the specifics of this metallurgical testing, given its importance for the development and justification for mining and remediation activities. Denison must also provide information demonstrating that the proposed restoration actions and remediation targets are As Low As Reasonably Achievable (ALARA).	1. Please provide a summary of the results and the analysis of results of the metallurgical tests within the EIS, or provide the technical supporting document with this information, and ensure the documentation is appropriately referenced in the EIS. This should include sample information for cores (e.g., mineralogy, location, U content, depth), test conditions (e.g., duration, # of iterations, column length, flow rate, temperature, pressure, sample frequency, influent/effluent composition), as well as results and how they are pertinent to the development of ISR activities.  2. Please provide further clarification/justification on how results from two singular coreflood tests (i.e., Coreflood #2B and Coreflood #3C) can justify large-scale remediation activities and targets following solution mining.  3. Please provide material demonstrating that the proposed restoration actions and remediation targets are ALARA.		Accepted	n/a
IR-68	-	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C, sections 3.3, 4.1, 4.4.4 and 4.7	<b>Context:</b> Sources terms for the COPCs considered in 3D reactive transport modeling are given by the composition of "Restoration Solution #1", which the Proponent believes is representative of groundwater quality in the ore zone after remediation at decommissioning (Appendix 7-C, sec. 3.3, Table 3-5; sec 4.0). The Proponent considers COPC source terms as "initial conditions" for groundwater quality in the ore zone at the start of the model simulation period. During the simulation, no additional mass of COPCs is transferred to groundwater in the ore zone.  <b>Rationale:</b> In NRCan's opinion, this representation of COPC sources is not conservative as it fails to account for various long-term slow mass release processes. These processes could include redissolution of secondary phases formed during ISR mining (e.g., radium-bearing gypsum or barite, jarosite, alunite) and migration of unrecovered lixiviant or restored solution from low-permeability regions or stagnant zones that were not fully swept during mining or remediation. NRCan notes that scenario #2 in the Proponent's transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) does consider an extended source release period for protons (desorption from chlorite). However, in NRCan's opinion, additional modeling scenarios should consider extended-release periods for other COPCs as well.	NRCan requests that the Proponent's reactive transport prediction uncertainty analysis (Appendix 7-C, sec. 4.7) consider extended source release periods for additional COPCs.		Accepted	n/a
IR-69	-	NRCan	Fish and fish habitat	Section 7.6.2.2.3  Appendix 7-C,	<b>Context:</b> For hydrogeological and geochemical assessments in support of ISR projects, the Proponent identifies two aspects of primary importance (Appendix 7-C, sec. 3.1). These are a) groundwater remediation (Appendix 7-C, sec. 3.1.1); and b) the assimilative capacity of host rocks downgradient from the ore zone (Appendix 7-	NRCan requests that the Proponent provide a detailed description of the expected mineralogical and hydrogeochemical changes occurring within the ore and barrier zones as a result of the injection of acidic lixiviant.		Accepted	n/a

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				sections 3.1 and 3.2	<p>C, sec. 3.1.2). According to the Proponent, the objective of groundwater remediation at decommissioning is to achieve water quality in the mined zone that does not pose a risk to receptors at the point of exposure. Assimilative capacity refers to the ability of groundwater-rock reactions to naturally sequester or attenuate COPCs migrating from the ore zone during the post-decommissioning period.</p> <p><b>Rationale:</b> However, in NRCan's opinion, the Proponent has neglected to mention the most fundamental aspect for hydrogeological and geochemical assessments in support of ISR projects. That aspect is the choice of ISR lixiviant and its effects on the mineralogy and hydrogeochemistry of the ore zone during mining operations. The Proponent provides information on the pre-mining mineralogy (Appendix 7-C, sec. 3.2.1) and hydrogeochemistry (Appendix 7-C, sec. 3.2.2) but no information on their expected changes as a result of ISR mining. This Information is important when considering source terms in reactive transport modeling.</p>				
IR-70	-	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Section 7.6.2.2.3, Evaluation of Geochemical Reactive Transport  Appendix 7-C, Section 4.4.2, Sub-Domain Model Hydrogeologic Parameters	<p><b>Context:</b> The EIS indicates that “changes to hydrogeological conditions within the mining area were considered during development of the 3D sub-domain model. Dissolution of ore within the active mining area is expected to enhance ... hydraulic conductivity”.</p> <p>In Section 4.7 (Prediction Uncertainty Analysis), predictive uncertainty scenarios are provided. For scenario 7, the hydraulic conductivity (K) of the ore zone was increased even further than initial model assumptions. The value used is not indicated in the text.</p> <p><b>Rationale:</b> A hydraulic conductivity (K) value of 5x10<sup>-6</sup> m/s, which is a factor of five (5) greater than the value assumed for the ore zone, was applied in the base case numerical model to account for this impact. It is unclear from the information provided in Section 7 of the EIS or associated Appendices what the basis of this five-fold increase in K value for the ore zone, and how this was judged to be conservative, or to adequately represent anticipated conditions. This parameter is important as it impacts the rate at which contaminants flow from the ore zone following mining activities. Due to of the dissolution of uranium, larger voids will likely be created, and the hydraulic conductivity may increase by more than a factor of 5 compared to pre-project material. Therefore, a variation of at least one or two orders of magnitude for hydraulic conductivity should be used in the sensitivity analysis. Having a representative, conservative value for hydraulic conductivity is essential for understanding groundwater as a pathway of contaminant transport to Whitefish Lake and potential impacts to aquatic life. The K value used in the predictive uncertainty analysis should be reported.</p>	Please provide a more fulsome discussion on the anticipated impacts of mining on permeability of the ore zone due to mining activities in the EIS or in an Appendix. The value used for scenario 7 of the prediction uncertainty analysis should be provided. The scientific rationale for the use of a K value only a factor of five greater than the value assumed for the ore zone in the 3D regional model should be provided, alternatively, provide simulation results for a more conservative scenario. Specifically, this discussion should address the potential effects of mechanical permeability enhancement with tools, dissolution of ore, gas plugging, chemical plugging, plugging due to ion exchange, and mechanical plugging.		Accepted	n/a
IR-71	-	CNSC	Geology and groundwater	Section 7.7.1, Climate Change Considerations	<p><b>Context:</b> The report states that in a scenario of increased precipitation and decreased/constant evaporation, climate change may result in greater flows in the Wheeler River drainage system and increased recharge to groundwater, which would correspond to increased groundwater discharge to Whitefish Lake. Additionally, it is also stated that climate change was evaluated qualitatively.</p>	Please provide a discussion on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area. Provide justification for performing qualitative assessment of impacts of climate change rather than a quantitative one.	<i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i>	Accepted	n/a

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					<b>Rationale:</b> It is not clear why the impacts of increased evapotranspiration associated with higher average temperatures were not considered, even though these are likely outcomes of temperature increases due to climate change in areas such as the Prairies (Climate trends and projections - Canada.ca). It is also not clear why climate change considerations were not assessed quantitatively.		The effect of climate change on groundwater recharge in Prairies or Canada is generally uncertain due to the large degree of uncertainty in the modelling of future recharge although future changes in temperature and precipitation are expected to alter groundwater recharge (through changes to runoff, evapotranspiration, and snow accumulation). While CNSC staff accepts the response on potential effects of increased evapotranspiration, as well as decreased groundwater recharge for the study area, no justification has been provided on why quantitative analysis was not completed to address the effect of climate change on groundwater recharge.		
IR-72	-	CNSC	Geology and groundwater	Section 7.8.2, Groundwater Monitoring	<b>Context:</b> Monitoring seems to consider COPCs from surface facilities, and excursion of pumped mine fluid in the Lower Sandstone Aquifer. There does not appear any discussion on how the proposed monitoring program considers potential excursions of brine from freeze wells.  <b>Rationale:</b> It is unclear how potential excursions of brine from freeze wells will be monitored. Would this be through the fiber optic cables installed within the freeze well network? Or would it be achieved in the monitoring well clusters? If this is the case, how would an excursion of brine from a freeze well be differentiated from an excursion of mining solution?	Please provide further information regarding how potential excursions of brine from freeze wells will be monitored as part of the proposed groundwater monitoring program.		Accepted	n/a
IR-73	-	CNSC	Geology and groundwater	Section 7.8.2.2, In Situ Recovery Mining Area  Appendix 7-A, Appendix C	<b>Context:</b> The EIS recommends that a follow-up study be carried out to supplement available data on hydraulic conductivity in the Desilicified Zone (DSZ).  <b>Rationale:</b> Appendix C (Summary of Hydraulic Testing Data and Conductivity Values) of Appendix 7A indicates that only n = 6 hydraulic conductivity values are available for the DSZ, one of which appears unreliable due to a problem with packer sealing. This is relatively few values compared to the Intermediate and Lower Sandstones. Additionally, limited hydraulic head data from boreholes screened in the DSZ is available (GWR-037, GWR-012 and GWR-014; See Figures 16/17 in Appendix 7-A) – most information appears to originate from open core holes. The information presented in its current form is insufficient considering the importance of this zone as a preferential pathway for contaminants following remediation activities, and the heterogeneity of the unit due to intense hydrothermal alteration and fracturing. Further information regarding hydrogeological properties and groundwater flow would aid greatly in validating and refining the numerical groundwater model.	As per the EIS recommendations, please provide additional information to supplement available data on hydraulic conductivity in the DSZ. Please provide the following information as part of the follow-up study: <ol style="list-style-type: none"><li>identification of the vertical conductivity (KV) as there is an upward flow component (isotropy was assumed in DSZ for numerical model, this assumption must be verified)</li><li>quantification of the horizontal and vertical flow gradients in the DSZ; and</li><li>identification and mapping of any structures with the potential to influence groundwater flow in the DSZ, such as fracture/fault zones.</li></ol>		Accepted	n/a
IR-74	-	CNSC	Geology and Groundwater	Section 7.8.2.3	<b>Context:</b> It is stated in Section 7.8.2.3 (p. 7-113, main EIS report) that, at the Post-Decommissioning Stage, “Excursion are signaled by a change in water quality that is outside of that bounded by modelling predictions”, and “The model predictions spatiotemporally bound COPC concentrations in the subsurface that do not pose a risk to the receiving environment. Water quality that is outside of this bounding is defined as representing a material increase over a meaningful period compared to the predicted values either in rate of change or magnitude of change of COPC concentrations.”  <b>Rationale:</b> It is not clear in which locations (e.g., is it in the mining area, or	Please clarify in which locations the water quality data is used to compare with the model predictions to determine if excursion occurs.		Accepted	n/a



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					downstream of the mining area, or anywhere else?) the water quality is used to compare with the model predictions to determine if excursion occurs.				
IR-75	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K	<p><b>Context:</b> The geomechanical study showed that the stability of the remnant ore zone and surrounding rock mass is highly sensitive to the magnitude of the material properties. To quantify this risk, the Proponent conducted a sensitivity analysis to assess the influence that material properties have on the stability of key stratigraphic layers. The results of the sensitivity analyses suggest that small variations in the cohesion magnitude and angle of internal friction may significantly influence the stability of the altered sandstone, ore zone, and upper and lower clays.</p> <p><b>Rationale:</b> By considering the potential uncertainties and risks in association with the geomechanical study and the empirically derived rock mass strength parameters and the non-site specific physical parameters of different rock formations used for the modeling, the Proponent’s consultant suggests to define a laboratory testing program to address data gaps in the current geotechnical data and increase confidence in the material properties, and use more accurate material properties to model the phased extraction of uranium-enriched rock and assess the associated risks for cavity collapse and failure in the steel casing. CNSC staff concurs with these suggestions.</p>	Please provide a plan to implement recommendations for further detailed geomechanical studies to reduce the uncertainties and risks in association with the stability and deformation analyses of ore zone rock matrix and its overlying rock mass formations and assess their impacts on the mine operation.		Accepted	n/a
IR-76	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K (p. 12)	<p><b>Context:</b> Based on the consultant’s report, the modeled vertical strain is approaching or exceeding the tensile and compressive yield limits for steel casing.</p> <p><b>Rationale:</b> Failure of steel casing may result in process loss or alter groundwater flow and quality.</p>	Please provide additional details on how casing integrity will be monitored and potential effects mitigated.		Accepted	n/a
IR-77	-	CNSC	Geology and Groundwater	Appendix 7-A, Appendix K Results of a Geomechanical Study Investigating the Influence of Uranium Extraction on Mining-Cavity Stability for the Wheeler River Uranium Project (Revision 1)	<p><b>Context:</b> It is reported in the appendix K report, within Appendix 7-A, that both phase I scoping analysis and phase II detailed strip model were investigated by numerical modelling. The analysis discussed influence on host rock stability as a result of incremental increase in volumetric extraction and graded conservative treatment of material properties.</p> <p><b>Rationale:</b> As critical components of a numerical geomechanical simulation, initial and boundary conditions are crucially important to the confidence and reliability of the modelling results. However, this information is absent from the current report. In-situ principal stresses largely affects the stability of the excavated host rock, and the vertical strain and surface subsidence. This information is also absent in current form.</p>	Please provide details on the boundary and initial conditions applied on stress loading and strain for the numerical analysis. In particular, the in-situ principal stresses, which are critical to correct understanding of the excavation disturbance to the host rock, should be provided and justified as appropriate.		Accepted	n/a
IR-78	-	CNSC  ECCC	Fish and fish habitat  Geology and groundwater	Appendix 7-A, Section 3.5.2, Porosity	<p><b>Context:</b> This section of the report outlines the estimated/assumed effective porosity values. The only reference provided is for permeameter testing on rock core samples (Scibek, 2019).</p> <p>Additionally, the report states that “As tracer test results to estimate effective porosity were unavailable at the time of modelling, effective porosity values for the</p>	<p>1. Please provide the reference for the data substantiating the assumed effective porosity values reported in Appendix 7-A and used in the numerical model in Appendix 7-C.</p> <p>2. Please provide information on how the site-specific effective porosity values from tracer tests or pumping tests,</p>	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>Effective porosity is an important parameter to understanding groundwater flow and contaminant transport. The Proponent states that “As tracer test results to</p>	Accepted	n/a



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				Appendix 7-C, Section 2.3.2.1, Porosity Values	<p>sandstone bedrock and basement units were sourced from literature values”, where literature values are effective porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to justify this value. Additionally,, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p><b>Rationale:</b> The source of reported effective porosity values is unclear from Section 3.5.2 in Appendix A (e.g. literature review, field work, laboratory work).</p> <p>In Section 2.3.2.1 of Appendix 7-C, there is a lack of clarity regarding the effective porosity data used in the numerical model. It appears that no site-specific data derived from tracer tests or pumping tests is used in the numerical model. Given that effective porosity directly correlates to seepage velocity and by extension transport time and distribution of COPCs in groundwater, it is an important parameter. Given its relative importance for contaminant fate and transport, effective porosity should be based on field measurements, or at the very least accounted for in the sensitivity analysis.</p>	were considered in the numerical models. Section 2.2.1.4 of the EIS asserts that tracer tests were carried out in 2021 – this information should thus be available for improving/updating models. Alternatively, provide a sensitivity analysis for the effective porosity in the Desilicified Zone, or contaminant transport simulation results with more conservative effective porosity values.	<p>estimate effective porosity were unavailable at the time of modelling, effective porosity values for the sandstone bedrock and basement units were sourced from literature values”, including porosities from the Cigar Lake study (AECL, 1994), situated approximately 40 km NE of Wheeler River. No on-site Wheeler River field data was used to explain this value. Additionally, in the Cigar Lake study, the authors reported that, because results from tracer tests and pumping tests were unavailable, “a practical approach was adopted, i.e., to use the porosity values obtained from laboratory measurements made on core samples, and to assume that those numbers were close to the average field kinematic (effective) porosity values”.</p> <p>In response to the IR, the Proponent explained and supported their methodology for selecting a value for effective porosity. This method included consideration of literature values and a regional analogue at Cigar Lake. ECCC notes that a tracer test was conducted, the results of which were not considered in the selection of the effective porosity parameter.</p> <p>If field test data is available that is potentially relevant to determining effective porosity, it should be included in the EIS when discussing effective porosity. The field test data should also be made available for review by the FIRT, to confirm the conclusions reached by the Proponent. Other sources of information can be useful when explaining the most appropriate value for effective porosity such as literature values and regional analogues, as per the Proponent’s IR response. However, field test results should be presented in the EIS and considered as a part of such an explanation. If the Proponent feels that not utilizing field test data is the most accurate approach when selecting an effective porosity value, then this conclusion should be reached with consideration of the field test data as a part of the evaluation.</p> <p>Provide a discussion of how the effective porosity values are selected, including a discussion of how field test results were considered. This information is necessary to confirm that the selected effective porosity values are valid. This also relates to IR-52.</p>		
IR-79	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4, Groundwater Chemistry	<p><b>Context:</b> Table 4-1 in Section 4 of Appendix 7-A provides groundwater monitoring results from sampling activities carried out at 26 monitoring wells in 2019, 2020, and 2021. The majority of these wells were only sampled once (n = 8) or twice (n = 17). In some cases (Lower Sandstone Aquifer/Intermediate Sandstone Aquitard), the variability of results between sampling events is quite high. Data for the Paleoweathered Zone is sparse.</p> <p><b>Rationale:</b> Insufficient information is presented in the EIS and associated Appendices to concretely define baseline groundwater chemistry for the different hydrostratigraphic units. As defined in the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>: “Based on the scope of the project, the EIS will present sufficiently detailed baseline information to determine the effects the project could have on the VCs and analyze those effects”. This is particularly important given</p>	Please provide the statistical basis (number of samples and variability) by which “baseline” is defined and the justification that the current information is sufficient to adequately characterize groundwater quality. In order to ensure sufficient baseline information is collected, further iterations of sample collection for groundwater monitoring wells in all defined hydrostratigraphic units may be required. In addition, groundwater quality downgradient from the proposed mining area should be further characterized to assess spatial influence of alteration and hydraulically active features,		Accepted	n/a

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					certain features of the study area (i.e., presence of zones of thermal alteration/desilicification, as well as hydraulically active fractures/faults), and the need to adequately characterize baseline conditions in the Desilicified Zone downgradient from the proposed mining area. As an example, the US Nuclear Regulatory Commission (NRC) typically requires a minimum of four (4) quarterly samples from (i) surficial aquifers, (ii) production aquifers, (iii) overlying aquifers, and (iv) underlying aquifers to characterize preoperational groundwater quality (E. Striz, pers. comm.).				
IR-80	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> This section provides data for groundwater samples collected during the Cigar Lake analogue study and Millennium Project for further regional context. The previous studies are heavily referenced to support interpretations made for the conceptual site model.</p> <p><b>Rationale:</b> The Piper Plots in Figure 26 are difficult to interpret (many overlapping circles with variegated colors), and Cigar Lake samples plot predominantly as Na/K-Cl/SO4 groundwater facies. Conversely, samples collected as part of the Phoenix Project (current), plot either as Ca-HCO3 or Ca-SO4/Cl groundwater facies. No explanation is provided for the observed hydrogeochemical differences between groundwater from the Phoenix project and the Cigar Lake analogue study/Millennium Project.</p>	Please provide additional clarity to and interpretation of Figure 26 in Appendix 7-A, including a revision to the Figure to allow for easier interpretation. This could include clear identification of end members, as well as arrows indicating proposed evolution of groundwater chemistry. Further discussion should be provided describing observed differences between groundwater chemistry at the Phoenix project compared to Millenium/Cigar Lake.		Accepted	n/a
IR-81	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> The report states in the description of hydrochemistry of the Lower Sandstone Aquifer that, “On the basis of groundwater chemistry and tritium values in that groundwater, the authors (of the Cigar Lake analogue study in 1994) concluded that the groundwater reflected a younger water component that had penetrated to depth along hydraulically active fractures/faults. The same conclusion is made here (in the Wheeler River EIS) for the Phoenix study area – meaning that fracture/fault conditions are such that some areas of the MFa are characterized by younger/recharge groundwaters”.</p> <p><b>Rationale:</b> Tritium results for most wells in the Lower Sandstone Aquifer (MFa) reported in Table 4-1 of Appendix 7-A exhibit tritium concentrations &lt;15 Bq/L for the 2020 sample, and 0.1 or &lt;0.1 Bq/L for the 2021 sample. Tritium in modern precipitation typically varies from 1 – 3 Bq/L. Conclusions made in the text are not supported by data, especially given that tritium values are not reported in the EIS for local precipitation or surface water. This is important in reinforcing the assumption from the conceptual model that modern meteoric water circulates at depth in the Lower Sandstone Aquifer.</p>	Provide a further discussion on the interpretation of tritium in groundwater, rather than echoing conclusions from the Cigar Lake analogue study. Consideration should be given to the assertion that modern meteoric water circulates at depth in the Lower Sandstone Aquifer. Collection and analysis of stable isotope (e.g., δ2H, δ18O) samples is a cost-effective solution which would greatly improve understanding of groundwater hydrology and support the development of a conceptual model.		Accepted	n/a
IR-82	-	CNSC	Geology and groundwater	Appendix 7-A, Section 4.3.3, Hydrochemistry by Hydrostratigraphic Unit	<p><b>Context:</b> A. In-field measurements of Oxidation-Reduction Potential (ORP) for three (3) out of twenty-six (26) groundwater samples are presented in Table 4-1 of Appendix 7-A. Although sparse, these values are also used to characterize redox conditions for representative groundwaters in Table 3-5 of Appendix 7-C.</p> <p>B. In Section 3.5.5 of Appendix 7-C it is stated that groundwaters in the PHREEQC model were allowed to equilibrate with atmospheric concentrations of oxygen,</p>	1. Provide further discussions and information (i.e., ORP measurements or analytical data for redox couples) on redox conditions at the Phoenix site. Particular focus should be given to the spatial heterogeneity of redox processes. Tools such as the reference provided [2] below provide an example of simplified framework for characterizing redox conditions in aquifers.	Please see AD-65 in the Advice to Proponent table.	Accepted	n/a

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				Appendix 7-C, Section 3.5	<p>resulting in oxidizing subsurface conditions. In Section 3.7 of Appendix 7-C it states that input files for 3D reactive transport were generated based on outcomes for PHREEQC modelling. However, in reading Section 4 of Appendix 7-C, it is unclear whether this assumption (equilibration with atmospheric oxygen) was carried forward for the 3D model.</p> <p>C. As per p. 3.49 of Appendix 7-C, “A small amount of reactive pyrite was assumed for the first 500 m of transport away from the ore zone in the model, primarily in the desilicified sediments of the Lower Sandstone Aquifer, and deeper portion of the Intermediate Sandstone Aquitard”.</p> <p><b>Rationale:</b> A. Given the importance of redox conditions for U mobilization and precipitation/dissolution of minerals (e.g., pyrite/metal oxyhydroxides) and the corresponding influence on contaminant transport from both a modelling and monitoring perspective, these should be further characterized. It should also be noted that the measurement of Oxidative-Reductive Potential (ORP) in natural waters can be complex and difficult due to the variability and disequilibrium of natural systems and issues inherent to electrode calibration (e.g., Schuring et al., 2000). Measurements of redox couples (e.g., As(III)/As(V); Fe(II)/Fe(III); S(-II)/S(VI)) are typically recommended to accurately characterize redox conditions in natural waters (Schuring et al., 2000).</p> <p>B. The assumptions regarding redox conditions for the 3D solute transport model should be clarified.</p> <p>C. The amount of pyrite (e.g., % by weight) assumed for the purposes of modelling should be clarified, given the potential role of pyrite as a reducing agent in limiting the transport of COPCs.</p> <p><b>Reference:</b> [1] Schuring J.; Schulz, H. D.; Fischer, W.R.; Bottcher, J.; and Duijnisveld, M.H.W. 2000. Redox: Fundamentals, Processes and Applications. Springer: Berlin.</p>	<p>2. Clarify assumptions regarding initial redox conditions for the 3D solute transport model.</p> <p>3. Provide the % reactive pyrite by weight assumed for models in the text. Justification for proportions used, such as analytical data, should also be provided.</p> <p><b>Reference:</b> [2] Jurgens, B.C., McMahon, P.B., Chapelle, F.H., and Eberts, S.M., 2009, An Excel workbook for identifying redox processes in ground water: U.S. Geological Survey Open-File Report 2009–1004 8 p.</p>			
IR-83	-	CNSC	Geology and Groundwater	Appendix 7-A, Section 7.4.2.2 and Appendix K	<p><b>Context:</b> Leaching of uranium from the ore zone will generate voids within the ore zone, which could fail and collapse. Failure of the voids would cause displacement in overlying rocks, which will lead to the eventual ground subsidence. Based on the developed geological model, a geomechanical study was conducted to assess potential maximum vertical displacement in the overlying rock formations and predict the ground subsidence. While a layer of altered sandstone is modeled above the ore zone, the desilicified zone, a zone that is comprised of completely to partially unconsolidated sands and has very low rock quality, high fracture intensity, and high friability, and low strength in the area overlying and east of the Phoenix deposit, appears not to have been included in the model for geomechanical modeling. The evaluated displacement/deformation in the overlying rock formation and the resulted ground subsidence would not be conservative without including the desilicified zone.</p>	<p>Please provide details whether and how the desilicified zone is considered in the geomechanical modeling of the detailed strip model. Such details should include figures and the linkage between the geomechanical model including the determination of strength parameters of the desilicified zone and the geological model including information on the core delineation of the desilicified zone.</p>		Accepted	n/a

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					<b>Rationale:</b> Stability of the ore zone rock matrix and the potential displacement/deformation in the overlying rock formations when voids in the extracted ore zone collapse are critical for protecting the overlying aquifers, preventing substantial ground subsidence, safeguarding casing integrity, and mitigating plug-off of the remaining ore as well as efficiently mining extraction. The deformed zone in the overlying rock formations will change in hydraulic conductivity that will impact on the assessment of potential effects on groundwater flow and contaminant transport in the zone. Therefore, the rock mass behavior including and above the ore zone should be adequately understood and the potential displacement/deformation should be assessed and quantified with adequately defined geological model.				
IR-84	-	CNSC	Geology and Groundwater	Appendix 7-C	<b>Context:</b> It is stated in Section 2.5.2.4 (p. 2.35, Appendix 7-C) that “In addition to calibrating to water level elevations targets, the model was calibrated to estimates of groundwater discharge to Whitefish Lake. A match between simulated and observed flows helps to support that groundwater recharge rates are reasonable, and to provide validation for water budget assessments. Baseflow calibration targets were developed using point streamflow measurements collected upstream and downstream of Whitefish Lake. Figure 2-10 (p. 2.26, Appendix 7-C) shows the locations of the baseflow calibration targets, and Table 2-7 (p. 2.35, Appendix 7-C) illustrates the model-simulated groundwater discharge rates in relation to the estimated range of baseflow from stream measurements. The simulated baseflow to Whitefish Lake is in good agreement with the estimated representative baseflow”.  <b>Rationale:</b> It is not clear in Figure 2-10 (p. 2.26, Appendix 7-C) where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. Additionally, it is not clear how the groundwater discharge to Whitefish Lake is simulated, since the model domain does not cover the whole Whitefish Lake.	1. Please clarify in Figure 2-10 where the point streamflow measurements were conducted upstream and downstream of Whitefish Lake. 2. Please clarify how the groundwater discharge to Whitefish Lake is simulated considering that the model domain does not cover the whole Whitefish Lake.		Accepted	n/a
IR-85	-	CNSC	Geology and Groundwater	Appendix 7-C	<b>Context:</b> Section 2.7.3 (Appendix 7-C) mentions Wells A, B and C, and Figure 2-17 (p. 2.43, Appendix 7-C) illustrates the predicted drawdown ranges at Well B and Well C.  <b>Rationale:</b> It is not clear where Well A, Well B and Well C are located.	Please provide the locations of Well A, Well B and Well C illustrated in a Figure.		Accepted	n/a
IR-86	-	CNSC	Geology and Groundwater	Appendix 7-C	<b>Context:</b> It is stated in Section 2.7.3 (p. 2.41, Appendix 7-C) that “Both the pumping demand and the recharge changes were incorporated into a transient simulation performed using the calibrated groundwater flow model. The model simulation was started at the beginning of mine construction, with initial conditions taken from the calibrated model. The simulation period was extended for 40 years to include the entire period of construction, operation, and decommissioning, and extending through 17 years post decommissioning”.  <b>Rationale:</b> It is not clear what is the difference between the calibrated model and transient model in terms of parameters (such as the K values for the mining zone), boundary conditions, etc.	Please clarify the parameters, boundary conditions and any other aspects as used in the transient model that are different from the calibrated model.		Accepted	n/a

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IR-87	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> In Section 2.8 (p. 2.45, Appendix 7-C) Parameter uncertainty assessment, only parameters for certain zones (part of each specific hydro-stratigraphic unit as shown in Figure 2-19, p. 2.46, Appendix 7-C) related to the pathway from the ore zone toward Whitefish Lake were allowed to vary in order to find combinations of parameter values that met statistical calibration criteria. If each hydro-stratigraphic units within the whole model domain were treated as parameter zones that can have varied hydraulic conductivity values, a different combination of parameter values could be obtained that meet statistical calibration criteria too.</p> <p><b>Rationale:</b> The parameter values for parameter zones between the mining area and Whitefish Lake is important in determining the hydraulic connection between the mining area and Whitefish Lake. Parameter values in other parameter zones could also be important. For example, if the K values for the intermediate sandstone aquitard are significantly larger than in the current calibration results, the interaction between the upper sandstone aquifer and the lower sandstone aquifer could be more active, and the mined-out zone could be more active hydraulically and groundwater in the minded-out zone could have a shorter residence time than in the current calibrated model.</p> <p>Additionally, it is noted that Figure 2.19 (p. 2.46, Appendix 7-C) illustrates the parameter zone for the intermediate sandstone aquitard. However, Figure 2.20 (p. 2.49, Appendix 7-C) did not include the intermediate sandstone aquitard in the results.</p>	It is recommended that the parameter zones in the Parameter uncertainty assessment include hydro-stratigraphic units in the whole model domain to investigate the possible combination of parameter values that could make the groundwater in the mined-out zone more active hydraulically.		Accepted	n/a
IR-88	-	CNSC	Geology and Groundwater	Appendix 7-C	<p><b>Context:</b> The conceptual hydrogeological model includes upper sandstone aquifer, intermediate sandstone aquitard, and lower sandstone aquifer. The desilicified zone above the ore zone have enhanced hydraulic conductivity. The boundary condition for the lower sandstone aquifer on the west (upstream) side was assigned to have specified head, which provide source of water for the lower sandstone aquifer.</p> <p>As a result of the conceptual model setup, the upper sandstone aquifer is hydraulically active and the groundwater residence time within the upper sandstone aquifer is relative short. In contrast, the lower sandstone aquifer (and the ore zone) is hydraulically inactive, and the groundwater residence time in the lower sandstone aquifer is relatively long (as shown in the particle tracking results in Figure 7.6-2 (p. 7-71, main EIS report), and the simulated plume for chloride in Figure 7.6-7(p. 7-86, main EIS report)).</p> <p>It is stated in Section 2.6.4 (Appendix 7-C) that “As noted above in section 2.6.3, it is estimated that 99% of the groundwater discharge to Whitefish Lake is derived from groundwater that has only flowed through shallow deposits (i.e., Overburden and Upper Sandstone Aquifers). Contribution of deep groundwater flow through the Desilicified Zone within the Intermediate Sandstone Aquitard is estimated to be &lt; 1% of the groundwater discharging to Whitefish Lake”. This simulation result is reflective of the conceptual model.</p>	It is recommended to conduct the following work to demonstrate if the mined-out zone is hydraulically active: <ol style="list-style-type: none"><li>Determine the groundwater residence time in the lower sandstone aquifer and compare it with the simulated residence time in the numerical model.</li><li>Conduct additional particle tracking to demonstrate where groundwater originating from the mined-out zone flow towards (forward tracking) and where groundwater flowing towards the mined-out zone originates from. This would help determine why groundwater in the mined-out zone is not hydraulically active.</li><li>Conduct sensitivity analysis to investigate the effect of higher K values for the intermediate sandstone aquitard and the K and porosity values of the mined-out zone on the plume migration.</li></ol>		Accepted	n/a



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					<p>Section 7.3.3.3 (p. 7-42) states that “The Lower Sandstone Aquifer is characterized spatially by two types of groundwater. The first groundwater type is most like that observed in the Local Flow System. This reflects hydraulically active fractures and fault systems that allow fresh recharge water to penetrate and mix with deeper waters in the aquifer. The second type of groundwater is within the zone of thermal alteration around the ore zone .....”.</p> <p>The hydraulic connectivity of the ore zone with the upper sandstone aquifer has important implication on the groundwater restoration. The ore zone is not hydraulically active locally because it is enclosed by a clay zone before the mining operation. But if it is located within a hydraulically active area, or on a groundwater flow pathway that is hydraulically active, the mined-out zone (with much larger porosity and hydraulic conductivity) could become active hydraulically after mining operation is finished.</p> <p>Figure 7.6-7 (p. 7-86, main EIS report) shows that the chloride plume is most persistent within the mined-out mining area. This seems to indicate the mined-out zone is hydraulically inactive after the mining operation is finished.</p> <p>It is stated in Section 7.3.3.2 (p. 7-37, main EIS report) that “Exploration boreholes drilled in the Phoenix area, where left unplugged, have the potential to provide preferential flow paths between the Overburden and Upper and Lower Sandstone Aquifers. Exploration holes were reportedly grouted approximately 10 to 20 m above and below the ore zone, resulting in open holes remaining throughout the overlying materials. These portions of the open holes may act as open conduits for groundwater flow through the 400 m of Athabasca Group Sandstone.” So, there is possibility that the unplugged borehole could increase the hydraulic connection between the upper and lower sandstone aquifer.</p> <p><b>Rationale:</b> It is important to understand if the larger area containing ore zone is hydraulically active. Additional confidence would be gained if there is any other evidence that support that the area containing the ore zone is not hydraulically active, and groundwater residence time in the lower sandstone aquifer surrounding the ore zone is comparable with the simulated results.</p> <p>Table 2-4 (p. 2.16, Appendix 7-C) shows the effective porosity (0.01-0.05) of the ore body. Figure B7 (p. B.8, Appendix 7-C) shows that the calibrated K values for the mined-out zone is 1x10-6 m/s. Section 3.5.2 (p. 3.24, Appendix 7-C) states that “The same average linear velocity was assumed for the mining area (source zone), following from the discussion in Section 4.4.2, where the hydraulic conductivity value in this zone following mining was set to 5x10-6 m/s, and a porosity of 0.2 is assumed for the ore zone (Table 4-2)”. It is not clear what the justification is for the selection of the porosity and K values for the mined-out area, and whether they are conservative. It is also not clear, what the potential impact on the groundwater flow and COPCs transport would be If the mined-out zones collapse.</p>				



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IR-89	-	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone	<p><b>Context:</b> The Proponent states that a hydraulic conductivity value of 5x10-6 m/s was uniformly assigned to the model layers representing the Desilicified Zone. They additionally state that this value is consistent with packer and pumping tests screened in this unit that have interpreted hydraulic conductivity values ranging from 1x10-6 to 3x10-5 m/s (Appendix C), with a geomean of 6.0x10-6 m/s.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on fish and fish habitat.</p> <p><b>Rationale:</b> The Desilicified Zone is a critical layer in the hydrogeological model as it represents a key potential pathway of contaminants to Whitefish Lake. The base case hydraulic conductivity value (5x10-6 m/s) is even lower than the geometric mean, not to mention the highest value found. When simulating geochemical processes and contaminant transport within this important pathway a more conservative approach should be employed. Modifying this parameter will affect travel times and distribution of COPC in the subsurface.</p>	<p>1. Provide an in-depth rationale for choosing a value of 5x10-6 m/s as the base case for the hydraulic conductivity, in both the PH REDox EQUilibrium (PHREEQC) and Finite-Element Ground Water Flow (FEFLOW) models.</p> <p>2. Provide a rationale for keeping the sensitivity analysis within one order of magnitude considering the lack of physical data on the Desilicified Zone. Alternatively, provide contaminant transport simulation results with more conservative hydraulic conductivity (e.g., more than 3x10-5 m/s) values in the Desilicified Zone.</p> <p>See also related: IR-96.</p>	<p>The Desilicified Zone is a critical layer in the hydrogeological model because it represents a key potential pathway of contaminants to Whitefish Lake. There is a limited amount of field data for the Desilicified zone. A sensitivity analysis should allow the model to test slightly outside of the observed field data values.</p> <p>Following a supplementary submission provided by Denison on July 2<sup>nd</sup>, this IR is accepted for the purposes of the EA review, subject to the addition of a commitment to:</p> <ul style="list-style-type: none"><li>revisiting and updating the groundwater models as necessary, as more data becomes available through the EA follow-up monitoring program to improve confidence on the hydraulic values of the desilicified zone.</li></ul> <p>This commitment must be provided in the updated commitment report, as part of the final EIS submission package. Denison should also take this commitment into account when developing the EA follow-up monitoring program.</p>	Accepted	n/a
IR-89	IR-89-R1	ECCC	Fish and fish habitat	Appendix 7-C, Numerical Modelling: Post-Decommissioning Evaluation, Section 2.3.1.4, Desilicified Zone  IR-89 Response from Denison	<p><b>Context:</b> The Proponent states that the range of hydraulic conductivities considered in sensitivity analysis was limited to values that fit within a calibration constrained uncertainty analysis of the model.</p> <p>Considering that the Desilicified Zone is of particular interest because it is the main pathway for the COPC to reach Whitefish lake, and that hydraulic conductivities are not entirely understood, ECCC recommends that a larger range of hydraulic conductivities be simulated to understand potential effects on the aquatic environment.</p> <p>The Proponent clarified the details of the calibration-constrained uncertainty analysis that was used for parameter bounding within the model, with hydraulic conductivity sensitivity bounds determined based on model calibration values that were supported by the available physical data.</p> <p><b>Rationale:</b> ECCC agrees that calibration constrained uncertainty analysis using hydraulic head field data is useful to determine probable upper limits of K values. However, there is always some degree of uncertainty in groundwater data and models. Sources of such uncertainty may include errors, lack of complete and representative field data to determine key parameters, or any number of heterogeneities associated with groundwater systems over large scales. Such uncertainties will always exist and can be accounted for by conducting a sensitivity analysis that accounts for the lack of physical data in the Desilicified Zone by running modelling scenarios using parameters that are outside of the calibration constrained values.</p>	Expand the sensitivity analysis of hydraulic conductivity outside of calibration constrained parameters to account for the lack of physical data in the Desilicified Zone.	See IR-89 (above).	Accepted	n/a
IR-90	-	ECCC	Fish and fish habitat	Appendix 7-C, Section 2.4 and 2.6	<p><b>Context:</b> Hydraulic conductivities and hydraulic gradients play an important role in groundwater flow, geochemical modeling, and contaminant transport for the PHREEQC and FEFLOW models. Although there is an important vertical component</p>	1. Explain if the vertical and lateral hydraulic gradients and hydraulic conductivities are assumed to be equivalent.		Accepted	n/a

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					<p>to the contaminant transport, there is no distinction made between lateral and vertical hydraulic conductivities of hydraulic gradients.</p> <p><b>Rationale:</b> According to the conceptual model, there is an important vertical aspect to the groundwater flow thus incorporating any vertical hydraulic gradient or hydraulic conductivity information into the calibration would increase confidence in the results.</p> <p>Providing a distinct value for vertical hydraulic conductivity will improve the accuracy of the model in regards to the transport of contaminants to Whitefish Lake through the Desilicified zone, which is important to understand potential impacts to aquatic life.</p>	<p>2. Provide a rationale for not distinguishing between vertical and lateral hydraulic gradients.</p> <p>3. Alternatively, provide both lateral and vertical hydraulic gradient estimates and the implications on contaminant transport.</p>			
IR-91	-	NRCan	Fish and fish habitat	Appendix 7-C, section 2.5.2	<p><b>Context:</b> The numerical model calibration quality plot (Appendix 7-C, sec. 2.5.2.1, Figure 2-13) contains a small error. The vertical (simulated heads) and horizontal (observed heads) axes do not have the same scales (499 to 521 masl versus 499 to 522 masl). Therefore, the line of ideal fit is offset.</p> <p><b>Rationale:</b> As a result, NRCan notes that observed heads in the 510-512 masl range are underpredicted by the model. NRCan also notes that the calibration statistics (Appendix 7-C, sec.2.5.2.3) are highly leveraged by two data points from open boreholes south of Kratchkowsky Lake where simulated values are largely controlled by the nearby constant-head boundary in the Lower Sandstone aquifer (520 masl).</p>	The Proponent should correct the scales on the axes of Figure 2-13 in Appendix 7-C. The Proponent should also comment on the effect on calibration of the clustering of most observation wells in the ore zone.		Accepted	n/a
IR-92	-	CNSC	Geology and groundwater	Appendix 7-C, Section 3.2.1, Mineralogical Composition	<p><b>Context:</b> Table 3-2 summarizes the clay content of the Athabasca Group sandstones and the Paleoweathered Zone. Although minimum, maximum and median values are provided, the number of samples and variability of the dataset are not. Rationale for incorporating illite into reactive transport modelling and excluding kaolinite/dichlorite is provided in the text.</p> <p>From p. 3.29 in Appendix 7-C: “The illite content was based on the normative clay composition determined from site-specific corehole elemental analysis (median illite by mass is 7.68%; Table 3-2) and using portable infra-red mineral analysis indicating median illite content by mass is 13.1% (data not shown)”</p> <p>From p. 3.30 in Appendix 7-C: “Using the minor amount of illite compared to the more dominant chlorite is conservative in that not all sorptive capacity of the clays is accounted for in the simulated paleoweathered zone”. This conservative assumption appears contrary to assumptions for the desilicified zone (DSZ) and Athabasca Group sandstones “Illite was used to represent the total clay content, which varies from 1.74% to 5.85% by mass in the hydrostratigraphic units within the Athabasca Group sandstones and Desilicified Zone”.</p> <p><b>Rationale:</b> Information is missing in the EIS regarding the clay composition of hydrostratigraphic units. Results from infrared mineral analysis are not reported.</p>	<p>1. Please provide in Table 3- the number of samples and variability of the datasets used to estimate the clay content of hydrostratigraphic units for the model. Include results from infrared mineral analysis in the text if the information is used to support assumptions for modelling.</p> <p>2. Please provide further information/discussion within the EIS relating to the assumptions of clay content in hydrostratigraphic units for modelling. Provide further justification and rationale as to why total clay content in the Athabasca Group sandstones and Desilicified Zone is assumed to be illite, and how this assumption is conservative. This discussion could include a comparison of the properties (cation exchange capacity, surface area) of illite vs. kaolinite vs. dichlorite for the anticipated range of subsurface conditions (pH, redox, U concentrations, etc.).</p>		Accepted	n/a

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					The assumption for the solute transport model is that all clays in the downgradient DSZ are illite. However, clay content in the Read Formation (Lower Sandstone Aquifer) downgradient of the ore zone is low in illite (0.42%) compared to kaolinite (0.52%) and dichlorite (1.18%). A value of 3.9% illite clay by weight is used for the DSZ, but Table 3-2 indicates median content is 2.42% illite. It is not clear why illite was used to represent total clay content for the DSZ, as opposed to the conservative assumptions used for the Paleoweathered Zone, nor has any basis or justification been given.				
IR-93	-	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-10: Properties of Adsorbing Mineral Phases	<p><b>Context:</b> In Appendix 7-C, section 3.5.6.2.2 Ion Exchange and Surface Complexation, the consideration of ion exchange and surface complexation and the corresponding parameters and chemical reaction are discussed.</p> <p><b>Rationale:</b> The site density of sorbent Geothite was reported in Table 3-10 to be 1.6E3 mol/kg. Taking into account the specific surface area of 60 m2/g, this equals to 1600/6E4 mol/m2, or 0.0266 mol/m2, 1.6e4 sites/nm2.</p> <p>This value largely overestimates the site density of goethite, which is reported to be in the range of 2~6 sites/nm2. The reference used in the EIS report indicates the similar range of variation for this specific parameter.</p> <p>There are plenty of similar studies on SCM of iron oxides in literature. It is suggested to consult with more than one single study to enhance the reliability of model parameters.</p> <p>The overestimation of sorption site density will directly result in underestimation of the affected COPCs’ concentrations in pore fluid. This will result in underestimation of COPC transport plume in the affected underground space, and potentially the dissolved concentrations in the hydrogeological sink.</p>	Please provide additional evidence to justify the model parameter of site density for goethite, applied to the numerical model. If necessary, the reactive transport modelling should be re-run to update the contents presented in the EIS report.		Accepted	n/a
IR-94	-	CNSC	Geology and Groundwater	Appendix 7-C, Numerical modelling: post-decommissioning evaluation, Section 3.5.5, Subsurface Conditions Incorporated	<p><b>Context:</b> It is reported in this section the assumed subsurface conditions that were applied in the geochemical site conceptual models. Critical phenomenon of pH tail was mentioned. Inclusion and exclusion of corresponding geochemical reactions were discussed briefly.</p> <p><b>Rationale:</b> It was reported that the residual reduced minerals of uraninite and pyrite were not included in the modelling of the remediated mining area. The argument was based on consideration of the upstream groundwater, passing through the mined zone, will not be oxidizing and groundwater conditions are expected to be similar to pre-mine conditions. However, this ignores the pH tail effect that releases proton H+ sorbed to solid surface during ISR flooding. By ignoring this process, there is a potential risk of underestimating the source terms for some key COPCs. Exclusion of uraninite and pyrite in remediated mining area modelling is contradictory to pH-tail effect. The justification is not sufficient in the current form.</p>	Please provide additional evidence to justify the approach for excluding uraninite and pyrite from the analysis of remediated mining area. This may require the results from additional modelling.		Accepted	n/a

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IR-95	-	CNSC	Geology and Groundwater	Appendix 7-C, Table 3-11	<p><b>Context:</b> The Table 3-11 reported the Solid-Phase Concentrations and Partitioning Constants for COPCs. Data were both measured and simulated.</p> <p><b>Rationale:</b> It is unclear how the partition coefficients of various COPCs upon desilicified and paleoweathered rocks were obtained. It was not reported at what pH were these <math>K_d</math> analyzed. Sorption of chemicals on solid phase is known to be pH dependent. It is unclear whether pH influence was considered in the measurement and analysis of apparent partition coefficients.</p> <p>In addition, uptake of metals on clay is highly nonlinear, and always has a maximum capacity. Even with a very strong affinity towards specific metal ions, the sorption will be saturated at elevated concentrations. Therefore, assuming a linear correlation needs to be cautious of the concentration range of target COPC species, and the applicable sorption capacity of the clay mineral.</p> <p>In the current model, only the linear form of sorption is considered, although with discussion of <math>K_d</math> value selection. Additional rationale is needed to justify if the applied methodology is sufficient for assessment.</p>	Please justify the choice of applying a linear form partition coefficient for the modelling and assessment, and whether it provides a conservative approach to the assessment results. Clarity around the experimental conditions during the measurement of partitioning coefficient of various COPCs on the target rocks may help support this assumption.		Accepted	n/a
IR-96	-	CNSC	Geology and groundwater	Appendix 7-C, Section 4.4.4, Sub-Domain Model Transport Boundary Conditions	<p><b>Context:</b> From the text, “Transport parameters were specified for diffusion (1x10<sup>-9</sup> m<sup>2</sup>/s), longitudinal dispersivity (10 m along the plume trajectory), and transverse dispersivity (5 m)”. The source of this information is not provided in Appendix 7-C. It is unclear if the values used are defaults in the modelling software, from literature, from small-scale laboratory tests, or are site-specific values determined through tracer tests.</p> <p><b>Rationale:</b> The use of a calibrated flow model does not imply that the solute transport model is calibrated. The transport parameters (such as effective porosity, dispersivity and reactive transport parameters) can only be calibrated by matching simulated and observed spatial and/or temporal distributions of a solute. Sensitivity analysis indicates that decreasing longitudinal and transverse dispersivities by a factor of two resulted in exceedances of groundwater criteria for both selenium (Se) and cobalt (Co). Given the clear influence of these values on contaminant transport, it is important that transfer parameter values are justified in the solute transport model. In addition, the influence of large-scale heterogeneity on dispersion and solute transport predictions should be discussed, to identify any uncertainty in the model predictions, and provide confidence that the applied model is adequately representing groundwater flow and solute transport.</p> <p>Further guidance on solute transport modelling can be found in BC MOE (2012) [1].</p> <p><b>Reference:</b> [1] British Columbia Ministry of the Environment (BC MOE). 2012. Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities. Report no. 194001, 385 p.</p>	<p>1. Please provide the source of the numerical value used for diffusion and longitudinal and transverse dispersivity, and provide justification if default values by the model code were used.</p> <p>2. Please provide a discussion on the influence of large-scale heterogeneity on dispersion and solute transport predictions in the modelling report.</p> <p>See also related: IR-89.</p>	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>CNSC staff appreciate the comprehensive information provided relating to longitudinal dispersivity and variation based on scale. However, it should be noted that guidance from Gelhar et al. (1992) and the BC MOE (2012) indicate that horizontal transverse dispersivity values should be approximately 1 order of magnitude lower than longitudinal dispersivity values, and vertical transverse dispersivity values should be approximately 2 orders of magnitude lower than longitudinal dispersivity. For the model presented in the EIS, transverse dispersivity is represented by a singular value of 5 meters, with the supporting rationale that the Gelhar et al. (1992) identified 5 meters as a representative value. It is important to note that the Gelhar et al. (1992) paper considered 5 meters to be representative for horizontal transverse dispersivity and identified that vertical transverse dispersivity is smaller than horizontal transverse dispersivity. Additionally, it is important to note that Petrotek (2021) used a transverse dispersivity of 1 m in their numerical models of the ore zone aquifer. CNSC staff thus request that Denison provide further information relating to why horizontal and vertical transverse dispersivity are represented using a singular value, and how this value is considered appropriate to represent both dimensions.</p> <p><b>Reference:</b> Petrotek 2021. Groundwater Model Report Phase 1, Phoenix Deposit Wheeler River Project. Prepared for Denison Mines. December 2021.</p>	Accepted	n/a

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IR-97	-	ECCC	Fish and fish habitat	Appendix 7-C, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b	<p><b>Context:</b> Appendix 7, Figures 4-6, 4-7a, 4-7b, 4-8a, 4-8b, 4-9a, 4-9b present contaminant transport simulations of chloride, selenium, cadmium, and uranium. All simulations use initial condition concentrations at t=0 (or end of mining operations. In the 3D FEFLOW contaminant transport model it is not clear why initial condition concentrations were chosen rather than a constant concentration boundary.</p> <p>It is also unclear if mining activities will cause mobilization of the contaminants beyond the end of operations.</p> <p><b>Rationale:</b> The choice of boundary conditions may impact the predicted transport of contaminants that reach Whitefish Lake through groundwater, which may have impacts to aquatic life.</p>	<ol style="list-style-type: none"><li>1. Explain and clarify if mining operations will mobilize contaminants beyond operations?</li><li>2. Clarify if the source of contamination, (e.g., uranium, selenium) will cease after operations?</li><li>3. For the 3D model please provide the rationale for using initial concentrations rather than constant concentration boundary conditions for contaminant concentrations.</li></ol>	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, if required.</i></p> <p>It should be noted that the fate and transport simulations of the COCs are dependent on groundwater flow. Therefore, the Proponent’s conclusions on the transport of COCs, may need to be revisited depending on how IR-89 is resolved.</p>	Accepted	n/a
IR-98	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 8, Aquatic Environment	<p><b>Context:</b> It states in EIS in Section 8.3.7.1 (p. 8-151) that "Cameco’s Key Lake Operation will overlap spatially and temporally with the Project".</p> <p><b>Rationale:</b> It is not clear whether there is the possibility that planned Denison discharges would eventually flow into and influence a background reference lake used by Key Lake operation.</p>	Please provide supporting information to demonstrate whether discharges from the proposed operation will not eventually flow into a reference lake used by another existing operation.		Accepted	n/a
IR-99	-	CNSC	Aquatic environment	Section 8, Water Quality, Table 8.2-13	<p><b>Context:</b> Table 8.2-13 shows the maximum concentration of hazardous and radiological COPC’s in surface water throughout the local study area. However, the concentration for all constituents is stated as mg/L.</p> <p><b>Rationale:</b> It is unusual for radiological COPC’s to be displayed in mg/L, radiological constituents are typically displayed in Bq/L</p>	Please use Bq/L when displaying concentration of radiological COPC’s. If this was a typographical error in the table, please indicate as such and revise the table to indicate values are indeed in Bq/L. Please also review other tables displaying concentrations of radiological constituents to ensure this error is not repeated in other tables.		Accepted	n/a
IR-100	-	HC	Indigenous Peoples' health / Socio- economic conditions	Section 8, (p. 8-195)  Section 8.5.3, Table 8.5-2, (p. 8-226)	<p>Mercury is excluded as a COPC in the assessment. Inadequate consideration of mercury and methylmercury in fish and other country foods, and use of incorrect Hg-related health guideline values can underestimate the risks to human health among country food consumers.</p> <p><b>Context:</b> Section 8 states “Mercury has not been identified as a COPC for the Project as it is currently not present in the receiving environment (i.e., background condition) at detectable concentrations and will not be produced as part of the mine process; therefore, it will not be discharged to the aquatic environment.</p> <p>However, it is understood that potential nutrient enrichment-related effects are possible and can be linked to increases in mercury in the environment” (p. 8-195).</p> <p>Table 8.5-2 shows that there is mercury present in the tissues of Northern Pike and White Sucker sampled in the waterbodies within the local study area and in Russell Lake. These fish are regularly consumed by nearby communities according to the ERFN 2017 dietary survey.</p> <p>In Section 8.5.3, fish tissue concentrations are</p>	<ol style="list-style-type: none"><li>1. Include mercury (including methylmercury) as a COPC in the assessment given the baseline presence of mercury in sampled fish, the potential increase of methylmercury in receiving waters due to nutrient enrichment resulting from the Project, the significant fish consumption by the local population and that country foods, particularly fish, are an important source of dietary exposure to mercury.</li><li>2. Assess health risks from fish consumption by calculating hazard quotients for baseline and predicted methylmercury levels in country foods using Health Canada’s pTDI for methylmercury (<a href="#">Health Canada, 2007</a>).</li><li>3. Clarify whether mercury data represented throughout the EIS represents total mercury, inorganic mercury or methylmercury.</li></ol> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends including methylmercury in the list of COPCs to be monitored in fish throughout all project phases.</p>	<p>The July 2<sup>nd</sup>, 2024 supplementary submission for IR-100 and version 2 of the Commitment Register (July 17<sup>th</sup>) included a commitment to assess health risks from fish consumption by comparing fish tissue data collected during operation from the monitoring program against Health Canada's mercury guideline of 0.5 ug/g wet weight, as applicable (ID 8-44). Reviewers note an apparent contradiction between use of the provisional tolerable daily intake (pTDI) and the commercial guideline for mercury in fish.</p> <p>The Proponent states that the health risks from fish consumption will be assessed by comparing mercury concentrations from monitoring activities to the Health Canada maximum level for mercury in retail fish. As noted in HC’s review of the Round 2 Response, the mercury guideline for commercial fish (0.5 ppm) may not be protective of human health because fish consumption patterns of local Indigenous populations may differ from that of the general Canadian population who generally obtain fish from retail sources.</p> <p>The health risks of mercury exposure should be assessed using local fish consumption rates and the provisional tolerable daily intake (pTDI) value of 0.2 µg/kg bw per day. Denison are expected to remove reference to the use of</p>	Accepted	n/a



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					<p>compared to Health Canada’s human health risk- based maximum permissible mercury concentration (0.5 µg/g wet weight), which is applicable to most species of commercially sold fish rather than country foods.</p> <p><b>Rationale:</b> It is recommended that mercury be listed as a COPC considering it is in fact present in fish tissue under existing conditions, the significant consumption of fish by the local Indigenous communities, and its toxicological significance to human health.</p> <p>Further, the Health Canada provisional tolerable daily intake (pTDI) value of 0.2 µg/kg/bw/day (<a href="#">Health Canada, 2007</a>) is a more appropriate reference level when evaluating consumption of mercury in fish by Indigenous people, as it allows for the consideration of food consumption patterns in the risk assessment that differ from the general population and is protective of the most sensitive sub-group (i.e., developing foetus).</p> <p>It is important to note that methylmercury, rather than inorganic mercury, is generally the predominant mercury species present in fish and is also the most toxicologically significant form. The assumption of 100% of mercury in fish and other country food items being present as methylmercury ensures that the potential health risks are not underestimated. It is unclear, however, if the mercury data presented throughout the EIS represent total mercury, inorganic mercury or methylmercury.</p>	See also related Advice to the Proponent: AD-31.	<p>commercial guideline for mercury in fish to remove apparent contradiction with provisional tolerable daily intake in the final EIS submission package, and this IR can be resolved for the purposes of the EA process.</p> <p><i>The following outstanding issue will be further assessed as part of licensing technical reviews, prior to the granting of a licence:</i></p> <ul style="list-style-type: none"><li>Local fish consumption rates should be discussed and refined as needed during planned engagement with Indigenous Nations and communities.</li></ul>		
IR-101	-	ECCC  CNSC	Fish and fish habitat	Section 8.1.1.3, Section 8.2.1.3 Aquatic Environment	<p><b>Context:</b> In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided.</p> <p>However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota.</p> <p><b>Rationale:</b> There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment</p>	<p>1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review.</p> <p>2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint.</p> <p>3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project.</p> <p>4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.</p>	<p>Denison has not adequately responded to the request to identify potential effects to sediment quality to support identification of project-related effect pathways to wetlands, in either the February 10<sup>th</sup>, 2024 responses to IRs or the July 2<sup>nd</sup>, 2024 supplemental submission. The K<sub>d</sub> values could differ significantly in wetland environments compared to in lake/stream measurements where all samples were taken and there are discrepancies in wetland classification within the EIS and information provided in IRs with the actual classification standards for various wetland types.</p> <p>For further explanation, the descriptions of the wetland areas provided in the February 10<sup>th</sup> response do not correspond to the information provided in the supplemental round of responses received from Denison. For example, Figure 2 of Appendix 8-F: Wetland Effects Assessment Report identifies a black spruce treed bog (ecotype BS17) between Whitefish Lake North and Whitefish Lake Middle (La-5), where effluent will be discharged. According to the Canadian Wetland Classification System (Warner &amp; Rubec, 1997), bogs are defined as receiving water only from precipitation, with no hydrological connections to groundwater or littoral areas. This does not match with the response of “<i>littoral areas and these wetland portions are not cut-off from or isolated from the main basin of the lake.</i>” The response also does not correspond to the BS17 ecotype described in Appendix 9-B: Terrestrial Environment Wildlife and Vegetation Baseline Inventory.</p>	Not Accepted	<p><b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments and updated EIS sections associated with the IR response in this table are available in Appendix A.</b></p> <p>Denison reaffirms the approach taken with baseline sediment data as utilized in the EIS and more specifically in the ERA (e.g., pooled sediment data from locations in an unimpacted system in the same watershed where land use and type is homogeneous) as an appropriate and acceptable basis to define</p>



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					quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.		<p>The uncertainty introduced as to the conditions on site complicates the discussions on baseline conditions and potential impacts in wetlands which the Proponent assumes to provide fish habitats. Bogs and fens (ecotypes BS17, BS18, BS19, BS21) are identified in and around Whitefish Lake and these wetlands will have different water and sediment chemistry than lakes and creeks. For example, the partitioning coefficients of sediments in a fen would not be expected to be the same as those in a lake, though both may be depositional environments, sediments in the fen would be richer in organic matter because of the vegetation present. Organic matter in sediment is an important factor affecting soil-water partitioning coefficients. Because of this, the sediment in wetlands is likely to adsorb more metals than sediment found in lakes. For this reason, it is important to understand baseline conditions and model impacts in order to ensure the aquatic environment will not be impacted by the project’s planned discharges.</p> <p>The Proponent should clarify if the wetlands were misidentified in the Terrestrial Environment Wildlife and Vegetation Baseline Inventory. If they have been misidentified, then corrections should be made to the Baseline Inventory and Wetlands Assessment Report, and information provided in the Proponent’s round 3 response should be integrated in Section 8.3 of the EIS. If they have not been misidentified, then the Proponent should respond to round 3 information requests considering the wetland environment.</p> <p><u>In order to resolve this IR, Denison are expected to:</u></p> <ol style="list-style-type: none"><li>1. Update wetland classification in the LSA according to the Canadian Wetland Classification System (Warner &amp; Rubec, 1997). Focus should be applied to updating areas with hydrological connections to groundwater and littoral sources, which may have been misclassified as bogs. This should include any sub-classification of wetlands currently categorized as Shallow Open Water in Appendix 8-F: Wetland Effects Assessment Report. Updates should be made as necessary to all relevant reports, including the Terrestrial Environment Wildlife and Vegetation Baseline Inventory as needed.</li><li>2. Update habitat mapping for wetlands to reflect any changes in wetland classifications, particularly for wetlands that may include fish and fish habitat.</li><li>3. Update Table 8.3-3 and 8.3-4 in Section 8 of the EIS to include more specific information on wetlands that may contain fish and fish habitat, such as information on wetland type &amp; extent, vegetation, substrate type, organic matter content, etc.</li><li>4. Provide a table with summary statistics (grain size analysis and sediment quality) from sediment sampling specific to each individual sampled lake or stream, rather than summary statistics for all waterbodies and watercourses pooled together.</li><li>5. Provide the source reference for the K<sub>d</sub> values used for the ERA in Table 3-6 and the specific characteristics of sediments (i.e. grain size and composition) of the regional study areas as they compare to LA-5, the LSA and the RSA.</li></ol>		<p>existing conditions (and the variability thereof) and to identify potential Project effects to sediment and evaluate the significance of these effects. The IMPACT model predicts how constituents travel through the environment and concentrations of constituents change as a result of interactions with natural flows and lake sediments. The K<sub>d</sub>s applied in the model have largely over predicted the baseline sediment concentrations throughout the lakes demonstrating that the model and model inputs are conservative, and impacts (i.e., incremental changes in constituent concentrations resulting from Project emissions to the aquatic environment) have not been under predicted.</p> <p>For context on a sensitivity analysis for sediment quality predictions, refer to Appendix 10-A, Section 6.2.2 Effluent Discharge Rate. A sensitivity analysis of key model parameters was undertaken to understand the degree to which the results or conclusions of the risk assessment would vary if parameters differed from what was assumed. In this section, sediment</p>

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							<p>6. Conduct a statistical analysis with a power analysis comparing sediment characteristics (grain size analysis and sediment quality) from the various sub-samples taken within each waterbody to conclude if there are any significant differences between sub-sampling stations, and determine if there is within-lake variation in sediments. Denison should provide the methodology they will use to conduct the statistical analysis and power analysis for CNSC review and acceptance prior to completing the analysis. Based on the results of this statistical analysis, Denison should:</p> <ul style="list-style-type: none"><li>a. If the results determine that there is enough statistical power to confirm there is no within-lake variation in sediment characteristics within LA-5, Denison should then complete a statistical analysis and power analysis comparing LA-5 to other sampled areas to determine if there is any between-lake variation in sediment characteristics.</li><li>b. If the results determine that there is not enough statistical power, or that there is enough statistical power but there is significant within-lake variation between sub-samples in LA-5, Denison will require the additional baseline data that Denison has already committed to collecting, to update the modelling during the EA phase to support conclusions on significance of effects to the receiving environment.</li></ul> <p>This IR relates closely to IR-107 that demonstrates that there is not enough baseline data to support conclusions on significance of effects.</p>		<p>predictions are shown for a scenario where effluent is released at the maximum upper bound rate of 81 m<sup>3</sup>/hr and the maximum concentrations of COPCs in the receiving environment increases up to 120%. It is also a conservative prediction in that it assumes effluent is released during decommissioning at the same upper bound flow and quality as during operations. In this sensitivity analysis, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, with the exception of cadmium, molybdenum, selenium and vanadium; however, the predicted exceedances for cadmium, molybdenum, selenium and vanadium are all below their probably effect level (PEL), no-effect (NE2), or severe effect level (SEL) values, therefore, adverse effects to benthic communities are not anticipated under the upper bound discharge scenarios.</p> <p>Importantly, monitoring programs will be implemented to assess the environmental performance of the Project relative to the predictive assessment that has been completed in</p>

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									support of the EA process. Such monitoring is needed since there is always some level of uncertainty associated with EA predictions (and it is noted that uncertainty analysis has been completed as part of the EIS and considered within the context of assessing the significance of effects). Specific to this IR, sediment sampling will be completed to verify the accuracy of predicted effects and the effectiveness of proposed mitigation measures. Monitoring and follow-up programs will be integrated within Denison’s overall Environmental Management System (EMS) framework and implemented through the various programs, plans and procedures that would be developed therein. Denison is committed to achieving continual improvement in environmental performance through its EMS. As part of this overall commitment to continual improvement, monitoring programs will be implemented via an adaptive management approach. Adaptive management is a systematic process for continuously improving environmental management practices by learning from their

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									outcomes. It provides the flexibility to address/accommodate new circumstances, to adjust monitoring, to identify and implement new mitigation measures, or to modify existing measures throughout all Project phases. Further, it provides a means to confirm that the monitoring elements remain valid, meet regulatory requirements, and be responsive to evolving objectives. At the EIS stage, the conceptual plan is for sediment sampling at Whitefish Lake South (near-field), at an upstream reference location (Whitefish Lake North), and at downstream locations (far-field) every three years. The far-field monitoring locations will be located in Whitefish Lake South prior to its discharge to McGowan Lake. The details of the sediment monitoring program will be refined as the Project advances. Sediment constituent concentrations will be compared to the values used in the EIS and to applicable regulatory criteria or objectives. As noted, above sampling effort will be predetermined that meet the rigor required of federal / provincial

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									<p>requirements as described in relevant technical guidance documentation for operational monitoring.</p> <p>In general, applying equally to sediment quality as with all other environmental aspects that have been considered in the EIS, where an environmental monitoring program identifies predicted effects are greater than anticipated, Denison would evaluate whether these effects could result in changes to the conclusions in this EIS. If changes are confirmed, then Denison would evaluate the need for revised mitigation actions and management practices to manage effects. As highlighted above, Denison’s interpretation of monitoring data would include reference to environmental performance criteria. An exceedance of environmental performance criteria would trigger Denison to respond to further investigate the potential issue. Based on this investigation, where need for revised mitigations is identified these measures would be developed and implemented. It is expected that the adaptive management process would be informed by input sought</p>

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									<p>from Indigenous people, stakeholders, and regulatory agencies. The following section provides a response to each to the specific IR questions:</p> <p>1. The project’s ecosite classification is outlined in Section 9. Ecosite classification was completed using the Guide to the Ecosites of Saskatchewan’s Provincial Forests (McLaughlin et al. 2010) Ecosite information was transferred directly into Appendix 8-F which originated in January 2024 during the EIS review process in response to FIRT IRs.</p> <p>Refer to Section 9 for the wetland assessment and Appendix 9-B for the terrestrial baseline report with information on ecosite mapping in Section 2.1.3 and ecosite characterization methods and results in Section 2.2. The measurable parameter for the wetlands assessment in Section 9 was change in areal extent of wetlands; this was also considered in Appendix 8-F.</p> <p>The EIS guidelines do not require use of the suggested classification scheme (Canadian Wetland Classification System</p>



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									<p>(Warner &amp; Rubec, 1997). Denison used information from the province’s land classification system and have fulfilled that EIS requirement.</p> <p>Effectively, to be conservative in one assessment (assessing change in areal extent of wetlands in Section 9) we have introduced questions and confusion in Appendix 8-F. The data was fit for purpose for Section 9 and to be consistent, it was carried over into Appendix 8-F without any adjustments or reclassifications.</p> <p>This IR is not questioning the assessment of changes in areal extent of wetlands, but the purported under estimation of risk through the effluent modelling. As such, no updates to the wetland classifications are warranted at this time. Further, Denison has committed to completing additional wetland studies (see response to point 2).</p> <p>2. Additional wetland surveys will be completed after the EA stage, per commitment 8-46 in Denison’s commitment register (i.e., “To further supplement existing information that exists for</p>

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									<p>the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.”).</p> <p>Appendix 8-F has been updated and specifically, a new appendix (Appendix A) has been added. This new appendix provides photos and text to orient the reviewer to the in-lake wetlands of interest. While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of interest are littoral / nearshore zones in the lake and connecting channels.</p> <p>The balance of this IR response outlines the rationale for why the CNSC’s suggested wetland mapping updates to the EIS</p>

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									<p>would not change any EIS conclusions and are not required at this stage for EA determination.</p> <p>3.Any wetlands that were present within water bodies, were mapped as part of the baseline program and results would be incorporated into the existing fish habitat summaries provided in Tables 8.3-3 and Table 8.3-4. Refer to Section 8.3.3 for the existing environment methods and results. It is noted in the EIS that detailed information regarding fish and fish habitat baseline data collection and analyses are provided in Appendix 8-D, Appendix 8-B, and additional information pertaining to wetlands is provided in Appendix 8-F.</p> <p>4. Sediment grain size results for McGowan Lake, Whitefish Lake south, Whitefish Lake north and Russell Lake are summarized in EIS Section 8 Table 8.4-2, and sediment chemical composition results are summarized in Table 8.4-3.</p> <p>The baseline sediment grain size and chemistry analysis for all stations within the baseline study area are</p>

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									<p>provided in Appendix 8-D Aquatic Baseline, Tables A-3 and A-4 of Appendix A, respectively.</p> <p>5. A summary of the source reference for the Kds is provided in Attachment IR-101 (Round 4), and a discussion on sediment grain size for the Wheeler River and regional study area is also provided.</p> <p>6. Based on discussions between the CNSC and Denison in September 2024, the primary request from the CNSC was related to additional information on the IMPACT Kds, which has been provided as part 5 of this response. The requested power and additional statistical analyses can be completed as part of licensing and will include results from pre-operational sediment sampling. Any pre-operational sediment sampling results will be included in the environmental risk assessment (ERA) update to support Denison’s application for a licence to operate. Additionally, the pre-operational sediment sample results in combination with existing data will be the basis of future comparisons of</p>

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									measured data from effluent exposed and reference areas. Such comparisons would be based on statistically based study designs that meet the rigor required of federal / provincial requirements as described in relevant technical guidance documentation for operational monitoring.
IR-102	-	ECCC  CNSC	Fish and fish habitat	Section 8.1.3.1  Appendix 8-C, including Appendix II, Table 1 (p. 2)	<b>Context:</b> Only one measured-results dataset for baseline stream flow exists that is relevant to the Project data from the Water Survey of Canada (WSC) station for Wheeler River (06DA005), and the Proponent used constructed records. The Proponent states that data from 06DA005 was used to extend local hydrometric station records and calculate baseline water quantity metrics. However, this was done through a complex combination of daily data correlation or monthly unit area runoff relationship, with or without offset, where some stations were based off constructed records instead of the real long-term dataset at 06DA005 (see Section 8.1.3.1 and Appendix II of Appendix 8-C, Table 1, p.2 (PDF p. 569)). Appendix 8-C references previous reports in its own appendices, but no equations are shown and there is no description of the accuracy of the fit, or explanation for not referring back to the one dataset (WSC station). Subsequent statistics calculated from these constructed records (e.g., 7Q10 needed for SK water Licenses) would be affected by this uncertainty.  <b>Rationale:</b> Fish habitat can be altered by changes to depositional and erosional patterns in streams. Confidence in the Proponent’s estimate of baseline water quantity, and by extension Project effects to fish habitat, cannot be established without a complete description of the method applied, as well as a discussion of its accuracy.	1. Provide more information on the extension of Project hydrometric station data using WSC station 06DA005.  2. Discuss the accuracy of any correlations/relationships and justify any deviations from simple unit area runoff relationships in the estimation of baseline water quantity values for the Project hydrometric stations. Constructing records from records that are themselves constructed is not recommended.  3. If baseline water quantity metrics need to be revised, discuss (if any) resulting changes to the effects assessment.		Accepted	n/a
IR-103	-	ECCC  CNSC	Fish and fish habitat	Section 8.1.3.4 Climate Change Influenced Extreme Events	<b>Context:</b> The Proponent notes that Intensity duration frequency (IDF) curves are used to estimate the size of water management structures around a site and that the IDF curves are often specific to climate monitoring stations.  The Proponent used the IDF_CC Tool 5.0 developed by the Institute for Catastrophic Loss Reduction (2021) which generates Intensity Duration Frequency (IDF) curves at ungauged locations in order to estimate future IDF curve values under influences of climate change. This tool generates sub-daily values at ungauged locations by interpolation and distance weighing from gauged locations.  <b>Rationale:</b> IDF trends exhibit random behavior at some locations and correlated behavior at other locations. The choice of gauged locations will infer the statistics	Provide the gauged stations used to generate the sub daily duration values found in Table 8.1-6: Baseline of Intensity Duration Frequency data.	As Denison has added a commitment related to updating the IDF (1 in 100 year 24-hour rainfall) and demonstrate climate change resilience of the project (conduct climate risk and resilience assessment) in version 2 the Commitments Register (ID 8-50), this IR has been accepted for the purposes of the current EA process.  <i>The following outstanding issues will be further assessed as part of licensing technical reviews, prior to the granting of a licence.</i>  If future projections of IDF are going to be used in design, then the Proponent is advised to consult the CSA (2019) guidance and provide revised estimates of their potential changes over the project’s duration.	Accepted	n/a

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					for the ungauged locations, including the IDF trends. Without identification of the gauged locations, it is not possible to assess if the modelled data is realistic or not. If the modelled data is not accurate the design of water management structures on the site may not be sufficient resulting in the potential for impacts to the Project from flooding or extreme weather events.		<p>The Proponent should perform a statistical analysis of precipitation using historical data at the location of interest including, confidence intervals to consider uncertainty using the approach outlined in CSA (2019). Additionally, ECCC calculated that the IDF value for a 24h 100-year event is 91.2 mm at 95% confidence interval (using 10 years (2011-2021) of historical precipitation data at Key Lake). However, the same IDF value for a 24h 100-year event was presented as an average value of 67.2 mm with no confidence interval in the IR-103 Attachment. The Proponent value is neither representative nor conservative and the proponent should update the current value based on a new statistical analysis that considers uncertainty and longer record of historical precipitation.</p> <p>See also AD-72 in the Advice to Proponent table.</p>		
IR-104	-	ECCC	Fish and fish habitat	<p>Section 8.1.3.4.2 Probable Maximum Precipitation (PMP) Events</p> <p>Appendix 8C</p>	<p><b>Context and Rationale:</b> The Proponent notes: “The probable maximum precipitation (PMP) event is a design standard value for an extreme rainfall event. The PMP event does not have an estimated return period but is instead based on the theoretical maximum amount of water that a storm could produce based on the maximum persisting dew point.”</p> <p>The Proponent provides a PMP value of 489.3 mm, which is based on data and methodologies available in 1999, taken from the <a href="#">Atmospheric Environment Branch Report (1999), Report Number AHSD-R99-01</a>. The Proponent references Appendix 8C for details. Appendix 8C contains no supplementary information other than what is already provided in Section 8.1.3.4.2.</p> <p>The assumptions and methodologies presented in the report are the results of time series analyses available in 1999. As time series evolve so do the derived statistics. In order to assess potential flood risks and impacts to the Project from flooding, data that is current and representative of the changing climate is needed. The Proponent should explain why they’ve used data from 1999 rather than using up to date data, describe what alternative methods for determining PMP they have considered, and describe how they will support their use of 489.3 mm as a PMP, or describe how they will generate a refreshed PMP. The main factor that influences the statistical data output is the length of the time series hence the reason to keep the statistical data. The PMP values can be substantially (&gt;10%) different if two decades of data is used in the statistical analysis.</p>	<p>1. Provide a revised PMP value (using up to date data) or justify the use of a PMP that is based on data and methodologies from 1999 as opposed to a more recent time series analysis.</p> <p>2. Describe the alternative methods for determining PMP values that were considered. Include descriptions of both “statistical” outcomes and “rational” outcomes as applicable.</p> <p><b>Technical Discussion Required:</b> Yes</p>	<p>Response to IR-104 is accepted by CNSC staff based solely on the Denison’s response (E-DOC#-7220826, p.47/112) that states:</p> <p>“Despite Denison’s reiteration that the PMP is adequate for the EA level design basis, Denison is committed to revisiting the estimates per CNSC’s recommendations, as applicable, for the licensing phase of the Project.”</p> <p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>There are an additional 24 years of meteorological datasets since the 1999 study thus all historical rainfall extremes including those since 1999 study should be considered to estimate up to date PMP at the Project site The proponent’s justification on whether the 1999 or 1994 PMP estimates are current and conservative should be substantiated based on meteorological data analysis. An estimation of updated PMP is achievable by the proponent as meteorological data is freely available and accessible from ECCC and the proponent should provide a revised PMP.</p> <p>The Proponent should also clarify how recent the data used to calculate the PMP or the time series is and explain the use of an older data set that will not produce as accurate of a PMP value as a more recent data set would produce, even when estimates are conservative.</p> <p>Specifically, a. Explain the rationale for the use of the data set which was used to derive the PMP. B. Clarify if the PMP and/or the time series was calculated using more recent data.</p> <p>This will allow for an accurate evaluation of the validity of results derived from the data sets selected by the Proponent.</p>	Accepted	n/a
IR-105	-	Directorate of Fisheries	Fish and fish habitat	Section 8.1.4.1, Potential	<b>Context:</b> Table 8.1-8 and Table 8.3-6 in the EIS indicates a potential for freeze wall operation to influence groundwater interactions and surface water quantity and as	1. Provide a more fulsome analysis of the potential impact of freeze wall operations on local and semi-regional groundwater		Accepted	n/a



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		and Oceans (DFO)		interactions between project and valued component/key indicators Surface Water Quantity  Section 8.1.4.2.2, Surface Water Taking  8.3.4.1, Potential interactions between project and valued component/key indicators	a result, impact fish and fish habitat. Section 8.1.4.2.2 references Section 7 Geology and Groundwater for details on potential impacts. In addition, IR-63 notes the groundwater model does not describe the pathway in which groundwater would pass around the freeze wall during operation and any resulting potential effects on groundwater discharge to Whitefish Lake.  <b>Rationale:</b> As per IR-63, the groundwater model analysis is insufficient to make conclusions on the potential effects of the freeze wall on groundwater discharge into Whitefish Lake. DFO requires this information to fully understand if altered groundwater regimes will result in changes to Whitefish Lake water levels and any potential impacts to fish and fish habitat as a result of changing water levels.	regimes, and subsequently to fish and fish habitat within Whitefish Lake. The analysis should provide a rationale of how the scope of the groundwater model is relevant to and able to detect changes at the scale of fish and fish habitat.  2. If impacts to fish and fish habitat in Whitefish Lake are predicted to occur due to changes in the groundwater regime, describe any mitigation measures that could be used to avoid these impacts.  3. If impacts are predicted that cannot be avoided, characterize residual effects on fish and fish habitat.			
IR-106	-	CNSC	Change to an environmental component due to hazardous contaminants	Section 8.1.4.2.3, Surface Water Discharge	<b>Context:</b> It is stated in this section under construction that all site contact water will be held in the Clean Waste Rock Pond.  <b>Rationale:</b> It is unclear from this section what will happen to the contact water held in the Clean Waste Rock Pond, and whether it will be removed from site or released at a later time. What is the contingency plan if more contact water is produced during construction than the Clean Waste Rock Pond has capacity for.	Please indicate what will happen to the contact water stored in the Clean Waste Rock Pond during construction activities, will it be released after the wastewater treatment plant is installed? Further, please describe the contingency plan if contact water produced exceeds estimates and will exceed the volume of the clean waste rock pond?		Accepted	n/a
IR-107	-	CNSC ECCC	Aquatic environment	Section 8.2.3.3, Existing Surface Water Quality	<b>Context:</b> Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent.  <b>Rationale:</b> The amount of data available for baseline water quality characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the Project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate.  To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment.  As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the “baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity”	Please clarify which data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization.  <b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline	A path to resolution is still under discussion for this IR. Further guidance to Denison is forthcoming, and this table will be amended and posted to the Canadian Impact Assessment Registry, once provided.		<b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments associated with the IR response in this table are available in Appendix A.</b>  <b>Denison recognizes this IR is under discussion and have provided the following response IR-107 received in September 2024.</b>  <i>Note: Denison and the CNSC had a number of meetings and discussions on this Round 4 IR between Sept. 16, 2024 and October 9, 2024. The response provided here is focused on the</i>

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					In addition, the “applicant or Licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.”				<p><i>central questions coming out of these discussions.</i></p> <p>Routine surface water quality sampling has started at the Wheeler River Project site. Denison made the commitment to collect additional pre-operational surface water quality data in commitment 8-48 and this work has been initiated. The list of surface water quality sampling stations, sample frequency, and analyte list is included in Attachment IR-107 (Round 4).</p> <p>For the CNSC’s consideration, a comparison of June, July, August, and September 2024 water samples collected at Whitefish Lake (LA-5) is provided in Attachment IR-107 (Round 4). As shown in the table, the results collected in 2024 are within the range (minimum to maximum) of pooled results for both the full LSA dataset and key assessed lakes. The majority of minor differences between recently collected samples and pooled datasets are related to differences in analytical detection limits. We note that a low-level trace metal analysis was used in 2024 and this resulted in lower detection limits for some parameters compared to previous results.</p> <p>We note that pooling of data to establish a background is not an uncommon approach. For example, such an approach is contemplated by Guidance</p>

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									<p>on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives (CCME 2003). This procedure acknowledges the use of “regional” data to derive background concentrations assuming the sites from which data are used “... are generally located nearby the site under consideration but have not been adversely affected by human activities.” This description is accurate for the Wheeler River Project aquatic LSA which is in an unimpacted, remote area of Saskatchewan’s boreal forest.</p> <p>We refer the reviewer to Appendix 10-A, Appendix A Section 3.2 for consideration of modelled average water baseline concentrations of COPCs and a comparison to measured values. The plots show trends over time for selected COPCs and the generally good agreement between the measured and modelled concentrations.</p> <p>Based on the data presented and methodology provided in relevant guidance, the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservatisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects.</p> <p>As shown in Attachment IR-107 (Round 4), surface water</p>

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									quality sampling will be conducted monthly during the open water period and twice under ice. Per CNSC licensing requirements, the new water quality data along with updated effluent quality data will be integrated into the risk assessment supporting Denison’s application for a CNSC licence to operate and prior to effluent release to the environment.
IR-108	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.3.3 Aquatic Environment	<p><b>Context:</b> Tables 8.2-2 and 8.2-3 provide summaries of the baseline surface water quality in the LSA. No justifications for the selection of water quality guidelines have been provided. COPCs that require calculations based on other parameters such as hardness, pH, or temperature to derive guidelines (i.e., ammonia, cobalt, zinc, etc.) should be indicated within the table, with a note specifying the parameter values used in the calculations, so that thresholds may be confirmed. No baseline data for un-ionized ammonia has been provided, which is a Schedule 4 substance requiring monitoring under the MDMER. For cobalt, manganese, and vanadium, Federal Environmental Quality Guidelines (FEQGs) and/or CCME Canadian Water Quality Guidelines (CWQGs) for the Protection of Aquatic Life have not been included. A guideline of 26 mg/L has been provided for molybdenum as a Saskatchewan Environmental Quality Guidelines (SEQG), however the actual SEQG is 31 mg/L and the CCME CWQG is 0.073 mg/L.</p> <p><b>Rationale:</b> In order to assess potential changes to surface water quality from Project related activities, ECCC requires that data on all parameters that require MDMER effluent and receiving environment monitoring be provided for assessment, including accurate water quality guidelines where available.</p>	<ol style="list-style-type: none"><li>1. Update Tables 8.2-2 and 8.2-3 to include all COPCs that require effluent characterization and receiving environment monitoring under the MDMER.</li><li>2. Update Tables 8.2-2 and 8.2-3 to include missing or corrected water quality guidance thresholds, and information on values used to derive thresholds for COPCs that are dependent on general parameters.</li></ol>	<p>A number of additional corrections were provided in the supplementary information provided by Denison on July 2<sup>nd</sup>, 2024. However, the following remains outstanding:</p> <ul style="list-style-type: none"><li>• In Table 8.2-3, the long-term benchmark for ammonia as N is 5.74 mg/L for all stations except SA-4, SA-5 and SA-6, where it is 6.98 mg/L. Additionally, the TDS long-term benchmark of 500 mg/L based on SEQG, found in Table 8.2-8 is not included in Tables 8.2-2 or 8.2-3.</li></ul> <p>This IR is accepted for the purposes of the EA review, and the following must be corrected in the final EIS submission package:</p> <ol style="list-style-type: none"><li>1. In Table 8.2-3, confirm if the long-term benchmark of 6.98 mg/L for ammonia as N for stations SA-4, SA-5 and SA-6 is correct and provide justification as to why the benchmark differs at these stations.</li><li>2. In Table 8.2-2 and 8.2-3, confirm the correct long-term benchmark for unionized ammonia as it currently differs between various stations.</li><li>3. For consistency, update Tables 8.2-2 and 8.2-3 to include the Total Dissolved Solids (TDS) benchmark utilized in Table 8.2-8.</li></ol>	Accepted	n/a
IR-108	IR-108-R1	ECCC	Change to an environmental component due to	Section 8.2.3.3 Aquatic Environment  IR-108 Response from Denison	<p><b>Context:</b> Incorrect benchmark environmental quality guidelines and guidelines that cannot be verified remain within the updated Tables 8.2-2 and 8.2-3 provided in the Proponent’s response. The Proponent provided an Aluminum Saskatchewan Environmental Quality Guidelines (SEQG) value of 0.005 mg/L in both tables. This is incorrect and appears to be the guideline for irrigation, not the guideline for protection of aquatic biota. The Proponent provided a Molybdenum SEQG of 26 mg/L in both tables. This value is incorrect. The correct SEQG for Molybdenum is 31 mg/L and the Canadian Water Quality Guideline (CWQG) is 0.073 mg/L. The Proponent provided a Nitrate SEQG of 13.29 mg/L in both tables. This value is incorrect. The correct SEQG for Nitrate is 3 mg/L and the CWQG is 13 mg/L.</p> <p><b>Rationale:</b> In order to verify the benchmark environmental quality guidelines that are calculated based on environmental modifying factors such as pH, hardness and</p>	<ol style="list-style-type: none"><li>1. Update Tables 8.2-2 and 8.2-3 to include footnotes with the concentrations of environmental modifying parameters such as pH, hardness and DOC used to derive guidelines for Aluminum, Cadmium, Copper, Lead, Manganese, Nickel and Zinc.</li><li>2. Update Tables 8.2-2 and 8.2-3 to include the correct benchmark guideline value for Aluminum, Molybdenum and Nitrate. Include the concentrations of environmental modifying parameters needed for deriving guidelines. If the most stringent guideline value is not selected for use, provide a rationale for use of the chosen guideline.</li><li>3. Update Tables 8.2-2 and 8.2-3 to include the calculated</li></ol>	In follow up to outstanding corrections following the Feb 10 <sup>th</sup> submission, supplementary information provided by Denison on July 2, 2024 resolved these issues.	Accepted	n/a

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					dissolved organic carbon (DOC), the specific concentrations of these environmental modifying parameters used in the calculations must be provided. Additionally, incorrect benchmarks for Aluminum, Molybdenum, and Nitrate remain within the updated tables provided by the Proponent. No benchmark was provided for Manganese. It is not clear if Total Chromium or Hexavalent Chromium was measured as the table does not specify, and the benchmark provided was for Hexavalent Chromium. This information is required to understand potential changes to surface water quality from Project related activities and facilitate threshold confirmation. Use of the incorrect threshold could allow for effluent to be discharged at the wrong concentration.	guideline value for manganese and the environmental modifying parameter concentrations used to calculate the guideline. A benchmark environmental quality guideline has not been provided for Manganese, however a chronic CWQG guideline exists that can be derived based on environmental modifying parameter concentrations.  Update Tables 8.2-2 and 8.2-3 to specify if Total Chromium or Hexavalent Chromium was measured.  See also related IR-115-R1.			
IR-109	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment	<p><b>Context:</b> In this section it is stated “Treated water from the IWWTP will be pumped to the three Effluent Monitoring and Release Ponds (each 3,300 m3). These ponds will be designed to hold effluent for 72 hours for testing before discharge to the environment” (p. 8-75). It is unclear what procedure will be followed if effluent in monitoring ponds does not meet discharge requirements following testing.</p> <p>Additionally, it is also stated that “Treated water in the Effluent Monitoring and Release Ponds will be monitored prior to release to a surface waterbody or injected into groundwater via deep well injection.” However, the MDMER pursuant to the Fisheries Act requires all mine effluent and seep. From the mine site that contain deleterious substances be discharged through a final discharge point.</p> <p><b>Rationale:</b> In order to fully understand effluent management, more information is required regarding the procedure for managing effluent in monitoring ponds that does not meet discharge requirements. It is unclear how effluent that does not meet discharge requirements will be managed if it needs re-treatment and re-testing prior to discharge.</p> <p>ECCC reminds the Proponent that Project effluent from all final discharge points must meet federal legislation requirements.</p>	Provide further information regarding management of effluent in monitoring ponds that does not meet the requirements for discharge under the MDMER.		Accepted	n/a
IR-110	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.1.1 Aquatic Environment  Appendix 8-E, Section 2.1	<p><b>Context:</b> It is stated that the diffuser at the final effluent discharge point will be located in approximately 3m of water. However, in Figure 8.2-5 displaying the location of the proposed diffuser and lake bathymetry, the diffuser location seems to be located in 2-2.5m of water. A similar image in Figure 1 Section 2.0 of Appendix 8-E also indicates that the diffuser seems to be located in 2-2.5m of water. Additionally, while thermal effects are unlikely, this cannot be confirmed until a more detailed diffuser design is provided for review.</p> <p><b>Updated Rationale:</b> The Proponent should confirm the location and depth of the proposed diffuser in order to confirm that modelling predictions for effluent discharged into the receiving environment are accurate.</p> <p>A review of the final discharge design is necessary to confirm the location and depth of the proposed diffuser and modelling predictions for effluent discharged into the receiving environment.</p>	Provide confirmation of the diffuser depth and location.  ECCC requests the opportunity to review the finalized diffuser design once it is available.	Denison has captured a commitment in version 2 of the Commitments Register (July 17, 2024) that the final diffuser configuration will not change the environmental assessment conclusions of risk to aquatic receptors and that water quality will remain below guidelines (ID 8-9), so this IR has been accepted.  Note, if there are deviations from predicted effluent and near-field surface water concentrations of COPCs and risk to aquatic receptors due to the finalized diffuser design, this is expected to be addressed through Denison identifying and implementing mitigation measures (e.g., treatment) to ensure that the environmental assessment conclusions of risk to aquatic receptors will not change and that water quality will remain below guidelines. This must also be factored into Denison's EA Follow-Up Program  <i>Any outstanding issues will be further assessed as part of licensing technical reviews, prior to the granting of a licence.</i>	Accepted	n/a



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IR-111	-	CNSC	Fish and fish habitat	Section 8.2.4.2.2, Controlled Discharge	<p><b>Context:</b> This section of the EIS indicated that the scenario was assessed using a conservative assumption of a continuous freshwater withdrawal rate of 40.5 m3/hr, and a continuous effluent discharge rate of 81.0 m3/hr.</p> <p><b>Rationale:</b> The withdrawal rate assessed is half of the effluent rate, it is unclear from the text where the other half of the volume of effluent is coming from, if not drawn from the lake.</p>	Please clarify where the other half of the total volume of effluent discharged is from in the water balance between water intake and effluent.		Accepted	n/a
IR-112	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.2, Aquatic Environment  Appendix 8-E, Section 1.2.1  Appendix 10-A (ERA), Section 3.1	<p><b>Context:</b> This section of the EIS states that, “for the purpose of assessing the scenario of greatest potential effects, the Project was assessed as having a continuous freshwater withdrawal rate of 40.5 m³/hr and a continuous effluent discharge rate of 81.0 m³/hr.” (p. 8-21)</p> <p>However, several sentences later it is stated that, “The approach to assessing Project-related effects on the Surface Water Quality VC was conservative for the following reasons: The assessment was based on a continuous (year-round) discharge rate at an expected average effluent discharge of 0.0101 m3/s (or 36.5 m3/hr) throughout Construction, Operation, and Decommissioning...”</p> <p>This is a continuous theme throughout Section 8, Aquatic Environment, where the discharge rate for the surface water quality assessment changes between 36.5 m3/hr and 81.0 m3/hr. However, in Appendix 10-A (ERA) the 36.5 m3/hr discharge rate is the only value used for the near and far-field modelling.</p> <p>It should be made clear in the main body of the draft EIS that the average effluent discharge rate of 36.5 m3/hr has been used as the input for the near- and far-field modelling for effluent, surface water and sediment quality predictions. The maximum upper bound discharge rate is 81 m3/hr; however, modelling for effluent, surface water and sediment quality was not completed for this discharge rate.</p> <p><b>Rationale:</b> It remains unclear throughout the draft EIS that all predictions of COPC concentrations in effluent, and receiving environment surface water and sediment are based upon the effluent discharge rate of 36.5 m3/hr, and not the maximum upper bound discharge rate of 81 m3/hr. All conclusions about risk to the environment and aquatic and terrestrial biota must make this clear. If the Proponent wishes to make conclusions based on the maximum upper bound discharge rate of 81 m3/hr, modelling needs to be conducted using this rate of discharge.</p>	<p>1. Confirm that the surface water quantity, quality, and aquatic biota risk assessments and modelling, were conducted using the discharge rate for 36.5 m3/hr within the draft EIS.</p> <p>2. Revise any statements or conclusions in the draft EIS to improve clarity about the usage of the maximum upper bound discharge rate of 81 m3/hr. Remove statements regarding use of the discharge rate of 81 m3/hr during modelling and risk assessments to the receiving environment as needed.</p>		Accepted	n/a
IR-113	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment	<p><b>Context:</b> No quantitative assessment of climate change has been conducted. Representative concentration pathways (RPC) projections for climate change have not been integrated with near-and far-field modelling to assess impacts to surface water quality or sediment quality in the future.</p> <p><b>Rationale:</b> Changes in air and water temperatures, precipitation, snow melt, ice formation, etc., due to climate change can all influence COPC concentrations in</p>	Provide a quantitative analysis of the potential impacts of predicted COPCs from mine effluent to surface water and sediment quality with climate change scenarios for the Project lifespan incorporated into modelling. Include modelling predictions regarding the influence of changes to air and water temperatures, precipitation, snow melt, ice formation, etc., on COPC concentrations in surface water and sediment.	<p>In order to resolve this IR, CNSC Staff expect that Denison:</p> <p>Make a commitment to not discharge during unusually low flow scenarios, and,</p> <p>Make a commitment to complete a sensitivity analysis during licensing after the BATEA has been completed.</p>	Accepted	n/a



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					surface water and sediment. It is not possible to assess the potential impacts from climate change on predicted surface water and sediment COPC concentrations with the current information.		<p>These commitments must be reflected in the final EIS submission package.</p> <p><i>This IR has been accepted for the purposes of the current EA process, the outstanding issue below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>The Proponent suggests that the requested quantitative analysis is not necessary and contends that potential climate change effects on water quality should instead be addressed through mitigation measures, monitoring and adaptive management.</p> <p>The Proponent’s approach does not sufficiently characterize the range of potential effluent and water quality predictions. Climate change analysis is lacking, and a sensitivity analysis was not conducted in order to further understand uncertainty and drivers of the model results. Further, some aspects of water quality modeling are not sufficiently conservative, including use of the geometric mean (instead of the 95<sup>th</sup> percentile) as the baseline concentration for constituents, and pooling data from all lakes, which would mask any differences between the lakes.</p> <p>It is therefore not known whether water quality exceedances may be predicted under climate change scenarios. Without estimating the potential influence of climate change on water quality, it is unclear whether the proposed water quality mitigation measures are adequate. Climate change may impact the assimilative capacity of the receiving waterbody, therefore the present day 7Q10 or low flows may vary under future climate conditions. A sensitivity analysis would further refine predictions of how the 7Q10 or low flows may vary with climate change and therefore provide insight into how water quality may be impacted as well.</p> <p>In order to resolve this issue, Denison will be expected to:</p> <ul style="list-style-type: none"><li>Conduct a sensitivity analysis of low flows (7Q10 low flow, monthly low flow and monthly average flow) and high flows to assess how low and high flows may change under future climate conditions and the potential implications on water quality predictions made during the EA phase.</li></ul>		
IR-113	IR-113-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 and Section 8.4.7.6, Aquatic Environment  IR-113 Response from Denison	<p><b>Context:</b> The Proponent states the following, “The PMP is very conservative (e.g., assumes effectively a full year of precipitation in one event) under both existing and future conditions (climate change)”. This statement suggests that the PMP value utilized considers future climate changes such as possible changes in the frequency or intensity of extreme precipitation events.</p> <p><b>Rationale:</b> As noted by the Proponent, increases in extreme rainfall are anticipated with a warmer climate. For precipitation extremes across Canada, the relative change in event frequency is expected to be larger for more extreme and rarer events. Given that the extreme precipitation is expected to intensify in the future</p>	Clarify if climate change has been considered in the PMP value provided. If it has not been considered, discuss how potential increases in PMP have been and/or need to be considered in the Project design.  <b>Reference:</b> Kunkel, K., Karl, T. R., Easterling, D. R., Redmond, K., Young, J., Yin, X., & Hennon, P. (2020). Probable maximum precipitation and climate change. <i>Geophysical Research Letters</i> , 1402-1408.	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>The Proponent has not clarified if climate change has been considered in the PMP value provided or discussed how potential increases in PMP have been or need to be considered in the Project design.</p> <p>Thermodynamic effects on atmospheric moisture will lead to intensification of local extreme precipitation in the future. Probable maximum precipitation (PMP)</p>	Accepted	n/a

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					(Kunkel et al. 2013), the Proponent should consider how these potential changes will influence design values such as PMP.		<p>is defined as the greatest accumulation of precipitation for a given duration meteorologically possible for an area (Kunkel et al., 2013). PMP values may increase with climate change.</p> <p>In the response to IR-113 R1, the Proponent states that “the design basis PMP is robust and inclusive of projected total annual precipitation under a high carbon scenario”. It is unclear from this statement how the analysis provided indicates that the PMP is inclusive of climate change.</p> <p>The Proponent should clarify how the analysis that they provided shows that the design PMP considers climate change, and indicate if or how the potential for increased PMP has informed site water management for the mine life and into post-closure and considered in the development of mitigation measures.</p> <p><b>Reference:</b> Kunkel, K. E., Karl, T. R., Easterling, D. R., et al. 2013. Probable maximum precipitation and climate change. Geophysical Research Letters 40(7), 1402–1408. Available at: 10.1002/grl.50334</p>		
IR-114	-	ECCC  CNSC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.3 and Section 8.2.4.2.4	<p><b>Context:</b> Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization.</p> <p>For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values &lt;250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations.</p> <p>Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC</p>	<ol style="list-style-type: none"><li>1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds.</li><li>2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.</li><li>3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large-bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts.</li><li>4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.</li></ol>	<p>In a supplementary submission provided on July 5<sup>th</sup>, 2024, Denison provided corrections to some tables. However, errors and conflicting information remain within and between tables.</p> <p><u>In order to resolve this IR, Denison are expected to correct the following issues:</u></p> <ol style="list-style-type: none"><li>1. Provide the following updates to Tables 8.2-8, 8.2-10, 8.2-13, and 8.2-14 to correct the errors outlined. Additionally, in Table 8.2-13 MDMER Schedule 4, the maximum authorized effluent concentration limits are not appropriate for use as short-term benchmark water quality guidelines. The Schedule 4 limits are only applicable to effluent and represent concentrations in effluent that cannot be exceeded at end-of-pipe, not to receiving environment surface water concentrations, and are not a reliable indicator of acutely lethal concentrations of constituents in receiving environment surface water.</li></ol> <ul style="list-style-type: none"><li>• Tables 8.2-8 and 8.2-10:<ol style="list-style-type: none"><li>A. Temperature: long-term screening criteria is “ambient temp” and should be updated to “narrative”, as has been used in updated Tables 8.2-2. The narrative is already included in the footnotes of Table 8.2-8 and 8.2-10, so the tables should be updated as well.</li></ol></li><li>• Table 8.2-13:<ol style="list-style-type: none"><li>A. Cadmium: both short-and long-term benchmarks are erroneous and should be corrected to values found in updated Table 8.2-2.</li><li>B. Chloride: long-term benchmark is erroneous and should be corrected to value found in updated Table 8.2-2.</li></ol></li></ul>	Not Accepted	<p><b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments associated with the IR response in this table are available in Appendix A.</b></p> <p>1) The updates were completed as requested. In Table 8.2-13 MDMER Schedule 4 maximum authorized effluent limits were removed and tables updated. Tables 8.2-8 and 8.2-10</p> <ol style="list-style-type: none"><li>a) Table were updated to include “narrative” rather than “ambient temp” as requested.</li></ol> <p>Table 8.2-13:</p> <ol style="list-style-type: none"><li>A) Cadmium values were checked and were correct, however, chloride values were incorrect and had the</li></ol>

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					<p>exceedances of water quality thresholds.</p> <p>Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent.</p> <p>Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.</p>		<p>C. Iron, Lead-210, and Uranium-234 &amp; -238: long-term benchmarks are missing and should be the same values found in updated Table 8.2-2 or Table 8.2-8.</p> <p>D. Alkalinity and nitrate have been added to the table as requested, however predicted maximum concentrations are only presented for Whitefish Lake Middle and South. The proponent should describe why there are no estimates for these parameters in other lakes, and how they intend to fill these gaps.</p> <ul style="list-style-type: none"><li>Table 8.2-14:<ul style="list-style-type: none"><li>A. The removal of constituents of potential concern from future centuries review need to be justified by the proponent. Otherwise, all parameters included in Table 8.2-13 should also be included in Table 8.2-14. Presently alkalinity, nitrate, uranium-234 &amp; -238 are missing.</li><li>B. Uranium: the long-term screening concentration is erroneous and should be corrected to the value found in all other tables.</li></ul></li><li>Footnotes:<ul style="list-style-type: none"><li>A. The footnotes for each table should reflect what is in the table.</li><li>B. All tables: acronyms used in the references that need explanations in the footnotes include: “CCME”, “HC”, “BC MOE”, “FEQG” and “MDMER”.</li><li>C. All tables: explanations in the footnotes for acronyms that were not used in the tables: “SSWQO”, “TKN”, and “TOC”. Removing these would increase clarity.</li><li>D. Footnote “*” should be removed. It explains how ammonia concentration is calculated and is not referred to in Tables 8.2-8, 8.2-10 &amp; 8.2-13. In Table 8.2-14 it is associated by cadmium, which does not make sense.</li><li>E. Footnote (4) should be removed. It states the short-term screening criterion for chloride limit is “<i>Based on water hardness &gt;0 to &lt;17 mg/L</i>”. This appears erroneous since neither the CCME guideline nor the SEQG is hardness based.</li><li>F. Tables 8.2-13 &amp; 8.2-14 do not refer to the footnotes “TDS”, “narrative”, (4) and (7), and removing them would help clarity.</li></ul></li></ul> <p>2. CNSC/ECCC staff agree that the minor baseline exceedances of copper concentrations in water do not constitute the use of a guideline that is a magnitude of order greater than the copper FEQG. The copper FEQG guideline is the most restrictive guideline and based on current science and site-specific conditions, whereas the CCME guideline is quite dated and does not incorporate the use of site-specific environmental modifying factors. As there are background concentrations of copper that do exceed the copper FEQG, there is the potential that biota may already be stressed due to these exceedances. However, there is not currently enough baseline characterization data within the immediate receiving environment to</p>		<p>cadmium footnote associated with them. This was corrected.</p> <p>B) Chloride long term benchmark was corrected to the value found in Table 8.2-2.</p> <p>C) Iron, Lead-210 and Uranium-234 and Uranium-238 long-term benchmarks were missing but have been added as per the values consistent with Table 8.2-2 and 8.2-8.</p> <p>D) Alkalinity and nitrate were not collected for other locations during baseline assessments. It is intended that these constituents will be added to the pre-construction water sampling suite of parameters to ensure consistency and completeness for additional analysis conducted for licencing.</p> <p>Table 8.2-14</p> <p>A) <b>Nitrate:</b> Nitrate was not included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) as it is not considered a COPC associated with the ISR mining process for this project. Nitrate concentrations</p>

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							<p>conclude the level of risk to receptors and if there are consistent exceedances of water quality guidelines. Following the principles of the Precautionary Approach, to be conservative Denison are expected to:</p> <p>A. Update the screening criteria used for the EIS and ERA (and all relevant tables) to utilize the more stringent FEQG guideline of 0.0002 mg/L as calculated using the currently available baseline data.</p> <p>B. Update the ERA effects assessment for copper to utilize the FEQG with regards to selected Toxicity Reference Values (TRVs) and risk characterization to receptors.</p> <p>C. Collect further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water and sediment quality and any potential exceedances of baseline water quality guidelines.</p>		<p>were below laboratory reported detection limits in the metallurgical testing, where tested, as shown in Table F-2 of Appendix 7C of the EIS. Further, nitrate concentrations are, with one exception for a groundwater monitoring well in overburden (GWR-036), below or very close to the laboratory reported detection limit, as shown in Table D-2 of Appendix 7C of the Final EIS. Baseline nitrate concentrations are low ( &lt; 0.5 mg/L) in surface water bodies assessed for the project, as reported in Table 8.2.2 of Chapter 8 of the final EIS. Nitrate concentrations are thus expected to remain at baseline levels in future centuries. A note has been added to Table 8.2-14 to indicate that nitrate is not a COPC in the future centuries and as such is expected to remain at</p>

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									baseline levels. <b>Alkalinity:</b> was included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) but not included in the future centuries assessment in IMPACT. Using the output from the geochemical reactive transport model (i.e., the mass flux of alkalinity, reported as “C” in Table 4-4 of Appendix 7C of the Final EIS), the approach and input parameters used in the IMPACT model (described in Appendix A to Appendix 10-A of the Final EIS), and assuming that alkalinity (as bicarbonate ion primarily at the circumneutral pH value Whitefish Lake) does not interact with the sediments, maximum alkalinity values in Whitefish Lake (LA-5) were calculated to be 8.1 mg/L as CaCO3 versus the mean baseline value of

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									<p>7.7 mg/L as CaCO3 (Table 8.2-2 of Chapter 8 of the Final EIS). This value has been included in Table 8-2.14, is within the range of baseline alkalinity values observed in that lake (3-15 mg/L as CaCO3 in Whitefish Lake South (LA-5)) and represents a 5.2 % increase from mean baseline concentrations. The alkalinity in the future centuries was not calculated for the other lakes as changes with respect to baseline conditions will be negligible (i.e., not outside of the range of values in each lake observed at baseline). <b>U-234 and U-238:</b> Uranium was modelled in the future centuries scenario and U-234 and U-238 (Bq/L) were calculated. The results have been added to Table 8.2-14.</p> <p>B) Uranium long-term screening value was updated to be</p>



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									<div>consistent with all other tables</div> <div>Footnotes:</div> <div><div>A) Footnotes for each table have been updated</div><div>B) All table acronyms have been explained as applicable.</div><div>C) Acronyms that were not used in a table were removed from the footnotes</div><div>D) “*” has been removed from the document where explaining ammonia concentration calculation.</div><div>E) Confirmed that this statement was correct. Footnote 4 was removed from all tables, and all footnote numbering adjusted to reflect changes.</div><div>F) TDS and “Narrative” footnotes were removed. Footnote 7 was missing in the table, so was added. Footnote 4 removed from all tables.</div></div> <div>2)</div> <div>A) The screening criteria used for the EIS and ERA (and all relevant tables) has been updated to utilize the more stringent FEQG guideline of 0.0002 mg/L.</div>

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									See Attachment IR-114 Round 4. B) The TRVs have been re-evaluated using the FEQG Biotic Ligand Model. See Attachment IR-114 Round 4. C) Denison is committed to collection of further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water (refer to response to Round 4 IR-107 for water quality results from Whitefish Lake from June to September 2024) and sediment quality and any potential exceedances of water quality guidelines and this information will be further presented and analyzed as part of licensing.
IR-115	-	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic Environment  Appendix 10-A (ERA), Section 3.1.1.1	<b>Context:</b> Table 8.2-8 demonstrates baseline concentrations of COPCs in LA-5 South Whitefish Lake, their respective water quality guidelines from applicable sources, and proposed Project thresholds. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, Total Suspended Solids (TSS) and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. Water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. The water quality objective selected for molybdenum is the 31 mg/L SEQG rather than the CCME guideline of 0.073 mg/L.  <b>Rationale:</b> ECCC recommends the use of guidelines that will ensure the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds.	1. Update Table 8.2-8 to include all COPCs with required monitoring under the MDMER.  2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and are at levels protective of aquatic life.  3. Provide additional information to justify the use of the selected water quality guideline for molybdenum.	Please see the response to IR-115-R1 (below).	Accepted	n/a
IR-115	IR-115-R1	ECCC	Fish and fish habitat	Section 8.2.4.2.3 Aquatic	<b>Context:</b> In the Proponent’s response to item two, it is mentioned that the derived water quality thresholds used in Table 8.2-8 and in the assessment (Section	1. Update Table 8.2-8 to include the following COPCs: un-ionized ammonia, aluminum, iron, manganese,	In a supplementary submission from July 5 <sup>th</sup> , 2024 Denison has provided updated information.	Accepted	n/a

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				Environment  Appendix 10-A (ERA), Section 3.1.1.1  IR-115 Response from Denison	<p>8.2.4.2.3, Aquatic Environment; Appendix 10-A (ERA), Section 3.1.1.1) are based on hardness concentrations found in effluent. The Proponent mentions that hardness derived from IWWTP discharge will consider IWWTP discharge on the receiving environment and provide “a reasonable estimate of expected hardness in effluent”.</p> <p>However, this does not consider induced hardness (i.e., hardness concentration increases in the receiving environment over the lifecycle of the Project) from effluent contributions as a Project effect; the receiving environment baseline concentrations of hardness have been altered due to inputs from Project effluent. Providing only one estimate of expected effluent hardness in the receiving environment is not an appropriate means of conducting the effects assessment.</p> <p>Additionally, the following COPCs have not been included in the updated table provided in the Proponent’s response: un-ionized ammonia, aluminum, iron, manganese, thallium and total dissolved solids (TDS). It is noted that these COPCs are also subject to monitoring requirements under the <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER).</p> <p><b>Rationale:</b> Background concentrations of un- ionized ammonia, aluminum, iron, thallium, manganese and TDS are required to determine potential effects to the environment. The Proponent will also require this information to satisfy their obligations under the MDMER.</p> <p>The purpose of the surface water quality assessment is to determine if changes to the receiving environment over the project lifecycle will have significant adverse effects on biota.</p> <p>Changes from baseline in hardness concentrations in the receiving environment due to the deposition of effluent is a Project related effect and therefore providing a single baseline water quality threshold which is applicable only to one set of conditions is not an appropriate method to evaluate impacts across a shifting hardness baseline.</p> <p>Water hardness is an environmental modifying factor, various concentrations of hardness influence the toxicity of other COPCs in the aquatic environment. Using water quality thresholds that have been derived from high effluent hardness concentrations will not be protective of aquatic biota, particularly in the early stages of the project lifecycle when receiving environment water quality will be similar to baseline water quality.</p>	thallium and total dissolved solids (TDS).	<p>Denison will be required to update the screening criteria for ammonia, aluminum, iron and lead during licensing review of the ERA. These updates are not anticipated to impact the conclusions of significance to the EA, and therefore are not required at this time.</p> <p><i>Any outstanding issues will be further assessed as part of licensing technical reviews, prior to the granting of a licence.</i></p>		
IR-116	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.4.2.5, Section 8.4.4.2.5 and Section 8.5.4.2.3	<p><b>Context:</b> Tables 8.2-14, 8.4-9 and 8.5-5 demonstrate predicted mass flux (in mg/s) of COPCs in groundwater during the future centuries scenario. The table does not provide any information on actual surface water concentrations of COPCs or accumulation in concentrations over time. It is not possible to determine what the COPC concentrations in surface water and sediment will be during the future centuries scenario with the current information.</p> <p>Additionally, only a subset of parameters have been provided in this table based on</p>	<p>1. Provide the predicted water and sediment quality concentrations of COPCs in the receiving environment for the future centuries scenario.</p> <p>2. Include data for a greater suite of COPCs that were assessed as having potential to be at elevated concentrations in groundwater.</p>		Accepted	n/a

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					parameters that were elevated in effluent after treatment. Groundwater may have a variety of different COPCs with elevated concentrations as it will migrate directly from the ore body area and not receive treatment.  <b>Rationale:</b> It is not possible for ECCC to assess the predicted concentrations of COPCs in surface water and sediment, and therefore risk to aquatic biota during the future centuries scenario with the provided information.				
IR-117	-	CNSC	Human health with respect to hazardous contaminants	Section 8.2.4, Table 8.2-9	<b>Context:</b> CNSC staff note that some of the effluent quality predictions in the EIS are quite high for a uranium mine and mill facility compared to the existing facilities.  For example, the upper bound effluent quality of molybdenum is 2.5 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.213 mg/L.  Also, the upper bound effluent quality of copper is 0.022 mg/L. In 2021, the highest monthly mean concentration at the existing uranium mine and mill facilities is 0.002 mg/L.  <b>Rationale:</b> Surface water quality models should be based on the anticipated effluent quality. From discussions with Denison, it appears that the effluent quality predictions may change based on the results of more bench scale tests that are still being conducted and continued optimization of the design of the water treatment plant.	Please provide the anticipated effluent quality of the constituents of potential concern during normal operations.  Once Denison has refined the effluent quality predictions, Denison is expected to update the inputs into the surface water quality model.		Accepted	n/a
IR-118	-	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.2.6.1, Section 8.4.6.1 and Section 8.5.6.1, Aquatic Environment	<b>Context:</b> It is unclear if Tables 8.2-16, 8.4-12, 8.5-7 and 8.5-8 take into consideration potential effects from groundwater seepages of COPCs to surface water and sediment quality in the future centuries scenario. No information regarding the future centuries scenario has been provided in the rationale summary for ratings.  <b>Rationale:</b> Groundwater seepage of COPCs may have future impacts to surface water quality, sediment quality and aquatic receptors; however, the extent of residual effects is unclear without further information.	Provide further information regarding how groundwater seep. Of COPCs may have future impacts to surface water quality, sediment quality, and aquatic receptors, and any residual effects that may persist.		Accepted	n/a
IR-119	-	CNSC	Fish and fish habitat	Section 8.3.1.2, Table 8.3-1, Sediment quality	<b>Context:</b> Sediment quality isn't considered a key indicator for fish and fish habitat, but the accumulation of contaminants in sediment porewater without habitat alteration is similar to the key indicator 'change in surface water quality from baseline conditions' that is considered.  <b>Rationale:</b> It is not clear whether sediment was just considered for physical disturbance, and why chemical changes are missing from key indicator list for fish and fish habitat.	Please provide the rationale for exclusion of sediment quality from the key indicator list for fish and fish habitat.		Accepted	n/a
IR-120	-	CNSC	Aquatic species	Section 8.3.3 and 8.5, Aquatic Environment	<b>Context:</b> Although downstream impacts are not predicted by Denison it is important from an ecosystem perspective to establish baseline locations to monitor for potential cumulative effects to the aquatic environment due to the Key Lake and Wheeler River Operations to ensure the aquatic environment is being protected from cumulative impacts.	If Denison has not collected baseline aquatic studies in the far-field downstream receiving environment of Russell Lake, please provide a rationale for why.	Response is accepted, but also see AD-51 in the Advice to Proponent table.	Accepted	n/a

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					<p>Denison should consider adding a far-field exposure location and collecting baseline aquatic ecosystem baseline data in Russell Lake including:</p> <ul style="list-style-type: none"><li>• Water quality/chemistry</li><li>• Sediment chemistry/quality</li><li>• Benthic invertebrate chemistry /community</li><li>• Large-bodied fish tissue/chemistry</li></ul> <p><b>Rationale:</b> Russell Lake is identified as part of the RSA for the aquatic environment, but it appears that no detailed aquatic baseline data was completed in far-field location in Russell Lake. In addition, several Indigenous Nations and communities and local resource users have indicated that Russell Lake is an important body of water both culturally for traditional use and was once used as commercial fishery.</p>	<p>If a far-field Russell Lake location was sampled as part of baseline data collection, more information about the process and results with regards to sampling at Russell Lake should be included in the EIS. This information would be valuable to help determine potential cumulative effects downstream in the Russell Lake drainage system (due to the Key Lake Operation) which has been identified as a key concern and area of interest by several Indigenous Nations and communities.</p>			
IR-121	-	CNSC	Fish and fish habitat	Section 8.3.3.1, Methodology and Metrics	<p><b>Context:</b> In the description of methodology for fish communities and spawning surveys, there’s no mention that could be found for an any evaluation of fish condition, other than sexual condition.</p> <p><b>Rationale:</b> Exposure to other pre-existing stressors could result in abnormal conditions or deformation(s) in existing population, but the extent of existing conditions should be evaluated to ascertain whether the rate is increasing as a result of proposed activities once in operation.</p>	<p>Please provide reference to where fish condition is considered or provide a justification for its exclusion.</p>	<p>Response is accepted, but also see AD-52 in the Advice to Proponent table.</p>	Accepted	n/a
IR-122	-	CNSC	Fish and fish habitat	Section 8.3.8, Monitoring and Follow-up	<p><b>Context:</b> Section 8.3.8 of the EIS states: “Changes in fish communities/populations will be assessed through comparison of Construction, Operation, and Decommissioning results to pre-development.”</p> <p><b>Rationale:</b> Tracking changes in fish communities / populations in reference lakes over time should be conducted, as reference lakes can be used to differentiate natural temporal variation with potential project impacts.</p>	<p>Please include reference lakes, and if it is provided, please reference where in the EIS these are discussed. If there are no reference lakes, these should be included in the monitoring program.</p>	<p>Response is accepted, but also see AD-53 in the Advice to Proponent table.</p>	Accepted	n/a
IR-123	-	ECCC	Change to an environmental component due to radiological contaminants	Section 8.4.3.2.3, Aquatic Environment  Appendix 8-D, Table 3-5	<p><b>Context:</b> Table 8.4-3 provides a summary of the baseline concentrations of COPCs in sediments in the LSA. Sediment quality thresholds and justification for the selection of those thresholds have not been provided. Table 3-5 in Appendix 8-D does provide benchmarks but the selection of benchmarks is not discussed, and the most stringent guidelines are not used for some COPCs. Additionally, there is no data provided for sediment concentrations of mercury, which is a COPC that requires surface water quality monitoring and effluent characterization under the MDMER.</p> <p><b>Rationale:</b> Further information should be provided regarding any exceedances of sediment quality thresholds in baseline concentrations of COPCs, which should be recommended for further assessment of risk due to effluent discharges.</p>	<p>1. Provide sediment quality thresholds and justification for the selection of those thresholds for comparison against measured baseline COPC concentrations in the LSA.</p> <p>2. Provide data on baseline concentrations of mercury in sediment.</p> <p>3. Identify any COPCs with baseline concentrations that exceed sediment quality thresholds in the LSA.</p>		Accepted	n/a
IR-124	-	ECCC	Change to an environmental component due	Section 8.4.4.2.3, Aquatic Environment	<p><b>Context:</b> Table 8.4-7 provides maximum concentrations of surface water COPCs in sediment. The following COPCs, which are required to evaluate the risk from effluent to sediment quality, were not evaluated:</p>	<p>1. Provide the information on baseline exceedances of COPCs in sediment.</p> <p>2. Provide an assessment of risk for any COPCs that have</p>	<p>Following review of a supplementary submission provided on July 2<sup>nd</sup>, 2024, concerns remain related to:</p>	Accepted	n/a

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			to hazardous contaminants		<ol style="list-style-type: none"><li>1. COPCs that have monitoring requirements in receiving environment surface water and effluent under the MDMER,</li><li>2. COPCs that exceed water quality guidelines in effluent, and,</li><li>3. COPCs that have baseline concentrations that exceed sediment quality thresholds in the receiving environment.</li></ol> <p><b>Rationale:</b> Due to the lack of information on COPCs with baseline concentrations that exceed sediment quality guidelines, and COPCs that require monitoring under the MDMER, a determination on risk to sediment quality and aquatic biota cannot be made.</p>	<p>baseline exceedances of sediment quality thresholds in the receiving environment.</p> <p>3. Provide an assessment of risk from any COPCs that require monitoring in the receiving environment and effluent under the MDMER. Please include any COPCs in effluent that will exceed water quality guidelines.</p>	<ul style="list-style-type: none"><li>• Denison’s assessment of water/sediment quality for near field and regional receiving waterbodies using low flow scenarios based on return periods beyond 100 years, as well as near field and regional models.</li><li>• The 7Q10 is considered acceptable low flow to provide conservative predictions for the assessment of water/sediment quality.</li><li>• The modeled results for maximum concentrations of COPC’s shown in tables 3.3 and 3.5 of Appendix 10-A, which show that copper may exceed the new FEQG in freshwater for both operational and post decommissioning phases of the project.</li></ul> <p>For the purposes of this review, this IR is accepted, and these outstanding concerns will be addressed in responses to IR-113 (through sensitivity analysis) and IR-114.</p> <p>See also AD-76 in the Advice to Proponent table.</p>		
IR-124	IR-124-R1	ECCC	Change to an environmental component due to hazardous contaminants	Section 8.4.4.2.3, Aquatic Environment  IR-124 Response from Denison	<p><b>Context:</b> In the Proponent’s response it is stated, “Schedule 5 parameters will be monitored as per the MDMER once under this regulation (i.e., meeting regulated criteria of discharge to the environment [50 m3/day). Please refer to Table 8.2-13 of attachment IR-114. In these cases, COPCs including Schedule 4 parameters were below screening criteria.”</p> <p>If concentrations of Schedule 5 parameters in effluent exceed water quality thresholds, these parameters are necessary for ECCC to examine in the risk assessment to determine the potential for effluent to be acutely lethal and for adverse effects to aquatic biota. These parameters will also be required to be characterized under Section 4, 5 and 7 of the MDMER. As per CSA N288.6-22 Section 7.2.5.2.1, “Screening of environmental concentrations of chemical and radiochemical substances released to the environment should be performed to identify COPCs for further evaluation in the risk assessment. Both measured concentrations and concentrations calculated from release rates may be used in the screening analysis. The screening concentrations should be compared to screening criteria, and chemicals that exceed screening criteria should be identified as COPCs.”</p> <p>As per CSA N288.6-22 Section 7.2.5.4.2, “If COPCs exceed the screening level for one medium, they should be carried forward into the EcoRA for all media that are likely to contribute to exposure. For example, for a given COPC, if a water screening benchmark is exceeded, the same COPC should be carried forward for sediment if its concentration was above the detection limit.”</p> <p>Additionally, updated Table 8.2-13 of attachment IR-114 has been found to be insufficient due to maximum concentrations in surface water for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus being absent and the use of incorrect water quality thresholds.</p>	Provide an assessment of risk from any MDMER Schedule 5 parameters that are required to be characterized in effluent and in surface water quality in the receiving environment and that have effluent concentrations that will exceed water quality guidelines derived from environmental baseline conditions.	See response for IR-124.	Accepted	n/a



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					<b>Rationale:</b> Due to the lack of information on COPCs with concentrations that exceed water quality thresholds in effluent, a determination on risk to sediment quality and aquatic biota cannot be made.				
IR-125	-	CNSC	Fish and fish habitat	Section 8.5, Aquatic Environment and Fish health	<b>Context:</b> Indigenous Knowledge studies and information collected in relation to the Project clearly identified the importance of water quality and fish health to local Indigenous peoples and is discussed throughout the Draft EIS. For example: <ul style="list-style-type: none"><li>“Russell is one lake where I commercially fish. How will this effluent impact the water quality, fish health? Will I be able to sell fish from here? If there is going to water” pollution, I just want to know” (19-LK-ERFNTrip-134.255)</li><li>“How are you going to protect the water quality? We are concerned about mercury in fish, other animals, etc. Is there mercury or arsenic in the uranium solution?” (p. 8-53)</li></ul> <b>Rationale:</b> Several Indigenous Nations and communities and local resources users have indicated Russell Lake is an important body of water both culturally for traditional use and was used as commercial fishery in the past and from an aquatic ecosystem perspective.	One of the many mitigation measures mentioned throughout the aquatic environment section states:  “Denison will work with the associated communities to develop and implement the Project-specific monitoring programs and a framework to share the results for the purpose of assessing the performance of the water management system.” (p.10-32)  Has Denison considered the collection of additional baseline fish tissue species that are of importance to Indigenous Nations and communities and local cabin owners from Russell Lake? Assuming the species would be walleye (commercially and recreationally) and lake white whitefish that is traditionally an important species consumed.  Please provide more information on the engagement to date on the development of the Surface Water Management Program and Monitoring program that Denison is developing and engagement to date with interested Indigenous Nations and communities in the region on fish and fish health.	Response is accepted, but also see AD-51 in the Advice to Proponent table.	Accepted	n/a
IR-126	-	ECCC	Aquatic species	Section 8.5.3  Appendix 10-A (ERA), Section 5.3.1.1.8	<b>Context:</b> The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.  <b>Rationale:</b> ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.	Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.	Following a supplementary submission by Denison on July 2 <sup>nd</sup> , 2024, it has been determined that item one and two of this IR have been resolved, but item three remains outstanding.  Denison has not provided the information requested to address Item 3 of the Round 3 IR. Including the estimates of error for the predicted selenium concentrations in fish is necessary as the maximum predictions for Northern Pike in Whitefish Lake North and Middle are within 1-2 ug/g dw of the Egg/Ovary FEQG guideline of 14.7 ug/g dw.  <u>In order to resolve this IR, Denison are expected to:</u> <ol style="list-style-type: none"><li>Provide an estimate of error associated with the Northern Pike BAF.</li><li>Include this estimate of error for the results in Table -IR-126-2 and consider this in the effects assessment.</li></ol>	Not Accepted	<b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments associated with the IR response in this table are available in Appendix A.</b>  1. An estimate of the error associated with the Northern Pike BAF is included in Attachment IR-126 Round 4 (see Appendix A to this IR response table).  2. An estimate of the whole body and egg-ovary concentrations using the range of uncertainty (low to high) is included in Attachment IR-126

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									Round 4 (see Appendix A to this IR response table).  Denison will include the information on selenium BAF sensitivity analysis from this IR response in Appendix 10-A of the final EIS (new subsection 6.2.3).
IR-127	-	CNSC	Aquatic environment	Appendix 8-E, Section 1.2.1, Hydrological Inputs	<b>Context:</b> Within this section it states that the 7Q10 low flow rate used in the mixing assessment “was provided verbally to Ecometrix by NewFields Canada during a project meeting on 26 April 2022”  <b>Rationale:</b> The statement that this value was provided verbally is not an infallible method of communicating data, as the value could have been misheard, misremembered, or recorded improperly.	Please verify that the 7Q10 value used in the assessment is the correct value determined by NewFields.		Accepted	n/a
IR-128	-	CNSC	Current use of lands and resources for traditional purposes	Section 9  Various pages in section 11.1, Land and Indigenous Resource Use Section 12 Section 14	<b>Context:</b> The increased road traffic (14-18 trucks per day during construction/operations) may have indirect impact on ungulates, furbearers and wood land caribou presence/absence for traditional and subsistence hunting have been raised to CNSC staff when meeting with Indigenous Nations and communities and are presented in the EIS.  <b>Rationale:</b> The increased traffic and therefore dispersal of game (moose, woodland caribou) due to increased traffic has been raised as a concern with respect to increased mortality on wildlife and decreased ability to practice traditional rights.	How have the potential residual impacts with respect to increased traffic and noise (due to current and future operations) been communicated to Indigenous Nations and communities who use the road #914 for cultural and traditional activities (such as moose harvesting, berry picking and small game and birds)?  Please provide any additional information on the engagement that has taken place to date with Indigenous Nations and communities with respect to concerns and potential impacts on current use of lands and resources due to increased road traffic, and any mitigation measures proposed by Indigenous Nations and communities to minimize the potential impacts.	Response is accepted, but also see AD-54 in the Advice to Proponent table.	Accepted	n/a
IR-129	-	CNSC	Current use of lands and resources for traditional purposes	Section 9 Section 10 Section 11, including Section 11.1.4.3.1 (p. 11-46) Section 12 Section 16	<b>Context:</b> ERFN indicated they are concerned about declining moose populations from an influx of hunters; more people may be accessing the area year after year, and worried populations may be affected by the Project (21-EN-ERFN-473.13).  Further, the EIS highlights that: “Vehicle collisions are the most likely source of direct mortality for moose. Effective mitigation measures (e.g., breaks in snowbanks; speed limits; and exclusion fencing around contaminated waste pads and ponds) will be implemented to reduce moose mortality.” (p. 11-46)  <b>Rationale:</b> The <a href="#">Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012</a> notes: “The views of affected Aboriginal groups on mitigation be considered and included in the EIS. This could assist in ensuring that the environmental effects on the current use of land and resources for traditional purposes are at an acceptable level for the community.”	Please provide additional information on the discussions Denison has had with Indigenous Nations and communities on how to mitigate any residual project impacts on their traditional harvesting activities of large game such as moose.  More information is required to determine if Denison has engaged directly with ERFN/KML and other Indigenous Nations who utilize the area to harvest moose to determine current baseline harvest numbers that provide subsistence, continued cultural identity and community well-being, as well as discussions on how the Project could potentially impact moose populations and the harvesting of moose for traditional practices.	Response is accepted, but also see AD-62 in the Advice to Proponent table.	Accepted	n/a

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					<p>Sources for indirect moose mortality (e.g., increased hunter access, changes to health due to sensory disturbances, changes to predator-prey dynamics) may result in mortality outside the Wildlife LSA. The residual effect of change in moose mortality is likely to occur. Although mitigation measures are expected to reduce, but not fully eliminate, the residual effect on moose.</p> <p>The potential residual impact on the moose and other large game populations in the broader regional study area may potentially impact Indigenous treaty rights, culture, and community well-being if the harvesting of moose and large game declines due to increased traffic, noise, and vehicle mortality or increased outside hunting pressure.</p>				
IR-130	-	H. Mulye	Physical stressors (noise and vibration) on wildlife	Section 9, Terrestrial Environment	<p><b>Context:</b> Sensory disturbances such as noise have been identified as stressors for selected wildlife (Ungulates, Furbearers, and Woodland Caribou), birds and amphibians in the Project area. However, there is no consideration of impacts from vibrations on these species. Also, impacts of noise and vibration on reptiles have not been assessed in the Project area.</p> <p><b>Rationale:</b> While noise has been qualitatively assessed for selected wildlife, birds, and amphibians, there is no consideration of project-related vibrations as a sensory disturbance/physical stressor. Sensitive terrestrial species (specifically, herpetofauna, amphibians, invertebrates, and caribou) can be impacted by vibrations emanating from the operation of heavy machinery, blasting activities, and other anthropogenic activities at the Project site.</p> <p>Also, impacts of physical stressors (noise and vibration) on reptiles were not assessed. These species should be included in this assessment due to their sensitivity to noise and vibrations.</p>	<p>Please provide a discussion of impacts of physical stressors (specifically vibrations) on wildlife, birds, and amphibians in the Project area. Specific mitigation measures and/or monitoring for impacts from project-related vibrations should be considered, as appropriate.</p> <p>Also, include reptiles in the assessment of project-related noise and vibrations as sensory disturbance/physical stressor, or a justification for their exclusion.</p>		Accepted	n/a
IR-131	-	ECCC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> As per the requirement outlined in Section 79 of the Species at Risk Act (SARA): <i>The person must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. This is accomplished by ensuring that the Proponent has identified, avoided, lessened and will monitor effects to species at risk.</i></p> <p>As per the CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> pursuant to the Canadian Environmental Assessment Act, 2012: <i>“The EIS will then describe mitigation measures that are specific to each environmental effect identified. Measures will be written as specific commitments that clearly describe how the Proponent intends to implement them and the environmental outcome the mitigation is designed to address. The EIS will describe mitigation measures in relation to species and/or critical habitat listed under the Species at Risk Act (SARA). These mitigation measures will be consistent with any SARA permit, applicable</i></p>	Identify all species at risk listed on Schedule 1 of the Species at Risk Act and their critical habitat that are likely to be affected by the Project and describe how they may be adversely affected by the Project. Describe what measures will be taken to avoid or lessen the effects of each Project activity and stage, and how these effects will be monitored to ensure they are avoided or minimized.		Accepted	n/a

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					<i>recovery strategy and/or action plan”.</i>  The draft EIS neither lists the adverse effects to all listed schedule 1 SARA species, nor outlines the measures that will be taken to avoid or lessen these effects. The Proponent references that additional species-specific mitigations will be detailed in environmental management plans but has not provided those plans for review.				
IR-132	-	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<b>Context and Rationale:</b> ECCC has identified that three species at risk arthropods (yellow banded bumble bee, transverse lady beetle, and nine-spotted lady beetle) have ranges overlapping the Project area and these were not mentioned in the draft EIS.	1.Conduct an effects assessment for arthropod species at risk.  2. Explain what mitigation measures will be used to minimize potential effects.		Accepted	n/a
IR-133	-	ECCC		Section 9, Terrestrial Environment	<b>Context and Rationale:</b> There is potential for some species at risk (e.g., myotis species, barn or bank swallows, common nighthawk) to be attracted to and use mine infrastructure (buildings, roads etc.) once constructed for nesting, roosting, or foraging.  Details on mitigation measures and adaptive management with respect to attraction to Project components should be identified to assess residual and cumulative impacts to species at risk.	For all Project phases, describe the mitigation measures and adaptive management to prevent and minimize effects on species at risk that may utilize mine infrastructure.		Accepted	n/a
IR-134	-	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<b>Context and Rationale:</b> The draft EIS states in multiple places that vegetation clearing may occur year-round.  In order to correspond with the timing of emergence from hibernation, tree clearing should not be conducted during the bat roosting period. If maternity roost trees are removed after pregnant females have established a roost area, there is a higher likelihood of abortion than there would be otherwise.  Species-specific mitigations are required to protect bat SAR.	Provide important roosting dates for bat species at risk in the Project area.	The Proponent provided a complete response regarding the roosting dates for bat species at risk, however follow-up IRs are required.  See follow-up IR-134-R1.	Accepted	n/a
IR-134	IR-134-R1	ECCC	Wildlife and Wildlife habitat	Section 9, Terrestrial Environment	<b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided. Knowing the survey methodology for pre-construction and pre-clearing for little brown myotis and northern myotis is important for assessing cumulative impacts, effectiveness of adaptive management strategies as well as determining how bat species were considered in the EIS.  <b>Rationale:</b> ECCC can determine whether the methodology the Proponent will use to collect data is appropriate and if the methodology would contribute to a more complete understanding cumulative effects and adaptive management strategies.  A clear outline of how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods for bats, such as roosting, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the	The information provided by the Proponent regarding the roosting dates and potential habitat for bats is complete, however, the information related to the pre-construction and pre-clearing surveys is missing details on important habitat features for bat species at risk. As two Species at Risk Act (SARA) schedule 1 listed bat species, little brown myotis ( <i>Myotis lucifugus</i> ) and northern myotis ( <i>Myotis septentrionalis</i> ) have been identified in the Project area, effects need to be identified, avoided, lessened and monitored.	Following a supplementary submission by Denison on July 8 <sup>th</sup> , 2024, this IR has been resolved. The response on bats is sufficient.	Accepted	n/a

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					effectiveness of mitigation strategies and adaptive management strategies which are being developed by the Proponent.				
IR-135	-	ECCC	Migratory birds, Wildlife and Wildlife Habitat	Section 9, Terrestrial Environment	<p><b>Context and Rationale:</b> The mitigation measures for birds and wildlife presented in the draft EIS are very general. Additional detail is required for a complete assessment of residual and cumulative Project effects to birds and wildlife.</p> <p>The Proponent has committed to providing a number of plans including, a Decommissioning Plan, a Spill Response Plan, a Waste Management Plan, a Surface Water Monitoring Plan, a Remediation and Closure Plan, a Radiation Protection Plan, a Soil and Vegetation Monitoring Plan, a Wildlife Monitoring Plan, and a Woodland Caribou Management Plan. In order to assess potential affects to migratory birds and wildlife from Project related activities, ECCC requires details on species-specific mitigation measures, and monitoring plans.</p>	<p>The following information should be included in the various plans and should be provided for review during the environmental assessment:</p> <ol style="list-style-type: none"><li>1. For all Project phases, describe the species-specific mitigation measures and responses to prevent and minimize effects on migratory birds or species at risk (SAR) birds and mammals that may utilize mine infrastructure.</li><li>2. Explain how light pollution will be managed and what specific mitigation measures will be used to minimize effects to migratory birds and SAR birds and mammals.</li><li>3. Provide details on what methods will be used for erosion control and how they will prevent sediment from entering waters frequented by migratory birds or SAR. Explain what actions will be taken if the erosion control measures are not successful.</li><li>4. Provide details on noise and other sensory disturbance monitoring and mitigations if noise levels surpass thresholds.</li><li>5. Describe time windows and species- specific mitigations related to maintenance activities such as vegetation management, road or building repair and stream crossing replacements.</li></ol>		Accepted	n/a
IR-136	-	CNSC	Soil Salvage Monitoring	Section 9.1.8.2	<p><b>Context:</b> The Proponent plans to salvage and stockpile soil and organic matter/peat in order to use it in reclamation activities during decommissioning. Periodic monitoring of the stockpiles is proposed to be conducted to verify that soil and organic matter/peat are delineated, stripped, handled, and stockpiled as recommended, and to evaluate the stability of salvaged soil, e.g., in relation to potential erosion and/or degradation. It is unclear whether monitoring includes soil quality in terms of concentrations of COPCs.</p> <p><b>Rationale:</b> It is expected that project-related activities (road and airport traffic, drilling) can result in open-source (i.e., fugitive) dust and process-source dust (incl. radionuclides), which can accumulate and result in changes in soil quality of the stockpiled soil and organic matter/peat as described in Sections 9.1.4.2.2 and 9.1.4.2.3).</p>	Please clarify if COPC concentrations monitoring is planned to be performed for stockpiled soil and organic matter/peat.		Accepted	n/a
IR-137	-	ECCC	Migratory birds, Wildlife and Wildlife Habitat,	Section 9.2.1.3, Spatial and Temporal	<p><b>Context and Rationale:</b> The CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> Pursuant to the Canadian Environmental Assessment Act, 2012 states that: “The EIS will describe the spatial boundaries, including local and regional study areas, for</p>	Provide a biologically relevant rationale for the delineated study boundaries (LSA and RSA) for all different valued components. Include the following information:		Accepted	n/a



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			Vegetation and Wetlands	<p>Boundaries for Vegetation and Ecosystems, Listed Plant Species and Wetlands</p> <p>Section 9.3.1.3.1, Spatial Boundaries for Ungulates, Furbearers and Woodland Caribou</p> <p>9.4.1.3.1, Spatial Boundaries for Raptors, Migratory Breeding Birds, and Bird Species at Risk</p>	<p>each VC to be used to assess the potential adverse environmental effects of the Project and provide a rationale for each boundary.</p> <p>Spatial boundaries will be defined taking into account the appropriate scale and spatial extent of potential environmental effects, community knowledge and Indigenous knowledge, current or traditional land and resource use by Indigenous groups, ecological, technical, social and cultural considerations.”</p> <p>The information provided in the EIS does not enable a biologically relevant assessment of the Project’s effects.</p> <p>The Proponent did not provide rationale for the selection of study areas for individual vegetation, wildlife or migratory bird valued components (VC). Different VCs may have different spatial boundaries for the LSA and/or RSA. For wildlife and bird VCs, the LSA is defined as a 1.7-km buffer from the Project area, and the RSA is defined as a 6.6-km buffer around the LSA. There is no information on how the spatial boundaries were derived.</p> <p>Specific to Woodland Caribou, boreal population (hereafter referred to as boreal caribou):</p> <p><u>Project Footprint:</u> In a scientific assessment of critical habitat (Environment Canada, 2011) [1] ECCC demonstrated that the application of a 500-m buffer to mapped anthropogenic features best represents the combined effects of increased predation and avoidance on caribou population trends at the national scale. Adding a 500-m buffer to the Project footprint is required to represent functional habitat loss.</p> <p>The draft EIS does not appear to use a buffer for their Project area. The draft EIS (Section 9.3.1.3.1) states: “Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area covers 169.6 ha and is not VC-specific, but consistent throughout the EA.” (p. 9-168)</p> <p><u>LSA:</u> The defined LSA for boreal caribou has to consider avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance. This required information is not detailed in the draft EIS.</p> <p>Adverse effects of Projects including predator and prey access to undisturbed areas, reduction in connectivity, and sensory disturbance to individual boreal caribou can vary and extend several kilometers depending on Project activities and ecological context. At minimum, the LSA should capture the above- mentioned effects. For boreal caribou, the Project footprint should be defined as the immediate area to be cleared, plus a 500-m buffer to represent functional habitat loss. Following this guidance, the LSA should be defined as a buffer of the Project footprint with the 500-m buffer.</p>	<ul style="list-style-type: none"><li>Descriptions of how the RSA and LSA boundaries were derived for all VCs.</li></ul> <p>Specific to boreal caribou:</p> <p><u>Project Footprint:</u></p> <ul style="list-style-type: none"><li>Include a 500-m buffer of area of maximum physical disturbance to represent functional habitat loss for boreal caribou</li></ul> <p><u>LSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the LSA takes into account boreal caribou avoidance of disturbed areas, predator access to undisturbed areas, reduction in connectivity and sensory disturbance to individuals.</li></ul> <p><u>RSA:</u></p> <ul style="list-style-type: none"><li>Include a description of how the RSA used in the draft EIS is an accurate representation of the SK1 boreal caribou range; <b>or</b></li><li>Re-do the assessment with the RSA at the scale of the range</li></ul> <p>See also related IRs: IR-154 and IR-156.</p>			



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					<p>RSA: The Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada states: <i>Mitigation of adverse effects from individual projects/activities will require a coordinated approach and management of cumulative effects within and among ranges. A cumulative effects assessment is essential to position the proposed project/activity in the context of all current and future development activities. The cumulative effects assessment will:</i></p> <ul style="list-style-type: none"><li>• <i>Assess the impact of all disturbances (anthropogenic and natural) at the range-scale;</i></li><li>• <i>Monitor habitat conditions, including the amount of current disturbed and undisturbed habitat, and amount of habitat being restored;</i></li><li>• <i>Account for planned disturbances; and</i></li><li>• <i>Assess the distribution of disturbance in large ranges for risk of range retraction in parts of the range.</i></li></ul> <p>The proposed Project’s cumulative effects for boreal caribou are possible at the scale of the SK1 boreal caribou range. The RSA used for boreal caribou for this Project is only 40,173.6 ha, compared to the SK1 range, which is 18,034,870 ha. As such, it is too small to capture cumulative effects to this species and does not follow the Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011) or the Amended Recovery Strategy for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada.</p> <p><b>Reference:</b> [1] Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (<i>Rangifer tarandus caribou</i>), Boreal Population, in Canada (Environment Canada, 2011).</p>				
IR-138	-	CNSC	COPC in Lichen	Section 9.2.4.2.2  Appendix 10-A (ERA)	<p><b>Context:</b> A quantitative assessment using modelling dispersion and uptake of COPCs in the environment was completed for the Project as part of the ERA, to support conclusions drawn in the EIS. In Appendix 10-A (ERA), COPCs in plant tissue was estimated for lichen. Table 5-5 of the ERA (p. 5.24) named “Complete Exposure Pathways for All Selected Ecological Receptors to be Assessed using the IMPACT Model” lists the exposure pathway for lichen as direct contact on soil.</p> <p><b>Rationale:</b> Airborne COPC can deposition on lichen and subsequently enter the food chain; therefore, the “contact with air” pathway should be considered. In fact, lichen species are frequently used to monitor the deposition and accumulation of airborne contaminants (e.g., dust, metals). It is also noted that based on sampling results of the 2017 baseline studies, lichen frequently contain higher concentrations of COPC than blueberry (compare Table 9.2-6 and Table 9.2-7 in the EIS), especially at sampling sites with elevated concentrations (e.g., RSV9 and RSV10).</p>	<p>Please include the exposure pathway of direct deposition (dry and wet) of airborne contaminants on lichen in the quantitative ERA, or justify why this exposure pathway was not considered.</p> <p>See also related: IR-189.</p>		Accepted	n/a
IR-139	-	ECCC	Change to an environmental	Section 9.2.5.2.7, Waste and	<p><b>Context:</b> In this section, the Proponent outlines various measures to mitigate air emissions, including implementation of the air quality programs within the</p>	<p>Confirm if vehicles and equipment will be equipped with Tier 4 engines where feasible.</p>	<p>Response is accepted, but also see AD-55 in the Advice to Proponent table.</p>	Accepted	n/a

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			component due to hazardous contaminants	Hazardous Materials Management	<p>Environmental Management System, regular maintenance and inspection of equipment, and elimination of unnecessary idling of equipment. However, the intention to use industry-standard emission control systems has not been substantiated.</p> <p><b>Rationale:</b> For the protection of air quality, it is important to specify the emission standards that equipment will have (e.g., Tier 3 or Tier 4 engines). Vehicles and equipment with Tier 4 engines have much lower emissions of contaminants than those with Tier 3 engines. If non-Tier 4 engines are used, ECCC recommends that best management practices are followed, including proper maintenance of the engine and anti-idling measures.</p>				
IR-140	-	CNSC	Change in the Areal Extent of Wetlands	Section 9.2.6.4	<p><b>Context:</b> Predicted residual effects on the areal extent of wetlands include the direct effect of loss of wetlands and several indirect effects of alteration of wetlands. As stated in the EIS, wetlands can exhibit low resilience and high susceptibility to disturbance. At the same time, wetlands tend to support a high species diversity, and are considered to have a moderate to high potential to support listed plant species. Lastly, wetlands are rare on the landscape compared to terrestrial ecosites (see Table 9.2-5).</p> <p><b>Rationale:</b> Several wetland ecosites (BS19/24, BS25, BS27) occur only in small areas (&lt; 30 ha) in the RSA but are predicted to experience disturbance of 6-64%, most notably the ecosite BS19/24 where 0.8 of 1.2 ha are predicted to be disturbed. It is noted that wetlands are scattered throughout the landscape as shown in Figure 9.2-8. More information is requested regarding the ecological impact of this disturbance.</p>	<p>1. Please provide a discussion on the ecological impact of disturbance to rare wetland ecosites.</p> <p>2. Please provide information on whether adequate other habitat is available for species impacted in these disturbed sites in close proximity, taking into account the home ranges of susceptible species.</p> <p>3. Please provide additional information on whether wetland connectivity is maintained through the landscape within the LSA/RSA.</p> <p>See also related: IR-141.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison conduct monitoring of species present in wetlands before and after disturbance, with a focus on listed plant species.</p>		Accepted	n/a
IR-141	-	ECCC	Wetlands	Section 9.2.6.4.1	<p><b>Context and Rationale:</b> The Proponent states that: “Direct loss of wetlands has been mitigated by reducing the size of the Project Area to the extent practicable during Project design.</p> <p>However, up to 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA are anticipated to be removed from the Project Area during Construction (Table 9.2-16).”</p> <p>Information is not provided on whether wetlands in the terrestrial RSA are considered ecologically, economically or socially important to the region. Information on the regional importance of the wetlands that will be lost is needed in order to assess effects, including a wetland compensation plan if the wetlands are considered regionally important.</p>	<p>1. Provide information that accounts for whether wetlands are considered ecologically, economically and socially important to the region.</p> <p>2. If the above is affirmative provide a wetland compensation plan to offset the loss. Consistent with the Operational Framework For Use of Conservation Allowance [1] a minimum ratio of 2:1 should be the starting point when determining the amount to be offset.</p> <p>[1] Available at : <a href="https://publications.gc.ca/site/eng/9.696852/publication.html">https://publications.gc.ca/site/eng/9.696852/publication.html</a></p> <p>See also related: IR-138.</p>		Accepted	n/a

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IR-142	-	ECCC  CNSC	Wildlife and Wildlife habitat	Section 9.3.3.2.1 Scientific Literature Review – Wolverine Section 9.3.5 Mitigation Measures Section 9.3.6 Residual Effects Evaluation	<p><b>Context:</b> The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens.</p> <p>In Section 9.3.3.2.1, the Proponent states: “Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success. “</p> <p>In Section 9.3.6, the Proponent states: “In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction.”</p> <p>The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost (Table 9.3-20).</p> <p><b>Rationale:</b> As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens.</p> <p>Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features.</p>	<ol style="list-style-type: none"><li>1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges.</li><li>2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project.</li><li>3. Assess the need for pre- construction/pre-clearing surveys to identify any wolverine denning sites.</li><li>4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.</li></ol>	<p>The information provided by the Proponent is complete, however, a follow up IR regarding survey methods for all pre-construction and pre-clearing surveys is required.</p> <p>See follow-up IR-142-159-167.</p>	Accepted	n/a
IR-142 IR-159 IR-167	IR-142-159-167-R1	ECCC	Wildlife and Wildlife Habitat	<p><b>Reference to EIS:</b> Section 9.3.3.3, Baseline Studies Section 9.3.5 Mitigation Measures</p> <p>IR 142, 159, and 167 Responses from Denison</p>	<p><b>Context:</b> The Proponent has committed to conduct pre-construction and pre-clearing surveys for multiple species, however the timing and methods for the surveys were not provided.</p> <p><b>Rationale:</b> Knowing the survey methodology for pre-construction and pre-clearing surveys across multiple species is important because the Proponent is intending to collect data so that ECCC can determine whether the methodology used to collect the data is appropriate and if the methodology would contribute to understanding cumulative effects and adaptive management. Understanding how timing has been considered and incorporated into the methodologies is required to understand how sensitive periods, such as nesting, breeding, foraging and migration, have been considered in the EIS. An understanding of the methodologies and how these sensitive periods are being considered is required to evaluate the effectiveness of mitigation strategies and adaptive management being developed by the Proponent for each species mentioned in IR-142, IR-159 and IR-167.</p>	Provide survey methodology and timing for all preconstruction and pre-clearing surveys, including avian and species at risk surveys (caribou, wolverine).	<p>The Proponent notes that they will use visual searches for several bird SAR. This includes Bank Swallow, Barn Swallow, Common Nighthawk, and Horned Grebe. While visual observations are an appropriate method for detecting Barn and Bank Swallow nests, it is not suitable for detecting Common Nighthawk. The province of Saskatchewan provides appropriate protocols for detection of <a href="#">Common Nighthawk</a>.</p> <p>The Proponent also notes that they will conduct call-playback or visual searches for Olive-sided Flycatcher and Short-eared Owl. While the call-playback surveys would be more likely to detect individuals in areas to be cleared, the visual searches are unlikely to be effective for these species. The Proponent should consider following the provincial detection survey protocols for <a href="#">Short-eared Owl</a> and <a href="#">Olive-Sided Flycatcher</a>.</p> <p><u>In order to resolve this IR, Denison are expected to:</u></p> <ol style="list-style-type: none"><li>1. Modify the Table in “Attachment IR-142, IR-159, IR-167-R1 (Round 3)” to incorporate appropriate protocols for detection of Common Nighthawk, Short-eared Owl, and Olive-Sided Flycatcher, as suggested by ECCC.</li><li>2. Incorporate the Table into the EIS documentation, e.g., Appendix 9-D.</li></ol>	Not Accepted	<p><b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments and updated EIS sections associated with the IR response in this table are available in Appendix A.</b></p> <p>1. To address this part of the Round 4 IR, the wildlife species at risk pre-clearance sweep methods and timing table (now included in the final EIS Appendix 9-D as Table 4-1) has been</p>

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							<p>3. Update any related commitments for pre-clearance / pre-disturbance surveys in their commitments register.</p> <p>See also AD-77 in the Advice to Proponent table.</p>		<p>updated. Refer to Appendix A.</p> <p>In this table, the column “survey techniques” has been updated as follows:</p> <ul style="list-style-type: none"><li>- common nighthawk – “visual search” changed to “call-playback”</li><li>- short-eared owl – “call-playback or visual searches” changed to “call-playback.”</li><li>- olive-sided flycatcher – “call-playback or visual searches” changed to “call-playback.”</li></ul> <p>A reference to the Saskatchewan SDSPs have been added to the last column of Table 4-1.</p> <p>Finally, a footnote has been added to the table: “Surveys will be completed by qualified professional biologists; in their capacity as professional biologists, they will refer to available guidance such as the Saskatchewan species detection survey protocols to develop details of the surveys (e.g., selecting the appropriate time of day for the survey).”</p> <p>2. The table is now available in the final EIS (Appendix 9-D Table 4-1). Refer to Appendix A.</p>

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									3. Existing commitment 9-3 has been updated and now reads (additions in <b>bold</b> ): “To adequately address potential effects, regardless of the wildlife, seasonal or species-specific sensitivities, pre-disturbance wildlife clearance surveys (i.e., not species-specific surveys) will be completed prior to any work commencing. Results of the wildlife clearance surveys will be used to inform the design and delineation/establishment of suitable setback distances (i.e., specific to species, habitat, life-cycle sensitivities), work delays and/or other species-specific mitigation measures at that location, with discussions with ENV as appropriate. <b>The details on the methodology of species-specific pre-clearance sweep protocols and timing are provided in the Appendix 9-D of the final EIS.</b> ”
IR-143	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies	<p><b>Context and Rationale:</b> The baseline caribou data is insufficient to understand potential Project impacts to this species. Presence/absence detection was provided by camera traps, incidental observations, winter track and pellet survey.</p> <p>Additional information and analyses on caribou use of the landscape during all life stages of the Project area is required to assess impacts and to determine significance of impact from the Project to caribou.</p>	<p>Provide details on the baseline caribou data including:</p> <ul style="list-style-type: none"><li>• Revision of map 9.3-8 to include all observations, categorized by type, season and year (see also IR-145); and</li><li>• Description of seasonal use of the LSA, RSA and caribou range.</li><li>• Description of Project areas used by caribou.</li><li>• Description of future studies planned to assess habitat use by caribou. Include specific details on how many additional years of aerial surveys will be completed to assess the caribou baseline conditions.</li></ul>	See also AD-81 in the Advice to Proponent table.	Accepted	n/a

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						Utilizing additional data noted above and specified in IR-145, explain how caribou use of the area could be affected by the Project throughout all seasons and life stages (e.g., calving, post-calving, rutting, wintering).  See also related: IR-152.			
IR-144	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Baseline Studies – map 9.3-8	<b>Context and Rationale:</b> The mapping of caribou observations during baseline studies provided in Figure 9.3-8, “Caribou Sign Observations in the Wildlife Study Areas,” is insufficient to enable conclusions to be drawn. ECCC is not able to review the spatial aspect of caribou observations without a map of all available observations. Additional information is available, as stated in Section 9.3.3.3.3: <i>“A total of 200 observations were made between 2017 and 2019 and recorded as either caribou sign (i.e., tracks, pellets, and evidence of feeding activity based on ground feeding craters and arboreal feeding evidence) or photographs (collected through the wildlife camera study) to document caribou presence in the LSA and RSA. Most observations occurred in the Terrestrial RSA, with observations concentrated in the north and southeast portions.</i>  <i>Three observations occurred in the southeast portion of the Wildlife LSA, and no caribou sign was observed in the Project Area. Figure 9.3-8 provides an overview of some caribou sign observed during the baseline studies.”</i>	Update map 9.3-8 to show all caribou observations during baseline studies, broken down by type of observation (camera, incidental, pellet, track) and season/year when the observation was made. Include additional data from the Province of Saskatchewan (see also IR-145) to help characterize caribou use on a spatial map.	See also AD-81 in the Advice to Proponent table.	Accepted	n/a
IR-145	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3, Woodland Caribou	<b>Context and Rationale:</b> The Proponent has not provided sufficient information on how caribou use the landscape, including identification of areas for different life stages of caribou (calving, post-calving, rutting and wintering).  The University of Saskatchewan published a report entitled Population and habitat ecology of boreal caribou and their predators in the Saskatchewan Boreal Shield. This report contains information on habitat types that are used during different life stages. Additionally, Appendix H of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 20202 [1] details habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery.  The scientific literature review (Section 9.3.3.3.1) on Woodland Caribou states: “While calving areas have not been documented within the SK1 range, it is recognized that caribou may use open fen and treed bog habitat types for calving during the spring/summer period. In Saskatchewan, caribou habitat used during the calving season in the SK2 range demonstrated a strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands, and roads (Dyke 2008).”  ECCC is not able to verify the Proponent’s effects assessment without sufficient information on important habitat or biophysical attributes for caribou within the study areas.	1. Provide, based off existing literature or available data and the Amended Recovery Strategy for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada: <ul style="list-style-type: none"><li>information on known important habitat features or biophysical attributes in Project areas for different caribou life stages (calving, post-calving, rutting, wintering),</li><li>a map(s) of the type and spatial extent of important caribou habitat features or biophysical attributes of the study areas as defined in Appendix H of the Recovery Strategy,<ul style="list-style-type: none"><li>mapping should be at the RSA/LSA level as well as larger-scale mapping at the scale of the Project footprint.</li></ul></li></ul> 2. Assess the potential direct and indirect effects based on additional information on caribou from bullet A above.  See also related IRs: IR-143 and IR-152.  <b>Suggestions for mitigation and follow-up measures:</b> ECCC recommends that the Proponent contact the Province of		Accepted	n/a



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					[1] <a href="https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0">https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/woodland-caribou-boreal-2020.html#toc0</a>	Saskatchewan to enquire about obtaining caribou telemetry data in the Project area. The data can be analyzed to determine important habitat features in the Project area.			
IR-143 IR-144	IR-143- 144-R1	ECCC	Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 144 Responses from Denison	<p><b>Context:</b> In the IR-143 response, the Proponent states: “As described in the EIS, caribou may use open fen and treed bog habitat types for calving during the spring/summer period. Information from Indigenous Knowledge (IK) was included in the EIS, including potential calving areas in the Terrestrial RSA.” The Proponent provided a revised Map 9.3-8 to display these features.</p> <p><b>Rationale:</b> While the revised Map 9.3-8 shows seasonal use, it is challenging to see the overlapping spatial and temporal features. The map is not adequate for fully understanding the seasonality of the data. The scale provided does not allow for a proper assessment of seasonal use, including differentiation of habitat use such as calving, movement or wintering habitats.</p> <p>Some habitats, based on use, may be more used for more critical functions than others and this information cannot be adequately assessed based on the information provided.</p>	Provide individual maps by season and survey type or with larger scale insets that show areas with overlapping spatial and temporal features.		Accepted	n/a
IR-143 IR-145	IR-143- 145-R1	ECCC	Wildlife and Wildlife Habitat	Section 9.3.3.3, Baseline Studies  IR-143 and 145 Responses from Denison	<p><b>Context:</b> Information presented on boreal caribou in the study areas in the Proponent’s response is insufficient to:</p> <ul style="list-style-type: none"><li>• characterize and determine the risk of Project impacts,</li><li>• and</li><li>• calculate the appropriate level of offsetting required.</li></ul> <p>Information on important habitat features and how caribou are using the landscape is required to complete an assessment of the Project impacts.</p> <p>Although the Proponent provided a map showing telemetry points (provided by the Province of Saskatchewan), the map lacked sufficient detail to assess habitat use and important biophysical features of the Project area.</p> <p>The IR-145 response states: “Available habitat was determined as the ecosites in which caribou / caribou sign were detected most frequently during the baseline studies, and the EIS used a precautionary approach by assuming caribou use of these areas during all seasons and life stages.” As a part of the analysis, calving areas are particularly important to delineate if information is available as a key part of all life stages.</p> <p>In the draft EIS, the habitat types that are considered non-habitat for caribou are open bogs (BS20), leatherleaf shrubby fens (BS22), graminoid fens (BS24), open</p>	<p>1. Provide maps at the Project Development Area (PDA)/Local Study Area (LSA)/Regional Study Area (RSA) scale showing caribou habitat quality.</p> <p>2. Provide maps at the PDA/LSA/RSA scale showing areas with the appropriate biophysical attributes for calving and other life stages, such as important wintering habitats and movement corridors.</p> <p>Indicate the source of telemetry data (i.e., University of Saskatchewan and/or the Province of Saskatchewan).</p>		Accepted	n/a

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					<p>fens (BS25), rush sandy shorelines (BS26), sedge sandy shorelines (BS27) and waterbodies.</p> <p><b>Rationale:</b> Woodland caribou are known to use treed bog and open fen (Section 9.3.3.3.1 of the draft EIS), however open fens and bogs are excluded from the identified available Woodland Caribou habitat, based on not detecting presence or not detecting presence as frequently.</p> <p>Mapping of important caribou habitat features is required to assess important potential impacts to caribou. In the absence of telemetry data, mapping of habitat quality, based on a combination of known ecosites and known important biophysical features will provide a reasonable alternative where known important caribou habitat features cannot be mapped.</p>				
IR-146	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.3.3.1, Woodland Caribou, Scientific Literature Review - Predation	<p><b>Context and Rationale:</b> The information on impacts of predation and apparent competition for caribou in relation to the proposed Project are insufficient.</p> <p>In the section on caribou predators (9.3.3.3.1), the Proponent provided details on densities of wolves and their overlap with caribou and speaks of apparent competition. The Proponent did not examine other predators, such as black bear.</p> <p>The analysis on impacts of predation and apparent competition is insufficient since known predators have been omitted without explanation from the assessment of effects. ECCC is not able to verify the Proponent’s effects assessment since important species have not been considered in the assessment.</p>	Provide further information and analyses on all potential predators of caribou, including impacts from apparent competition.		Accepted	n/a
IR-147	-	ECCC	SAR – Boreal Caribou	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> The process of in-situ recovery mining will likely create changes to the surface topography and potential ground subsidence as well as changes to groundwater elevations. These changes can affect the plant communities and ecosite types.</p> <p>In Section 9.3.4.2.1 the Proponent states that: “Following decommissioning and reclamation, wildlife habitat is expected to recover to baseline conditions.”</p> <p>A more thorough explanation regarding post-decommissioning landscape is required to assess Project impacts.</p>	<p>1. Provide further rationale and/or analysis regarding the return of wildlife habitat to baseline conditions post-decommissioning. Incorporate other environmental impacts including:</p> <ul style="list-style-type: none"><li>Ground subsidence and impacts on wildlife habitat</li><li>Changes to aquifers and impacts on wildlife habitat</li></ul> <p>2. Describe reclamation activities/measures, including temporal information that will be implemented to help in the recovery to baseline conditions.</p>		Accepted	n/a
IR-148	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.4.2.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> ECCC analyzes disturbance for caribou at the range level, in this case within the SK1 range. However, the Proponent did not provide an adequate assessment of total disturbance at the range level. The draft EIS (Section 9.3.4.2.1 p. 9-211) reads: “The SK1 Boreal Shield Woodland Caribou Management Unit has relatively low levels of anthropogenic disturbance and was exposed to large fire disturbances in the past 40 years (ECCC 2019). Environment and Climate Change Canada (2019) identified this caribou population as being self-sustaining at a threshold of 40% undisturbed habitat with the total anthropogenic disturbance not exceeding 5% of their habitat. The current anthropogenic disturbance levels (without areas burnt by past forest fires) for the study areas are below this</p>	<p>Provide the following in order to support analysis of habitat disturbance:</p> <ol style="list-style-type: none"><li>Calculation of total disturbance including natural and anthropogenic disturbance at the range level.</li><li>Description of effects on existing habitat at the scale of the range (for &lt; 40% undisturbed habitat in the SK1). Include:<ul style="list-style-type: none"><li>an account (and GIS file if available) of existing habitat affected, using the following formula:</li></ul></li></ol>		Accepted	n/a

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					<p>threshold (with the exception of the already disturbed Project Area) and are estimated as: 24.8 ha (14.6%) for the Project Area, 168 ha (3.5%) for the Wildlife LSA, and 599 ha (1.5%) for the Terrestrial RSA.”</p> <p>Analysis of habitat disturbance should be calculated at the range level in order to assess impacts and determine significance.</p> <p>Analysis should be consistent with the methodology described in the document Scientific Assessment to Support the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada (Environment Canada, 2011) [1].</p> <p>[1]<a href="https://publications.gc.ca/site/eng/401605/publication.html">https://publications.gc.ca/site/eng/401605/publication.html</a>, p. 28/41</p>	<p>(Project footprint + 500m buffer) – overlapping (permanent alteration(s) + 500m buffer)</p> <p>3. A map of the SK1 range showing all disturbed and undisturbed habitat, including predicted disturbance (direct and indirect) resulting from the Project.</p> <p>4. Description of whether the Project is expected to compromise the ability of the range to be restored to the undisturbed habitat threshold, and provide a rationale for the conclusion.</p> <p>See also related: IR-154.</p>			
IR-149	-	ECCC CNSC	Wildlife and Wildlife habitat	Section 9.3.5.2, Additional Wildlife- specific Mitigation Measures	<p><b>Context:</b> The EIS describes that ongoing research is performed to inform the development of a Woodland Caribou Management Plan. This includes studies on the effectiveness of linear disruption features on predator/prey movements, and a field program for long-term reclamation planning. Moreover, it is stated that the Plan will include a detailed assessment of the need for habitat offsets.</p> <p>The draft EIS Section 9.3.5.2 states: “A wildlife monitoring plan and a Woodland Caribou Management Plan will be developed to address wildlife-specific mitigation measures based on proven and accepted mitigation following standard industry guidelines and BMPs. The plans will provide guidance to avoid or minimize potential adverse effects of the Project on wildlife and wildlife habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered.”</p> <p><b>Rationale:</b> The draft EIS does not present sufficient species-specific mitigation measures for boreal caribou. ECCC is not able to assess potential residual impacts to caribou without specific mitigations.</p> <p>Since the Woodland Caribou Management Plan is still under development, it is difficult to judge whether the measures will be adequate to mitigate and/or offset potential project effects on Woodland caribou and its critical habitat.</p>	<p>Provide the Woodland Caribou Management Plan, to demonstrate effective mitigation of potential project effects, along with wildlife-specific mitigation measures for review.</p> <p>The Plan should be informed by and consistent with the Boreal Caribou Recovery Strategy and demonstrate that avoidance and minimization measures will be applied to mitigate for predicted Project effects to boreal caribou and its critical habitat prior to considering offsetting measures. That is, the Plan should follow the mitigation hierarchy and information should be provided as outlined below:</p> <ol style="list-style-type: none"><li>1. AVOID: Describe all measures that will be taken to avoid effects to boreal caribou and avoid the destruction or alteration boreal caribou critical habitat.</li><li>2. MINIMIZE: Describe all measures that will be taken to minimize the effects to boreal caribou and minimize the destruction of boreal caribou critical habitat.</li><li>3. RESTORE ON-SITE: describe the measures that will be taken to restore disturbed areas of the Project, related to construction, operation and maintenance, on boreal caribou critical habitat, remaining after considering the avoidance and minimization measures.</li><li>4. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance minimization, and onsite restoration measures have been considered.</li><li>5. OFFSET: Describe the measures that will be implemented outside the Designated Project area to mitigate adverse effects, destruction or alteration of boreal caribou critical habitat by the Designated Project during construction and operation.</li></ol>	<p>A path to resolution is still under discussion for this IR. Further guidance to Denison is forthcoming, and this table will be amended and posted to the Canadian Impact Assessment Registry, once provided.</p> <p>See also AD-83 and AD-85 in the Advice to Proponent table.</p>		

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						<p>6. Characterize the risk of the adverse effects that are likely to result from the Project on boreal caribou and its critical habitat after avoidance, minimization, onsite restoration, and offset measures have been considered.</p> <p>Describe all relevant uncertainties on the effectiveness of the measures to address adverse effects on boreal caribou and the rationale for the selected measure, in light of the mitigation hierarchy.</p> <p>See also related IRs: IR-157.</p>			
IR-149	IR-149-R1A	ECCC	Wildlife and Wildlife Habitat	<p>Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149</p> <p>IR-149 Response by Denison</p>	<p><b>Context:</b> Much of the information presented in the Conceptual Caribou Management Plan is qualitative in nature and does not present specific details regarding a quantitative assessment of impacts following measures to avoid, minimize, and restore on-site and then assess residual effects and determine the offset required to counterbalance the remaining impacts. This is required to understand if offsetting is sufficient to address impacts to caribou. The Proponent also does not provide details on methods that will be used for pre- disturbance wildlife clearance surveys. ECCC is aware that that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program.</p> <p><b>Rationale:</b> ECCC requires the quantitative details on the assessment of impacts to be included within the Conceptual Caribou Management Plan to adequately assess how the Proponent has applied the mitigation hierarchy. Details on the methods that will be used for pre- disturbance wildlife clearance surveys will also be required to verify that the Proponent has adequately considered how they have avoided, mitigated, or restored impacts to caribou.</p> <p>While ECCC understands that the Proponent will be participating in restoration trials as part of the ‘Developing Eco-restoration Together’ program, however, more clarity on the Proponent’s role in the program and the scope of the program is required. Details such as how the outcomes of these programs will result in mitigation measures and offsetting requirements and additional clarity on the scope of the program should also be provided so that ECCC can understand the objectives and deliverables of the program.</p>	<p>1. Provide a quantitative assessment of impacts following measures to avoid, minimize and restore on-site and then assess residual effects and determine the offset required to counterbalance the remaining impacts.</p> <p>2. Provide details on methods to be used for pre-disturbance wildlife clearance surveys.</p> <p>3. Provide details on the Proponent’s role in the Developing Eco-restoration Together program and how that work may be used in offsetting requirements.</p> <p>4. Provide the scope (i.e., quantitative habitat amount) of the Eco-restoration Together program.</p>	<p>A path to resolution is still under discussion for this IR. Further guidance to Denison is forthcoming, and this table will be amended and posted to the Canadian Impact Assessment Registry, once provided.</p> <p>See also AD-82 and AD-85 in the Advice to Proponent table.</p>		
IR-149	IR-149-R1B	ECCC	Wildlife and Wildlife Habitat	<p>Section 9.3.5.2, Additional Wildlife specific Mitigation Measures Proponent response to IR-149</p> <p>IR-149 Response by Denison</p>	<p><b>Context:</b> Section 4.2.2 of the Conceptual Caribou Mitigation plan states: “locating excessive noise generating activities such as the concrete batching operation as far away from sensitive wildlife locations as possible;”. However, no specific mitigation measures are mentioned for impacts to caribou due to noise generated from the Project air strip.</p> <p><b>Rationale:</b> Noise from the air traffic using the air strip will also generate excessive noise that can impact caribou. Additional information on the timing and frequency of air traffic, as well as specific mitigations related to impacts from air traffic,</p>	<p>1. Provide additional information on the timing and frequency of air traffic using the Project air strip.</p> <p>2. Provide specific mitigations related to impacts from air traffic, including mitigations related to frequency and timing of flights.</p>	<p>Following the supplementary submission provided on July 8<sup>th</sup>, 2024, as well as the commitment (ID 9-36) provided in version 2 of the Commitments Register (July 17, 2024), this IR is accepted for the purposes of the EA review. However, the following must be corrected in the final EIS submission package:</p> <ul style="list-style-type: none"><li>Update the caribou management framework (EIS Appendix 9-E) to reflect the additional information and proposed mitigation measures, in the final EIS submission package.</li></ul> <p>See also AD-78 and AD-85 in the Advice to Proponent table.</p>	Accepted	n/a

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					including mitigations related to frequency and timing of flights, will be necessary to evaluate impacts to caribou due to air strip noise.				
IR-150	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.5.2.1, Best Management Practices for working in Boreal Woodland Caribou Range in Saskatchewan	<p><b>Context and Rationale:</b> In the draft EIS Section 9.3.5.2.1, the Proponent states: “Denison proactively initiated research to provide field-based findings on the effectiveness of linear disruption features on predator/prey movements.”</p> <p>“Results will help the development of proactive and meaningful restoration strategies as an ongoing part of the overall Project (Omnia 2022). Additionally, the 2023 field program will support a program that uses the results from the 2021/2022 Caribou Trail Study in long-term reclamation planning. The program will be led by the University of Saskatchewan and is funded by Denison, an Indigenous-owned environmental company, the Northwest Communities Environmental Services (Métis owned), Mitacs, and the Natural Science and Engineering Research Council of Canada through an alliance grant. The Caribou Trail Study and the reclamation plan will culminate with the development of a Woodland Caribou Management Plan.”</p> <p>ECCC is available to support the Proponent through review of study programs should those programs be made available during the review process.</p> <p>ECCC requests to see the 2021/2022 study to further our review of caribou use in the Project area.</p>	Provide the report for 2021/2022 Caribou Trail study for long-term reclamation planning for ECCC review.		Accepted	n/a
IR-151	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4	<p><b>Context and Rationale:</b> In the analysis of residual and cumulative effects for woodland caribou, information and analyses on impacts to connectivity and movement across the landscape is lacking.</p>	<p>1. Using available reports and data, provide an analysis of impacts to landscape connectivity for woodland caribou at the LSA and Range scales.</p> <p>2. Determine whether the Project is expected to result in a reduction of connectivity within or between the ranges and provide a rationale for the conclusion. Describe how movement corridor(s) may be affected by Project activities and infrastructure.</p>		Accepted	n/a
IR-152	-	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4, Appendix 9-B	<p><b>Context:</b> Baseline studies for Woodland caribou include:</p> <ul style="list-style-type: none"><li>• Winter Track Count Survey to assess presence, abundance, feeding activity, and ecosite affiliation;</li><li>• Pellet Group/Browse Availability Survey to detect presence and abundance of caribou, and frequency of occurrence and abundance of lichen;</li><li>• Covert Camera Survey to determine presence and use of linear features (roads, trails, and hand-cut lines).</li></ul> <p>The Saskatchewan Conservation Strategy for Boreal Woodland caribou [1] states that caribou are very susceptible to predation during the calf-rearing period, and populations are extremely sensitive to even minor changes in mortality rates.</p> <p><b>Rationale:</b> It is unclear if, or how, any data on seasonal and spatial use of habitat was considered in the residual effect analysis, for example summer/winter home</p>	<p>Please provide a summary of available baseline data on habitat use during all seasons and life stages, in particular sensitive stages such as calving, and how habitat use during all seasons and life stages was considered in the residual effect analysis.</p> <p>See also IR-145 and IR-143.</p>	See also AD-82 in the Advice to Proponent table.	Accepted	n/a



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					<p>ranges, sensitive life stages including calving (e.g., location of calving sites). It should be noted that the English River First Nation have identified caribou calving areas in the vicinity of the Project footprint.</p> <p><b>Reference:</b> [1] Saskatchewan Ministry of Environment. 2013. Conservation Strategy For Boreal Woodland Caribou (Rangifer tarandus caribou) in Saskatchewan. Saskatchewan Ministry of Environment. Fish and Wildlife Technical Report 2014.</p>				
IR-153	-	CNSC	Woodland Caribou Residual Effects Evaluation	Section 9.3.6.4.1	<p><b>Context:</b> According to ECCC (2020), forest fires can directly alter habitat, making it unsuitable for boreal caribou (e.g., through loss of mature conifer stands, loss of lichens and other forage plants, barriers to movement). Boreal caribou generally do not return to burned areas for several decades until the forest is old enough to support lichens and other food sources, although they may make limited use of burned areas to feed on new growth.</p> <p>The residual effects evaluation of alteration and/or habitat loss lists ecosites BS3 and BS7 (regenerating forest types) as available habitat in Table 9.3-22, which represent 43.5% of the Regional Study Area.</p> <p><b>Rationale:</b> It is unclear whether the ecosites BS3 and BS7 (regenerating forest types) represent suitable habitat for Woodland caribou year-round. More information is required on the habitat quality (e.g., time since last forest fire) and suitability for different life stages of caribou.</p> <p>For conservatism, it is recommended to perform a second residual effect analysis not including regenerating forest ecosites.</p>	<p>1. Please provide further information on the suitability of ecosites BS3 and BS7 for Woodland caribou in different life stages.</p> <p>2. Please provide the results of a residual effect analysis not including ecosites BS3 and BS7 for conservatism.</p> <p>3. If 2 leads to habitat fragmentation, consider connectivity of habitat patches in the residual effect analysis.</p>		Accepted	n/a
IR-154	-	CNSC	Woodland Caribou Alteration and/or Loss of Habitat	Section 9.3.6.4.1	<p><b>Context:</b> Lichen, the primary food source for Woodland caribou (up to 70% of the year-round diet), can be exposed to airborne contaminants and dust deposition at distances of 1–40 km (e.g., increased metal concentrations or dust were detected in lichen at distances of 1–40 km from a mine site [1, 2]).</p> <p><b>Rationale:</b> Further information is requested on how the potential for contamination of the food source “lichen” is reflected in the applied buffers of direct and indirect disturbance for woodland caribou.</p> <p><b>References:</b> [1] Watkinson et al. (2021). Effects of dust deposition from diamond mining on subarctic plant communities and barren-ground caribou forage. Journal of Environmental Quality 50(4): 990-1003. Doi: 10.1002/jeq2.20251. [2] Chen et al. (2017). Does dust from arctic mines affect caribou forage? Journal of Environmental Protection 8(3): 258-276. Doi: 10.4236/jep.2017.83020.</p>	<p>1. Please provide additional justification for how the potential for contamination of the food source “lichen” is reflected in the applied buffers for sensory disturbance.</p> <p>See also related IRs: IR-137, IR-148 and IR-156.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>• COPC in Lichen monitoring is recommended in transects from the Project site to assess COPC concentrations and confirm whether the chosen buffer is conservative.</li></ul>		Accepted	n/a
IR-155	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1, Alteration and/or Loss of Habitat	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent presents figure 9.3-14 and table 9.3-22, which “depicts available woodland caribou habitat in the Project study areas” and provide a summary of available Woodland Caribou</p>	<p>1. Provide a biologically relevant explanation about how available caribou habitat was determined or determine</p>		Accepted	n/a



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					<p>Habitat in the Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area.</p> <p>The Proponent does not provide a biologically relevant explanation on the ecosites that are considered available woodland caribou habitat.</p> <p>According to the amended recovery strategy for Caribou, all habitat within SK1 range has been designated as critical habitat. To align with best current knowledge and the amended recovery strategy, the map and table should show the biophysical attributes, as outlined in Appendix H of the recovery strategy.</p>	<p>available habitat based on new data from the province of Saskatchewan (See IR-145).</p> <p>2. Consider referencing Appendix H <a href="#">of the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020</a> to define important biophysical features.</p>			
IR-156	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.6.4.1 Section 9.3.7.3.1	<p><b>Context and Rationale:</b> In Section 9.3.6.4.1 of the draft EIS, the Proponent identified that 142 ha of available caribou habitat within the Project footprint will be directly impacted or lost, while an additional 1,165 ha will be indirectly impacted by Project activities such as sensory disturbance. They assessed the residual and cumulative effect of alteration to habitat for woodland caribou as not significant: “The residual effect of alteration and/or loss of available woodland caribou habitat is not expected to result in a change that will alter caribou habitat integrity to the point where it would not be able to sustain the regional woodland caribou population. Therefore, the effect is assessed as not significant.”</p> <p>Section 9.3.7.3.1 of the draft EIS states: “It is not expected that the cumulative effects of alteration and/or loss of habitat will alter the integrity of woodland caribou habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions. Therefore, the cumulative effects resulting from the Project’s residual effect interacting with residual effects from other projects and activities is predicted to be not significant.”</p> <p>For the residual effect of alteration and/or loss of available caribou habitat (Section 9.3.6.4.1, Table 9.3-24), the Proponent assessed the magnitude as low, the geographic extent as local, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high and the likelihood as likely. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack of data and the small size of the assessment area. ECCC does not support the residual effects assessment of low magnitude, given the uncertainties related to seasonal use by caribou in the Project area and the current level of disturbance in the SK1 range.</p> <p>For the cumulative effect of alteration and/or loss of available caribou habitat (Section 9.3.7.3.3 , Table 9.3-30), the Proponent assessed the magnitude as moderate, the geographic extent as beyond the RSA, the duration as long-term, the frequency as frequent, the reversibility as fully reversible, the context as high, the likelihood as likely, the significance as not significant and the level of confidence as moderate. The rationale provided by the Proponent is insufficient to determine the accuracy of these assessments, given the lack to data presented for caribou and the small size of the RSA, compared to the SK1 region. ECCC does not support the conclusion of the cumulative effects assessments or for the level of confidence.</p>	<p>Provide a revised assessment of residual and cumulative effects, taking into consideration that the disturbance within the SK1 range is above the disturbance management threshold required for survival and recovery of the species.</p> <p>See also related IRs: IR-137 and IR-154.</p>		Accepted	n/a

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					The Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020 states that the range is currently at the 60% disturbance management threshold. Therefore, any activity likely to result in the alteration or destruction of critical habitat may impact on the species survival and recovery. In addition, the Proponent’s assessment was based on information that was lacking data on calving, wintering and rutting areas, and connectivity and caribou movements. The absence of considerations of the regional context of disturbance does not provide a conclusion based on best available information.				
IR-157	-	ECCC	Wildlife and Wildlife habitat	Section 9.3.9 Ungulates, Furbearer and Woodland Caribou Summary	<p><b>Context and Rationale:</b> The Proponent has committed to developing a Woodland Caribou Management Plan, which will include a “detailed assessment for the need for habitat offsets.” The Woodland Caribou Management Plan will support ECCC’s review of the Proponent’s assessment of residual effects following mitigation and offsetting.</p> <p>This plan should consider ECCC’s Operational Framework for Use of Conservation Allowances (ECCC, 2012). ECCC is available to assist the Proponent in the determination of appropriate offsets that would balance against Project adverse effects after the application of measures to avoid, minimize and restore on-site are adopted.</p> <p>Based on the Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada 2020, anthropogenic impacts to local caribou populations experience a lag effect, which occurs over extended periods. This lag effect needs to be adequately considered when proposing offsets. ECCC is available to assist the Proponent in understanding how critical habitat is described in the Recovery Strategy and the determination of appropriate offsets that would balance against Project effects based on the predicted impacts to caribou habitat.</p>	<p>Provide the Woodland Caribou Management Plan for review. The plan should clearly demonstrate efforts to avoid and minimize any Project effects and restore on-site any disturbed areas prior to the consideration of offsetting. Details on how severity of disturbance and vulnerability of the species were considered should be explained.</p> <p>See also related: IR-149.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> ECCC notes that the Woodland Caribou Management Plan should clearly explain efforts to address Project effects, including any contribution to cumulative adverse effects, after it has been determined that all options in the previous steps of the mitigation hierarchy (i.e., avoidance, and minimization,) have been fully considered and applied.</p> <p>In the Woodland Caribou Management Plan, provide details on how the factors outlined in the Operational Framework for Use of Conservation Allowances (ECCC, 2012) were considered in determining the offsetting amounts, including the severity of disturbance and vulnerability of the caribou population. Important factors including time lag (the amount of time from restoration work to when the habitat would be considered caribou habitat) would also need to be considered.</p> <p>ECCC typically recommends a minimum offset multiplier of 4:1 (offset outcome: area disturbed). This is a benchmark ratio applied to a project that is in the lower end of the risk spectrum, such as one with a low severity impact adversely affecting a low vulnerability ecological component. In general, the minimum 4:1 multiplier accounts for time-lags to restoration, uncertainty in outcomes, a precautionary approach, and the adverse impact itself in its specific context. Offset multipliers are variable and determined by project-specific circumstances and associated risks and uncertainties.</p>	<p>A path to resolution is still under discussion for this IR. Further guidance to Denison is forthcoming, and this table will be amended and posted to the Canadian Impact Assessment Registry, once provided.</p> <p>See also AD-85 in the Advice to Proponent table.</p>		

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IR-158	-	ECCC	Migratory birds	Section 9.4.1.2, Key Indicators and Measurable Parameters	<p><b>Context and Rationale:</b> In Section 9.4.1.2 the Proponent outlined key indicators for “Migratory Breeding Birds” which includes Waterbirds and Waterfowl, Upland Game Birds and Migratory Songbirds. These are broad categories, which do not allow for assessment of the variation in habitat requirements or ecology of individual species or guilds.</p> <p><b>Updated Rationale:</b> The Proponent should identify additional focal species that can serve as indicator species by representing anticipated impacts to a broader guild of species. Indicator species should be demonstrably sensitive to the potential effect of interest, and suitable for inferring effects on other species.</p> <p>Species may be grouped into guilds for assessment based on similarities in ecology or vulnerability to Project effects, such as species at elevated risk of collision with vehicle traffic.</p> <p>By identifying focal species or guilds for each key indicator species within the Migratory Breeding Birds Valued Components (VCs), ECCC would be able to accurately review the Proponent’s assessment of impacts and mitigation measures in order to assess the accuracy of the Proponent’s conclusions and provide expert advice on the mitigation measures.</p>	Identify focal species/guilds for each key indicator species within the Migratory Breeding Birds valued components. Provide an updated analysis of Project effects on migratory birds.	See also AD-79 in the Advice to Proponent table.	Accepted	n/a
IR-159	-	ECCC	Migratory birds	9.4.3.2.3 Baseline Studies – Migratory Songbirds  Appendix 9-B, Section 2.10.2, Results	<p><b>Context and Rationale:</b> Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data.</p> <p>Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts.</p> <p>Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p> <p>The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.</p> <p><b>Updated Rationale:</b> ECCC recommends that for major projects, a minimum of two years of field surveys should be provided so that temporal variability can be considered when comparing post-construction against baseline records and other available data. More recent data is needed due to landscape changes that may have occurred since 2017 as well as cumulative effects that have occurred in that time. Additionally, if there was an unusually high population density of birds in 2017 due to extraneous circumstances, Project effects may be attributed to a non-</p>	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	See also AD-80 in the Advice to Proponent table.	Accepted	n/a

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					<p>existent decline in the population when the discrepancy can be due to natural variability.</p> <p>A more recent baseline will account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.</p>				
IR-160	-	ECCC	Migratory birds	Section 9.4.3.2.3 Baseline Studies – Migratory Songbirds	<p><b>Context and Rationale:</b> ECCC advises that the results of the field studies need to be interpreted/analyzed in the context of the study area. The Proponent presents results on areas with highest richness and diversity but does not make a link to habitat that will be lost or experience indirect effects.</p> <p><b>Updated Rationale:</b> Results regarding the effects of the Project, including a discussion on habitat types that will be lost or indirectly impacted during the life of the Project, and a discussion on the overall impact on the avian community including results from baseline studies as well as other supplemental information as per IR-159 are required to assess the validity of the Proponent’s conclusions and should be used in effects assessment.</p>	<p>Provide results interpreted in the context of Project direct and indirect effects. Include discussion on the habitat types that will be lost or indirectly impacted during the Project and the overall impact on the avian community, using results from the analysis of baseline studies and other supplemental data (as per IR-159).</p> <p>Discussion should support the conclusions of the effects assessment.</p> <p>See also related IRs: IR-161 and IR-162.</p>		Accepted	n/a
IR-161	-	CNSC	Bird Species at Risk	Section 9.4.3.3  Appendix 10-A (ERA)	<p><b>Context:</b> For the assessment of effects on Bird Species at Risk (SAR), in the EIS it was decided to use representative species for certain SAR birds:</p> <ul style="list-style-type: none"><li>Olive-sided Flycatcher and Common Nighthawk were selected to represent Barn Swallow.</li><li>Yellow Rail and Rusty Blackbird were selected as substitutes for Horned Grebe.</li></ul> <p>No further rationale is provided to demonstrate that the identified surrogate species are representative of the Barn Swallow and Horned Grebe in the EIS. For example, do they share a common diet?</p> <p>Moreover, in the residual effects assessment, limited discussion is provided on the conservatism of chosen suitable habitat types for both surrogate and represented species, in the calculation of habitat loss and alteration, as well as change in mortality. For example, how does habitat for Common Nighthawk and Barn Swallow overlap (do they use identical habitat types?) and how does this affect the calculation of habitat loss and alteration used to evaluate the magnitude of residual effect?</p> <p>Finally, in the ERA, Lesser Scaup is the surrogate for Horned Grebe. Yellow Rail is also represented by Lesser Scaup but Rusty Blackbird is represented by Olive-sided Flycatcher.</p> <p><b>Rationale:</b> It is unclear what criteria were applied to select surrogate species for Barn Swallow and Horned Grebe, and how the chosen surrogates relate to Barn</p>	<p>1. Please provide additional information to justify the selection of surrogate species for Barn Swallow and Horned Grebe in the EIS. This should include a description of the similarity of SAR and associated surrogate species and any relevant uncertainties.</p> <p>2. Please provide conservative estimates of habitat loss and alteration for the represented and not directly assessed species (Barn Swallow, Horned Grebe).</p> <p>3. Please provide clarity as to why different surrogate species are used for Horned Grebe between the EIS and ERA.</p> <p>See also related IRs: IR-160 and IR-162.</p>		Accepted	n/a

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					Swallow and Horned Grebe in terms of habitat type and range, nesting, and feeding requirements etc.  There is also inconsistency with respect to the use of surrogate species for the Horned Grebe between the EIS and ERA supporting document.				
IR-162	-	ECCC	Migratory birds	Section 9.4.3.3, Bird Species at Risk	<p><b>Context and Rationale:</b> Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored.</p> <p>In Section 9.4.3.3. the Proponent states: “It is acknowledged that the listed Barn Swallow (<i>Hirundo rustica</i>) and Horned Grebe (<i>Podiceps auratus</i>) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially.”</p> <p>Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually.</p> <p><b>Updated Rationale:</b> The management plans for these three species demonstrate the variability in their habitat selection.</p> <p>The Management Plan for the Yellow Rail (<i>Coturnicops noveboracensis</i>) in Canada (Environment Canada, 2013) states “Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert 1999, COSEWIC 2009), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). “</p> <p>The Management Plan for the Rusty blackbird (<i>Euphagus carolinus</i>) in Canada (Environment Canada 2015), states: “Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka et al. 2010a, Matsuoka et al. 2010b, Greenberg et al. 2011).”</p> <p>The Management Plan for the Horned Grebe (<i>Podiceps auritus</i>), Western population, in Canada (ECCC, 2022) states: “The Horned Grebe breeds in small</p>	<p>1. Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>2. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>3. Assess individually each SAR that overlaps with the Project and is likely to be affected.</p> <p>See also related IRs: IR-160 and IR-161.</p>		Accepted	n/a



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					<p>(generally 0.5 to 2 ha, but ranging from 0.24 to 18.2 ha), shallow (at least 20 cm deep, but on average 40 cm), and usually fishless, perennial wetlands, but they can also nest on larger lakes with shallow edges and sufficient emergent vegetation. Breeding sites usually contain at least 40% open water with beds of emergent vegetation, such as sedges (<i>Carex</i> spp.), rushes (<i>Juncus</i> spp.) and cattails (<i>Typha</i> spp.) (Faaborg 1976, Kuczynski et al. 2012, Routhier 2012, Stedman 2018).”</p> <p>Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures. This will allow for a more accurate review of the chosen mitigation measures.</p>				
IR-163	-	ECCC	Migratory birds	Section 9.4.3.3.3, Baseline Studies – Avian species at risk VCs	<p><b>Context and Rationale:</b> The baseline studies and data analysis for species at risk (SAR) birds is insufficient to accurately predict Project effects.</p> <p>ECCC recommends the use of predictive modeling in relation to survey data and habitat attributes to produce distribution and density maps. Sites within the study area that support particularly high densities or diversity of an individual species, based on direct observation and, where appropriate, distribution or occupancy models, would greatly improve confidence in Project impact predictions.</p> <p>Additional information on specific habitat use or models of habitat used by SAR would facilitate a more complete analysis of Project effects.</p>	Provide additional information, including mapping/modelling of specific habitat requirements for each avian species at risk or provide a justification of models used in the draft EIS.		Accepted	n/a
IR-164	-	ECCC	Migratory birds	Section 9.4.4.2.1, Alteration and/or Loss of Habitat – Migratory Breeding Birds	<p><b>Context and Rationale:</b> The discussion on impacts to migratory songbirds presented by the Proponent is not sufficient to understand the impacts on various guilds of birds (e.g., aerial insectivores, forest birds, wetland birds, habitat specialists).</p> <p>As per IR-158, focal representative species/guilds should be used as key indicators (KI) in the Migratory Breeding Birds Valued Component. A greater level of detail on Project impacts to migratory songbirds with differing habitat requirements is needed for a fulsome assessment of effects.</p> <p><b>Updated Rationale:</b> A greater level of detail, including a discussion on impacts to different focal species and/or guilds within the Migratory Breeding Birds Valued Component, is required for a more fulsome assessment of effects and identification of mitigation measures. Additionally, mapping detailing important features or habitat types that will be lost due to the Project for different guilds of migratory birds will be required to assess Project effects. This information will be required in order for the Proponent to apply adaptive management, and for ECCC to review the adequacy of these management plans.</p>	<p>1. Provide further discussion on impacts to different focal species/guilds within the Migratory Breeding Birds Valued Component.</p> <p>2. Provide mapping of important features or habitat types that will be lost due to the Project for different guilds of migratory birds.</p>		Accepted	n/a
IR-165	-	CNSC  ECCC	Birds (all species)	Section 9.4.4.2.2  Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment	<p><b>Context:</b> On p. 9-364 of the EIS, it is stated that exposure to hazardous materials through contact with contaminated waste ponds could affect avian health and contribute to mortality.</p> <p>However, the ERA places the avian receptors only in waterbodies and locations outside of the Project area (see Figure 5-2 in the ERA), i.e., Whitefish Lake, McGowan Lake, the inlet to Russell Lake, and Kratchkovsky Lake.</p>	<p>Please perform an ecological risk assessment with avian receptors located at the contaminated waste ponds, including:</p> <p>1. Describe and analyze the possibility of birds, species at risk and other wildlife using the water or waste management facilities and provide an analysis to determine if there is a risk to wildlife that may access these areas.</p>		Accepted	n/a



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				Appendix 10-A (ERA)	<p>Further, there are insufficient details on the potential effects of the water quality in the water management and treatment facilities on birds, species at risk, and other wildlife, including the risk of bioaccumulation of contaminants. The Proponent should assess potential effects of water quality from these areas using applicable CCME guidelines.</p> <p><b>Rationale:</b> It is unclear whether the ecological risk assessment based on the chosen exposure locations is protective and conservative for avian species potentially exposed to contaminated waste ponds on the Project site.</p> <p>While mitigation measures such as physical, visual, and/or auditory deterrents are proposed in Section 9.4.5.2.4, the possibility of avian species coming into contact with waste ponds cannot be excluded based on the available information in the EIS. The possibility of birds, species at risk, and other wildlife accessing the water management and treatment facilities for drinking water or other purposes is not discussed in the draft EIS.</p>	<p>2. Identify the potential toxicity of water management ponds to aquatic migratory birds and species at risk (SAR).</p> <p>3. Describe what measures will be taken if the waters are found to be toxic to migratory birds and SAR.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends that Denison ensure adequate mitigation measures are implemented to minimize the potential for avian exposure to pond waters.</p>			
IR-166	-	ECCC	Migratory birds	Section 9.4.5.2 Additional Avian Species-specific Mitigation Measures	<p><b>Context and Rationale:</b> Avian species-specific mitigation measures are not presented in the draft EIS. The Proponent has committed to providing a variety of environmental management plans.</p> <p>Section 9.4.5.2 reads: “Additional mitigation measures specific to the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs, in accordance with the Migratory Birds Convention Act, and tailored to Project features will be incorporated into various Project management and monitoring plans such as the, erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring, and Waste Management Plan.”</p> <p>Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities, including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear; this is known as incidental take. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoiding Harm to Migratory Birds website at: <a href="https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html">https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds.html</a></p> <p>In order to assess the effectiveness of species-specific mitigations and need for additional mitigations ECCC requires details on the species-specific mitigation measures proposed, and the monitoring plans.</p>	<p>Provide details on species-specific mitigations for species at risk (SAR) and other avian species that will include:</p> <ul style="list-style-type: none"><li>• details on what activity restrictions will be implemented for migratory birds and SAR and when they will be applied;</li><li>• details on mitigations used during regular maintenance activities such as vegetation management (e.g., mowing), access road repair (e.g., aggregate stockpiles), and infrastructure repair;</li><li>• details on methods used to detect species listed on Schedule 1 of the <i>Migratory Birds Convention Act</i> (e.g., Pileated Woodpecker) and mitigations/setback distances and timing to reduce risk to these species.</li></ul>		Accepted	n/a

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IR-167	-	ECCC	Migratory birds	Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance	<p><b>Context and Rationale:</b> The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: “Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area.”</p> <p>ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season.</p> <p>The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered:</p> <ol style="list-style-type: none"><li>Most migratory birds: - Nests are protected only when they are in use or when live eggs or chicks are present.</li><li>Migratory birds listed in MBR 2022 Schedule 1: - For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned.</li><li>Migratory birds listed under SARA: - For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.</li></ol>	<p>Provide the following information:</p> <ul style="list-style-type: none"><li>details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR).</li><li>the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR</li></ul>	Response is accepted, but also see AD-57 in the Advice to Proponent table and follow-up IR-142-159-167-R1.	Accepted	n/a
IR-168	-	ECCC	Migratory birds	Section 9.4.5.2.4, Avian Deterrence and Prevention of Entrapment	<p><b>Context and Rationale:</b> The Proponent mentions that avian deterrents will be used on power transmission lines, buildings and other Project infrastructure. However, the Proponent does not mention any deterrents that will be used for deterring birds from the water or waste management facilities.</p> <p>Details on deterrents for all Project components should be identified to assess residual and cumulative impacts to migratory birds.</p>	<p>Provide information on avian deterrents to be used to prevent birds or other wildlife entering water or waste management ponds.</p> <p>2. Explain how proposed timing of use of deterrents will reduce risk of migratory birds making contact with treatment waters outside of the nesting season (i.e., during migration and stop overuse).</p> <p>3. Explain which deterrents will be used, which deterrents were considered, and what alternative, adaptive measures will be considered if deterrents are unsuccessful for any Project components.</p>		Accepted	n/a
IR-169	-	ECCC	Migratory birds	Section 9.4.6.3, Residual Effects Evaluation for Migratory Birds,	<p><b>Context and Rationale:</b> The analysis of available habitat types for migratory songbirds appears incorrect.</p> <p>In their interpreted ecosite mapping, the Proponent identified 25 different ecosite</p>	<p>1. Explain how information in Table 9.4-15 and map 9.4-11 were derived.</p>		Accepted	n/a

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				Table 9.4-15 and Map 9.4-11	<p>types. In their table 9.4-15 and map 9.4-11, the Proponent only lists 8 ecosite types that are available migratory songbird habitat. Section 9.4.6 Residual Effects Evaluation for Migratory Songbirds reads: “Considering the baseline data (Appendix 9-B), migratory songbird habitat is described in the following text without species-specific differentiation and referred to as available habitat for migratory songbirds. Based on the baseline study results, 66.8%, 52.2%, and 50.7% of the Project Area, Wildlife LSA, and Terrestrial RSA, respectively, are assumed to provide available habitat for migratory songbirds (Table 9.4-15).”</p> <p>All Project areas, except some anthropogenic features and open water, would be considered available habitat for migratory songbirds. Although some ecosite types may have lower density and diversity, it is expected that all ecosites provide migratory songbird habitat.</p>	2. Explain why other habitat types were not considered as available habitat for migratory songbirds.			
IR-170	-	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19	<p><b>Context and Rationale:</b> The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat.</p> <p>As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage.</p> <p><b>Rationale:</b> Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.</p>	<p>1. Provide an updated table and map that considers all available habitat for common nighthawk.</p> <p>2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.</p>	<p>Following the supplementary information provided by Denison on July 8<sup>th</sup>, CNSC staff determined that Denison has not provided the requested information on species-specific mitigation measures for each SAR.</p> <p>It is not adequate to group SAR together (e.g., all birds) due to the unique life history and habitat requirements of each individual SAR. Denison is expected to provide species-specific mitigation measures for each SAR separately.</p> <p><u>In order to resolve this IR, Denison are expected to:</u></p> <ul style="list-style-type: none"><li>Provide species-specific mitigation measures for each individual SAR. Denison may provide this information through revision of Section 3.3 and Table 4.1 in EIS Appendix 9-D.</li></ul> <p>See also AD-77 in the Advice to Proponent table.</p>	Not Accepted	<p><b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments and updated EIS sections associated with the IR response in this table are available in Appendix A.</b></p> <p>The requested updates have been made in Appendix 9-D of the final EIS (October 2024) which has been included here in Appendix A (refer to response to IR-142-159-167-R1).</p>
IR-171	-	ECCC	Migratory birds	Section 9.4.6.4, Residual Effects Evaluation	<p><b>Context and Rationale:</b> Section 9.4.6.4 Residual Effects Evaluation for Bird SAR – Common Nighthawk reads: “Progressive reclamation is anticipated to begin during Construction. However, a conservative approach is used, with Common Nighthawk (CONI) habitat in the Project Area considered to be unavailable for the duration of the Project, only becoming available as habitat following Post-Decommissioning (i.e., during the regeneration of vegetation following Decommissioning).”</p> <p>CONI may nest on the roadsides of access roads within the Project area. As such, the Project area should still be considered available habitat for the duration of the Project and appropriate mitigations and adaptive management should be discussed for this species.</p>	Develop mitigation plans appropriate for avoiding collisions of common nighthawks with vehicles, when and where nighthawks are observed foraging near or roosting on gravel roads. Demonstrate how the planned mitigation activities will result in reduced residual effects from this pathway.		Accepted	n/a
IR-172	-	CNSC	Birds (all species)	Section 9.4.6.4.2	<p><b>Context:</b> Populations of listed species may be less resilient to changes in mortality.</p> <p>CSA N288.6:22 Clause 7.2.4.3 states that effects on a few individuals of endangered, threatened, or vulnerable species would not be acceptable.</p>	Please provide a discussion on mitigation measures with respect to their effectiveness in minimizing mortality for bird species at risk, for which effects on a few individuals would not be acceptable.		Accepted	n/a

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					<p>The residual effects assessment for “Change in Mortality” for bird species at risk states that Project mitigation measures identified in Section 9.4.5 are expected to limit interactions between bird species at risk and potential sources of direct and indirect mortality. However, the mitigation measures are not discussed with respect to their effectiveness to limit interactions, specifically for bird species at risk.</p> <p><b>Rationale:</b> It is unclear if the proposed mitigation measures are effective in preventing mortality in bird species at risk for which even only a few deaths could negatively impact the population.</p>				
IR-173	-	ECCC	Migratory birds	Section 9.4.8 Monitoring and Follow-up	<p><b>Context and Rationale:</b> Monitoring and follow up programs are part of adaptive management and implementation of additional mitigations.</p> <p>In Section 9.4.8 the Proponent states: “Considering the Project planning, baseline survey results, and proposed mitigation measures, no follow-up programs are considered to be warranted at this time.”</p> <p>Project impacts related to mortality of birds, such as collisions with the transmission line, mortality along roads and use of waste and water management facilities should be monitored during all phases of the Project and adaptively managed.</p>	<p>Provide details on the follow-up program to monitor impacts to avian mortality. The follow-up plan should include:</p> <ul style="list-style-type: none"><li>• Monitoring of avian use of waste and water facilities</li><li>• Monitoring of mortality along access roads</li><li>• Monitoring of mortality related to transmission lines</li><li>• Monitoring of effectiveness of avian deterrents.</li></ul>		Accepted	n/a
IR-174	-	ECCC	SAR – Bats	Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys	<p><b>Context:</b> The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (<i>Myotis lucifugus</i>) and northern myotis (<i>Myotis septentrionalis</i>). However, the Proponent did not do an effects assessment of either of these bat species.</p> <p><b>Rationale:</b> Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.</p>	<p>1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to ‘kill’, ‘harm’, or ‘harass’ Little Brown Myotis and Northern Myotis and its ability to carry out its life processes.</p> <p>2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities.</p> <p>3. Describe what mitigation measures will be taken to avoid the breeding period for bats.</p> <p>4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.</p>	<p>A path to resolution is still under discussion for this IR. Further guidance to Denison is forthcoming, and this table will be amended and posted to the Canadian Impact Assessment Registry, once provided.</p>		<p><b>Note: For the complete history of the FIRT’s comments and Denison’s responses to this IR, refer to Appendix A below. Any attachments associated with the IR response in this table are available in Appendix A.</b></p> <p><b>Denison recognizes this IR is under discussion and have provided the following response IR-174 received in September 2024.</b></p> <p>1. The frequency of detections was on a 5 minute interval. This has been clarified in Figure 2-9 of Appendix 9-F (see Appendix A). We can confirm the turquoise dots represent passes or buzzes that were uncertain (unable to distinguish echolocation call</p>

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									<p>characteristics between bat species) in all cases.</p> <p>2. See <b>Attachment IR-174 (Round 4)</b> in Appendix A for the response to this IR along with supporting maps.</p> <p>3. Methods for future pre-construction baseline bat surveys will build on the 2019 baseline (refer to EIS Appendix 9-B) and methods from the 2019 baseline are provided below along with information on how comparisons within year and between years will be completed.</p> <p><i>Methods</i></p> <p>Surveys will be commenced one half hour after sunset and ended one half hour before sunrise. Survey stations will be established 500 m apart along linear features where safe night travel was possible.</p> <p>Surveys will only be completed during appropriate weather conditions, with weather attributes (temperature, sky condition and wind (Beaufort scale)) recorded throughout the survey.</p> <p>Each survey site consists of a five-minute listening period using a Wildlife Acoustics Echo Meter Touch 2 Pro. The detector will be held with the microphone at a 45 degree angle and slowly rotated 360 degrees for the duration of the sampling period. If a bat is detected the detector is held</p>

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									<p>stationary for 15 seconds to avoid duplicate counts.</p> <p>Total detector hours will be calculated for the Project area and by ecosite/vegetation cover type. Ecosite/vegetation cover type for each survey point is established by utilizing the dominate ecosite/vegetation cover type within a 50 m radius of the survey point.</p> <p><i>Acoustic Bat Call Analysis</i></p> <p>Data will be analyzed using Wildlife Acoustics Kaleidoscope software. Echolocation call characteristics will be used to identify bat species. Call characteristics used to establish species included: minimum frequency maximum frequency call duration call slope call shape</p> <p>Call characteristics will be compared to reference calls in literature and call libraries (WDNR 2016, WNDD 2016, Keinath 2011, Adams 2003). In addition, reference calls within Omnia’s call library will be used where possible.</p> <p>For future monitoring of bat species Denison will continue to inventory bat presence at given sites and this data will be analyzed to characterize:</p> <ul style="list-style-type: none"><li>• Presence (occupancy)</li></ul>



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									<ul style="list-style-type: none"><li>• Relative abundance</li><li>• Change metrics to be analyzed include:<ul style="list-style-type: none"><li>○ Annual and total change at specific site</li><li>○ Annual and total change across all sites</li></ul></li></ul> <p>The analysis will be done using mean and 95% credible interval bars and will include covariates such as time of year (date), precipitation, temperature, forest cover, Ecosite and proximity to water/wetland. Appropriate statistical methods to compare pre-construction baseline and 2019 baseline data spatially and temporally will be employed and accompanied by power analysis.</p> <p>Results of acoustic bat surveys will be submitted to Saskatchewan’s Conservation Data Centre.</p> <p>4. Commitment 9-37 has been updated in version 3 of Denison’s commitment register (additions in bold) and now reads: <b>“Pre-construction baseline</b> acoustic bat surveys will be completed prior to construction, building on the 2019 surveys (Appendix 9-B). The surveys will determine the presence/non-absence, diversity and relative</p>

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									abundance of bat species in the Project Area. <b>Results of acoustic bat surveys will be submitted to Saskatchewan’s Conservation Data Centre.”</b>
IR-175	-	CNSC	Provincially Listed Species	Appendix 9-B; section 2.2.2	<p><b>Context:</b> Vegetation and wildlife habitat characterization field surveys were completed in 2017, based on which ecosite factsheets were prepared. The factsheets list observations of two provincially listed plant species with a rank of S3 (vulnerable/rare to uncommon; Table 2.4-2) according to the Saskatchewan Conservation Data Centre, which are not discussed in the main EIS document:</p> <ul style="list-style-type: none"><li>Angle-leaved sundew (<i>Drosera anglica</i>) observed in ecosites BS19, BS20, BS22, BS25</li><li>Neat Spike-rush (<i>Eleocharis nitida</i>) observed in ecosite BS25</li></ul> <p>Table 9.2-12 in section 9.2.6.2.1 of the EIS indicates that there may be indirect disturbance to some of these ecosites (BS19, BS20, BS25). In section 9.2.6.3.1 it is discussed that listed plant species are not likely to return once lost from a specific location.</p> <p><b>Rationale:</b> Given that not all areas in the revised Project footprint were surveyed for listed plant species in baseline studies, there is uncertainty as to whether any species were missed, in particular those that have been observed in ecosites present in the LSA/RSA (e.g., <i>Drosera anglica</i> and <i>Eleocharis nitida</i>, see also Appendix 2 Table of Appendix 9-B). It should also be noted that rare plant surveys were completed in summer 2017 only (section 2.4.2 of Appendix 9-B), which may underestimate annual rare species that may be dormant in the seed bank in some years due to specific seed emergence requirements.</p> <p>It is acknowledged that the Proponent committed to pre-construction listed plant surveys targeted on ecosites encountered in the Project Area but not previously surveyed, as well as ecosites within the Project Area with high potential to support listed plants.</p> <p>More information is requested on the potential indirect effects on rare plant species as well as the planned pre-construction surveys.</p>	<p>1. Please provide a discussion on the potential risks from indirect effects on ecosites with observed rare plant species</p> <p>2. Please provide additional information on the ecosites included in the planned pre-construction listed plant surveys</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends focusing monitoring on ecosites that have known observations of listed plant species outside of the Project Area (e.g., BS19, BS20, BS22, BS25).</p>		Accepted	n/a
IR-176	-	CNSC	Human Health with respect to radiation exposure	Section 10.1.4.2.1 Section 10.1.6.1.4  Appendix 10-A (ERA)	<p><b>Context:</b> In section 10.1.4.2.1, the Proponent provides an evaluation of air quality constituents of potential concern to human health. It states: “A screening value for radon gas of 200 becquerels per cubic metre (Bq/m3) was available from Health Canada, which applies to total radon including background sources (Health Canada 2009). The radon concentrations which were predicted are incremental concentrations (i.e., above background) and were therefore compared to the applicable incremental screening value of 60 Bq/m3 for indoor air established by the Canadian Nuclear Safety Commission (CNSC) (Health Canada 2010a; Radiation Protection Regulations. SOR/2000-203).”</p> <p>The 60 Bq/m3 radon concentration value also appears in section 7.1.2 of Appendix</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>Removing the reference to a 60 Bq/m3 limit.</li><li>Reporting the assessment results as the total dose, from all radionuclides combined including radon progeny, and by comparing this annual effective dose to the effective dose limit.</li></ol> <p>Provide a summary of the conservative assumptions that have been included in the dose calculations.</p>		Accepted	n/a

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					<p>10-A (ERA).</p> <p>Further in section 10.1.6.1.4, it is stated: “Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 Bq/m3.”</p> <p>The Radiation Protection Regulations do not stipulate a limit for radon above background for sites Licensed by the CNSC. The effective dose limits for Nuclear Energy Workers (NEWs) and persons that are not NEWs are listed in section 13 of these regulations, and in subsection 1(3) of these regulations for the general public.</p> <p>The annual effective dose from all sources associated with the Licensed activities and within the scope of the Nuclear Safety Control Act and Regulations must be compared to the applicable effective dose limit. For members of the public this limit is 1 mSv per calendar year.</p> <p>In Section 4.2.5.3 of Appendix 10-A (ERA), there appears to be no reference mentioned for the radon equilibrium factors. These factors are a significant input into the dose calculations for radon.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure consistency with the Radiation Protection Regulations.</p>	Provide a reference that shows how the radon equilibrium factors were determined.			
IR-177	-	HC	Change to an environmental component due to radiological contaminants	<p>Section 10.1.4.2.1 (p. 10-22)</p> <p>Appendix 10-A (ERA) : Appendix B Table B.9, Ref. 19-2638</p> <p>Section 6, Table 6.1-1 (p. 6-7)</p>	<p><b>Context:</b> Section 10.1.4.2.1 states that, “Screening values for radionuclide concentrations in ambient air were not available. All relevant radionuclides were assessed in the HHRA in terms of their contribution to the total radiological dose to human and ecological receptors” (p. 10-22).</p> <p>Section 10 Appendix 10-A (ERA) states that, “No formal screening was conducted for radionuclides. However, since radiation dose to human receptors is of public and regulatory interest, the radionuclides in the uranium-238 decay series are carried forward as COPCs for further assessment” (Appendix 10-A (ERA): Appendix B Ref. 19-2638).</p> <p>Table 6.1-1 lists radionuclides as a key indicator for air quality, but only uranium and radon are considered in Section 6, and Section 10 Table B.9 does not include doses from uranium progeny in air.</p> <p><b>Rationale:</b> Health Canada recommends using screening values that are available for radionuclides if they are appropriate for the dose and if the screening values have listed assumptions (such as particulate size and worker exposure time that can be adapted to in Denison’s models). Two examples are ICRP 96, which CNSC uses in their regulatory reports to derive reference air quality values for Pb-210, Ra-226, and Th-230 (CNSC: Regulatory Oversight Report for Uranium Mines and Mills in Canada 2019); and Health Canada’s Guidelines for Management of NORM (Health</p>	<p>1. Assess predicted radionuclides in Section 10 Appendix 10-A (ERA) using appropriate available screening values. Alternatively, provide a justification for why a screening wasn’t conducted for radionuclides despite the availability of screening values (e.g., ICRP 96 and NORM Guidelines, 2011).</p> <p>2. Clarify if uranium progenies in air are considered in the atmospheric transport and air quality modelling and are simply not reported, or if they are not included in the models because no screening criteria are available.</p>	Response is accepted, but also see AD-55 in the Advice to Proponent table.	Accepted	n/a

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					Canada: Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials, 2011).				
IR-178	-	HC	Change to an environmental component due to hazardous contaminants	Section 10.1.4.2.1 (p. 10-22)  Section 6.1.4.2, Potential Project Related Effects (p. 6-31)	<p>The Baseline + Project scenario was not provided for radon levels.</p> <p><b>Context:</b> Section 6.1.4.2 states that the predicted levels for radon were not added to the respective baseline air quality levels (p. 6-31), and further explains that “In all modelled phases of the Project, annual average radon concentrations at receptors beyond the Property Boundary are expected to be indiscernible from background levels.”</p> <p>In Section 10.1.6.1.4, a different approach to evaluating predicted radon levels is mentioned: “the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m3“(p. 10-44).</p> <p><b>Rationale:</b> Without a rationale as to why baseline levels of radon were not included in the assessment, HC cannot fully evaluate the appropriateness of the air quality assessment. While Health Canada is of the opinion that using background radon levels as a screening value is appropriate in this case from a health perspective, different approaches to screening predicted radon levels in different sections appear to be used (i.e., background radon levels vs. CNSC incremental concentration).</p>	<p>1. Provide further information on whether and how baseline radon concentrations in air were determined.</p> <p>2. Include baseline radon concentrations in the predicted total concentrations when comparing to existing guidelines; alternatively, provide a rationale for why baseline concentrations of radon were not included.</p> <p>3. Discuss the potential health implications of the project-only increment-over-baseline radon levels</p>		Accepted	n/a
IR-179	-	CNSC	Groundwater quality decommissioning objectives.	Section 10.1.4.2.2, Release of Treated Effluent to Whitefish Lake During Decommissioning	<p><b>Context:</b> It is stated that “This process would continue until the recovered water meets acceptable groundwater quality decommissioning objectives”.</p> <p><b>Rationale:</b> The information provided does not include groundwater quality decommissioning objectives nor a reference to these objectives.</p>	Please provide groundwater quality decommissioning objectives or a reference to the information.		Accepted	n/a
IR-180	-	CNSC	Human health with respect to hazardous contaminants	Section 10.1.6.1.1, Human Receptors Selection and Characterization	<p><b>Context:</b> Within the Human Health assessment, offsite receptors during the operation period are only considered downstream of Whitefish Lake. The only identified concern was for Se to the Fisher/Trapper located at Russel Lake. This section cites Indigenous Knowledge as informing the receptor selection and location.</p> <p><b>Rationale:</b> While the assessment is fairly conservative in the assumptions made on intake and receptor habits, it stands to reason that if the trapper receptor was located closer to the operation, such as at McGowan or Whitefish Lakes, this exceedance of Se could be more pronounced.</p> <p>In terms of maintaining a conservative assessment, if the most vulnerable receptor can be shown to be protected at the point of highest expected COPC concentration, it can be concluded that this receptor would be protected further away from the Project. Considering this, why was the hunter/trapper receptor not also assessed at Whitefish or McGowan Lake? Was Indigenous Knowledge specific in mentioning Whitefish or McGowan Lakes were not used for the activities carried out by identified receptors?</p>	<p>Please provide justification for excluding a receptor from occupancy at lakes closer to the Project during operation (McGowan, Whitefish). Alternatively, conduct a risk assessment to a receptor at these lakes during operation to determine if there is a predicted risk that may require monitoring or mitigation.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>Assessment of a receptor located closer to the point of effluent release may need to be considered to ensure there are negligible risks</li><li>If Se is expected to exceed hazard quotients further upstream, selenium removal technology may be required as part of the effluent treatment process as a mitigation measure. Other COPC’s exceeding an HQ of 1 may also be identified under this process that could require specific monitoring or mitigation measures.</li></ul>	Response is accepted, but also see AD-59 in the Advice to Proponent table.	Accepted	n/a

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IR-181	-	CNSC	Human Health with respect to radiation exposure	Section 10.1.6.1.4	<p><b>Context:</b> In section 10.1.6.1.4, it is stated: “The maximum incremental radon concentration at the camp worker site during Operation was predicted to be 12.4 Bq/m3, which is below the CNSC limit of 60 Bq/m3 for incremental radon.”</p> <p>As per IR-176, there is no such CNSC limit for incremental radon.</p> <p>The camp worker would be considered a person who is not a nuclear energy worker (NEW) and subject to the dose limits of section 13 and 14 of the Radiation Protection Regulations, not the dose limit for the general public as per subsection 1(3) of the Radiation Protection Regulations. The CNSC has regulatory requirements for the ascertainment and recording of doses of radiation as per section 5 of the Radiation Protection Regulations. Every Licensee must ascertain and record the magnitude of exposure to radon progeny, the effective dose and equivalent dose received by and committed to a person who performs duties in connection with any activity that is authorized by the Nuclear Safety and Control Act or is present at a place where that activity is carried on.</p> <p>The camp worker performs duties in connection with the Licensed activity and is present at the location where the activity is carried out. Hence, they are not considered to be a member of the general public (who has no connection with the activity)</p> <p>Further, the Proponent indicates that the maximum incremental radon dose to the camp worker was estimated to be 0.13 mSv/year during Operation. The assessment assumes that the camp worker spends 100% of the time indoors. Table 10.1-11 shows the maximum total incremental dose for the camp worker to be 0.02 mSv/year. This appears to be a discrepancy.</p> <p>Table 5.2 in Appendix 10-C provides internal annual dose from radon inhalation. The radon doses to some NEW workers (9.44E-02 mSv/a Driller 1 and 1.03E-01 mSv/a Wellfield Operator 1, 2) here appear less than the radon dose (0.13 mSv/year from section 10.1.6.1.4) to the camp worker, who is a non-nuclear energy worker.</p> <p><b>Rationale:</b> The reason for the requested change is to ensure consistency with the Radiation Protection Regulations and the environmental impact statement.</p>	<p>The EIS and appendices should be aligned with the Radiation Protection Regulations by:</p> <ol style="list-style-type: none"><li>1. Removing the reference to a 60 Bq/m3 limit for incremental radon.</li><li>2. Revising all references to the ‘public dose limit’ applied to camp workers (non-NEWs) to align with section 13 and 14 of the Radiation Protection Regulations.</li></ol> <p>The Proponent should explain why the radon dose for the camp worker appears as 0.13 mSv/year in one instance and 0.02 mSv/year in another.</p> <p>The Proponent is also asked to provide the rationale as to why a non-NEW has a higher radon dose than a NEW.</p>		Accepted	n/a
IR-182	-	HC	Change to an environmental component due to radiological contaminants	Section 10.1.6.1.4, (p. 10-44)	<p><b>Context:</b> Section 10.1.6.1.4 states, “The limit is incremental and is exclusive of natural background, such as natural levels of radon and medical exposures. A dose constraint of 0.3mSv/yr was established for the public from all radionuclides and all pathways for the Project, as recommended by Health Canada (2010a). The dose constraint represents a dose lower than the public dose limit that ensures the combined dose from multiple sources does not result in exceedance of the public dose limit. Radon dose was calculated separately from the dose due to other radionuclides; however, the predicted radon concentration was compared against the CNSC incremental concentration limit of 60 BQ/m3” (p. 10-44).</p>	<p>1. Provide clarification on how combined doses from all sources would be accounted for in respecting the public dose limit of 0.3 mSV/yr if radon concentrations are being calculated separately.</p>	Response is accepted, but also see AD-65 in the Advice to Proponent table.	Accepted	n/a

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					<b>Rationale:</b> Calculating radon separately from all radionuclides may underestimate the health risks by not considering combined doses from multiple sources when comparing to the public dose limit constraint of 0.3 mSv/yr recommended by Health Canada (2010a).				
IR-183	-	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C	<b>Context:</b> Exposure scenarios for workers have been identified and high-level summaries of the assumptions and resultant dose estimates have been provided. However, the detailed dose calculations have not been provided.  <b>Rationale:</b> The method used to estimate effective, equivalent and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data, for at least the most dose significant scenarios.	Provide the dose calculations for deriving the dose estimates for workers in all exposure scenarios, for at least the most dose significant scenarios.		Accepted	n/a
IR-184	-	CNSC	Human Health with respect to radiation exposure	Section 10.2  Appendix 10-C, 2.0	<b>Context:</b> It is stated in Appendix 10-C, section 2.0 that: “In addition, the CNSC has proposed a 100 mSv 5-year equivalent dose to lens of eye, in accordance with recent recommendations of the International Commission for Radiological Protection (ICRP, 2012a). This implies an average annual equivalent dose to lens of 20 mSv/a and will be considered as an applicable dose limit for workers.”  As per section 14 of the Radiation Protection Regulations, the equivalent dose limit for the lens of an eye for nuclear energy workers (NEWs), effective January 1, 2021, is 50 mSv in a one-year dosimetry period.  <b>Rationale:</b> The reason of the requested change is to ensure consistency with the Radiation Protection Regulations.	The EIS and Appendix 10-C should be aligned with the Radiation Protection Regulations regarding the equivalent dose limit for the lens of an eye for NEWs.		Accepted	n/a
IR-185	-	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2  Appendix 10-C Table 3.10-3.12	<b>Context:</b> The Geometries for External Exposure Scenarios Modelled in MicroShield for Sources in various locations were provided in tables 3.10-3.12 in appendix 10-C. The doses from those scenarios were omitted.  <b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.	The Proponent is asked to provide all the necessary information and assumptions required to perform the MicroShield calculations independently and to list the resulting calculated values from the listed scenarios.		Accepted	n/a
IR-186	-	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6 Section 10.2.4  Appendix 10-C, Section 3.2	<b>Context:</b> In sections 10.2.3.2.4 and 10.2.3.2.6, as well as section 3.2 of Appendix 10-C, the Proponent has stated that workers in the drying and packaging areas of the processing plant will be required to wear powered air purifying respirators (PAPR) to reduce/eliminate inhalation exposure.  Further in section 10.2.4, which elaborates mitigation measures, it is stated: “For the drying and packaging/loading areas of the ISR plant, use of PAPR has been assumed. It will be needed in these areas, and it has been planned in these areas to substantially reduce doses from inhalation of uranium dust. Dust levels in these areas will be monitored and kept ALARA.”  The use of respirators appears to be in contradiction of the requirements of section 13 of the Uranium Mines and Mills Regulations, which states: <i>No Licensee shall rely</i>	Provide the rationale for mandating the use of respirators by workers in the drying and packaging areas of the processing plant.  Include the demonstration of the application of the hierarchy of control for radiological protection within the design of these areas of the processing plant.  Justify that this approach complies with section 13 of the Uranium Mines and Mills Regulations.		Accepted	n/a



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					<p><i>on the use of a respirator to comply with the Radiation Protection Regulations unless the use of the respirator (a) is for a temporary or unforeseen situation; and (b) is permitted by the code of practice referred to in the licence.</i></p> <p>The Proponent is also reminded that respirators should not be the first choice for dose reduction in workplaces. They should only be used when the hierarchy of control (elimination, substitution, engineering, or administrative controls) is not possible.</p> <p><b>Rationale:</b> At this stage of the Project, the Proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p>				
IR-187	-	CNSC	Human Health with respect to radiation exposure	Section 10.2.3.2.4 Section 10.2.3.2.6  Appendix 10-C, Section 3.3, 6.0	<p><b>Context:</b> The exposure scenarios and assumptions for the workers in the drying area and the packaging/loading area of the processing plant include the wearing of PAPRs, which is assumed to provide a 1000-fold reduction in dust exposure.</p> <p>Further to reference IR-186, the use of a respirator as well as in worker dose predictions for the Project, appears to contravene section 13 of the Uranium Mines and Mills Regulations, and does not follow the hierarchy of controls for radiological protection of workers as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p> <p><b>Rationale:</b> At this stage of the Project, the Proponent is expected to identify design improvements to these areas of the ISR plant/processing plant following the hierarchy of control for the radiological protection of workers, as per regulatory requirements and as described in REGDOC-2.7.1, <i>Radiation Protection</i>.</p>	<p>Modify the exposure scenarios and assumptions (i.e., remove the use of a respirator) for the workers in the drying area and the packaging/loading area of the processing facility.</p> <p>Assess the resultant exposures against CNSC regulatory dose limits and the ALARA principle.</p> <p>Identify mitigation measures as per the hierarchy of control for radiological protection.</p>		Accepted	n/a
IR-188	-	CNSC	Human Health with respect to radiation exposure	Section 10.2.4	<p><b>Context:</b> The following is stated in section 10.2.4: “Dust inhalation is also a potentially substantial component of worker dose at the core shack. At this location, PAPR will not be required; however, N95 masks will be used, and dust levels will be monitored here...It may be possible to increase air exchange in the core shack, above the planned six exchanges per hour, should this be necessary. This would also reduce radon exposure in the core shack.”</p> <p>If it is possible to increase air exchanges in the core shack, it is not clear why this was not assessed and incorporated in the design of the core shack.</p> <p><b>Rationale:</b> It appears that a control measure (e.g., air exchange protocols in the core shack) to reduce the exposure to workers has been identified. However, it is not certain if it has been formally documented to ensure that it is incorporated in the engineered design of the core shack.</p>	<p>Provide details on how the control measures to reduce the exposure to both workers through the air exchange protocols in the core shack have been formally documented to ensure that it is incorporated in the engineered design of the core shack.</p>		Accepted	n/a
IR-189	-	CNSC	Woodland Caribou Ecological Model	Appendix 10-A (ERA)	<p><b>Context:</b> In the ERA (p. C.12, section 2.3.6 Woodland Caribou) it is stated: “For the ecological model a diet comprised of 50% browse, 20% lichen and 30% macrophytes is assumed for the woodland caribou.”</p>	<p>Please provide additional evidence to support that those Woodland Caribou who may have higher consumption rates of lichen as part of their diet, will remain protected. This can be provided through including a second model that assumes 70%</p>		Accepted	n/a

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					<p>In the EIS, section 9.3.3.3.1, it is stated: “Research has shown that up to 70% of the year-round diet of caribou may consist of ground and arboreal lichens.”</p> <p><b>Rationale:</b> It is unclear whether the assumptions in the ecological model in the ERA regarding Woodland caribou diet are conservative, given only 20% lichen intake in the model. Lichen is known to accumulate COPC such as metals and dust from the atmosphere.</p>	<p>lichen in the diet.</p> <p>See also related: IR-138.</p>			
IR-190	-	HC	Change to an environmental component due to hazardous contaminants	<p>Appendix 10-A (ERA), Table 3-8 (p. 3.31) and Table 3-9 (p. 3.36)</p> <p>Appendix 6, Table 5 (p. 16)</p>	<p>NO2 criteria is not being consistently compared.</p> <p><b>Context:</b> Provincial and federal air quality criteria/screening values for NO2 have been used inconsistently.</p> <p>Table 3-9 in Appendix 10-A (ERA) uses the 2015 Saskatchewan Ambient Air Quality Standards (SAAQS) value of 300 µg/m3 to compare the maximum concentrations of NO2 at receptor locations for the 1-hour average period, while Table 5 of Appendix 6 uses the 2025 Canadian Ambient Air Quality Standards (CAAQS) of 79µg/m3 for the same average period time.</p> <p><b>Rationale:</b> By utilizing the SAAQS screening value for NO2, the maximum concentrations at receptor locations exceed the 1-hour threshold solely during the decommissioning stage (Table 3-9). However, if the 2025 CAAQS are applied, the screening values would be exceeded at receptor locations for all project phases. It is best practice to use the more protective air quality standards to evaluate potential human health risks associated with project activities.</p>	<p>1. Compare the predicted maximum concentrations to the most protective applicable air quality standards available. Alternatively, provide a rationale as to why the SAAQS for NO2 were used rather than the more protective 2025 CAAQS to determine potential exceedances and screen for the need for additional mitigation measures.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the standards from the 2025 CAAQS for NO2 in future mitigation and follow-up plans.</p>	<p>Following the supplementary submission by Denison on July 5th, 2024, one minor correction remains outstanding. There is an error in Section 3.2.1.3.1 Nitrogen Dioxide (updated text in the ERA in Appendix 10-A):</p> <p>The results reported in the paragraph under the Summary of Exceedances at Human/Ecological Locations sub-heading (0.3% of the year for approximately 28 hours per year) is associated with the <u>operation phase</u> and not the decommissioning phase.</p> <p>This editorial error must be corrected in the final EIS submission package. This IR is accepted for the purposes of the EA review.</p> <p><i>The following outstanding issues will be further assessed as part of licensing technical reviews, prior to the granting of a licence:</i></p> <ol style="list-style-type: none"><li>1) In their documents to support their licence application, the proponent will have to describe mitigation measures to minimize releases of NO2. If this information is not described, CNSC staff will request the proponent to provide the information.</li><li>2) 1-hour threshold for NO2: Denison should not rely on a single study (Hesterberg et al., 2009) to support a 1-hour threshold for NO2. Denison is expected to consult more than one study. Denison will be required in their environmental risk assessment submitted as part of licensing to demonstrate that there will be no unreasonable to the environment and to the health of people as a result of NO2.</li></ol>	Accepted	n/a
IR-190	IR-190-R1	HC	Change to an environmental component due to hazardous contaminants	<p>Section 6.1.3.2.2 (p. 6-21)</p> <p>Table 6.1-8 (p. 6-22); and,</p> <p>Table 6.1-9 (p. 6-22)</p>	<p>Limitations with the proposed use of passive NO<sub>2</sub> monitoring would not allow comparison of measurement results to the 2025 CAAQS for 1-hour NO<sub>2</sub>.</p> <p><b>Context:</b> In response to IR-190, there was agreement to using the 2025 CAAQS for NO<sub>2</sub> in future mitigation and follow-up plans, which Health Canada supports. However, the proposed air quality monitoring and follow-up plans (Chapter 6.1.8)</p>	<p>1. Provide additional details on proposed air quality monitoring for NO<sub>2</sub> that will allow for comparisons to both the 1-hour and annual 2025 CAAQS and how that will be used to support mitigation and follow-up plans. Distinguish between comparisons with measured and modelled monitoring data, as well as use of passive and active samplers.</p>	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>Please provide the following information:</p>	Accepted	n/a

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				<p>Section 6.1.8 (p.6-44)</p> <p>IR-190 Response from Denison</p>	<p>anticipate continued use passive NO<sub>2</sub> samplers, which do not measure hourly (1-hour) concentrations.</p> <p>Section 6.1.3.2.2 indicates that the assessment makes use of passive samplers to measure NO<sub>2</sub> at two sampling locations. The results from those samplers are presented in tables 6.1-8 and 6.1-9, for a ~30-day sampling period (i.e., a total concentrations for NO<sub>2</sub> in ambient air over ~30 days).</p> <p>While passive samplers provide measurement data for comparison to the annual 2025 CAAQS for NO<sub>2</sub>, measurement data for the 1-hour NO<sub>2</sub> standard commonly requires use of an active sampler.</p> <p><b>Rationale:</b> Health Canada encourages the monitoring of air contaminants when exceedances or near-exceedances of air quality criteria, standards and/or guidance values are predicted or reported, to:</p> <ul style="list-style-type: none"><li>determine the accuracy of predictions;</li><li>help verify whether standards are being met; and,</li><li>assist with implementing or modifying mitigation measures.</li></ul>	<p>2. If multiple approaches will be used to monitor NO<sub>2</sub> (e.g., use of passive and/or active samplers, modifications due to differences between project phases, etc.), describe their intended contribution to the monitoring objectives and outcomes (e.g., determine the accuracy of predictions; assist with implementing or modifying mitigation measures).</p>	<p>1. Clarify the conditions under which a switch from passive to continuous monitoring would be warranted (e.g., if the 30-d measured NO<sub>2</sub> concentration, after conversion to a 1-h concentration, approaches or exceeds the 1-h CAAQS value).</p>		
IR-191	-	HC	Change to an environmental component due to hazardous contaminants	<p>Appendix 10-A (ERA), Table 3-9 (p. 3.36) and Table 3-10 (p. 3.46)</p> <p>Section 6.1.8 (p. 6-44)</p>	<p>Non-threshold substances are not included in screening and monitoring plans.</p> <p><b>Context:</b> Fine particulate matter (PM2.5) is not being considered further in secondary air quality screening for short and long-term exposure at human and ecological receptors because it is not predicted to exceed the screening values of the Ontario Ambient Air Quality Criteria (OAAQC) or the Canadian Ambient Air Quality Standards (CAAQS) for both annual and 24-hour average periods (Tables 3-9 and 3-10). Furthermore, it is not compared against the baseline for analysis.</p> <p>Table 3-9 indicates that coarse PM (PM10) is predicted to exceed the 24-hour CAAQS during all phases of the Project. However, Appendix 10-A p. 3.46 states that, “There were no exceedances of PM2.5 which is generally considered to be a more reliable indicator of potential health effects. However, health effects would be infrequent and reversible, subsiding after exposure; therefore, PM10 was not considered for further quantitative assessment in the ERA.”</p> <p>PM10 and PM2.5 were not included in the air quality monitoring plan (Section 6.1.8).</p> <p><b>Rationale:</b> Particulate matter and NO2 are considered non- threshold pollutants, meaning that health effects can occur at any level of exposure, The CAAQS for PM2.5 PM.10, and NO2 recognize that there is no population health threshold for human health effects; therefore, any increase in exposure will result in an incremental population risk (Environment Canada and Health Canada, 2012; CCME, 2000). The CAAQS values should not be construed as limits to which polluting up to is allowed. In addition, based on the principles of keeping clean areas clean and continuous improvement, proposed mitigation measures should not be confined to meeting the standards but should also be targeted towards reducing population</p>	<p>1. Include PM2.5 and PM10 in the secondary air quality screening for short and long- term exposure at human receptors.</p> <p>2. Include PM10 and PM2.5 in the air quality monitoring plan as they are non- threshold substances.</p> <p>3. Provide a discussion of the significance of predicted exceedances of health- based standards.</p> <p>4. Identify additional mitigation measures to reduce concentrations of non- threshold air contaminants associated with the Project.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends use of the <u>2025 CAAQS Management Levels</u> to develop mitigation measures that reduce project contributions of non-threshold pollutants (e.g., PM2.5, NO2).</p>		Accepted	n/a

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					<p>exposure to CACs associated with the proposed project.</p> <p>Furthermore, although health risks associated with PM2.5 are higher than those associated with PM10, both fractions are considered non- threshold pollutants and identified by IARC (2013) as causes of cancer.</p> <p><b>Reference:</b> [1] International Agency for Research on Cancer (IARC). 2013. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 109. Outdoor air pollution. Lyon: International Agency for Research on Cancer.</p>				
IR-192	-	CNSC	Human Health with respect to radiation exposure	Appendix 10-A (ERA), Section 3.1.1.2, including Tables 3-1 and 3-2	<p><b>Context:</b> Section 3.1.1.2 in Appendix 10-A (ERA) provides the method of how select constituents including cadmium, chromium, selenium and lead-210 were determined. This section does not mention how the other constituents as listed in Tables 3-1 and 3-2 are determined.</p> <p>The values for Th-230 and U-238 in Table 3-1 are unexpected. Typically, these values should be at equilibrium.</p> <p><b>Rationale:</b> The technical basis for the selection of constituents of concern is required as part of the environmental and human health risk assessments.</p>	<p>1. Provide the methodology of how all listed constituents are determined.</p> <p>2. Provide the rationale as to why Th-230 and U-238 are not in equilibrium.</p>		Accepted	n/a
IR-193	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.1.2  Section 8.2.4.2.3	<p><b>Context:</b> Appendix 10-A (ERA) Table 3-1 ‘Screening of Effluent Quality against Surface Water Quality Guidelines for the Wheeler River ERA’ does not include acute water quality thresholds for all COPCs compared against predicted effluent quality. For example, it is stated that the final effluent quality discharge target for uranium is 0.057 mg/L. However, the CCME water short term (acute) water quality guidelines for the protection of aquatic life is 0.033 mg/L. The proposed effluent discharge target for uranium exceeds the acute water quality guidelines, indicating effluent may pose the risk of being acutely lethal to aquatic biota at end-of-pipe.</p> <p>All water quality thresholds should be derived from receiving environment parameters, and there are discrepancies between the values used in Appendix 10-A (ERA) Table 3-1 and the values presented in Tables 8.2-8 and 8.2-10 in Section 8.2.4.2.3 of the draft EIS. No selected screening value for TSS has been calculated from baseline conditions. Un-ionized ammonia, which is a regulated Schedule 4 substance under the MDMER, has not been included.</p> <p><b>Rationale:</b> A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment.</p>	<p>1. Provide acute and chronic water quality thresholds for all required COPCs with monitoring required under the MDMER.</p> <p>2. Ensure all water quality thresholds are derived from receiving environment baseline parameters and that these thresholds are consistently applied throughout the draft EIS.</p>	<p>In Denison’s July 2<sup>nd</sup>, 2024, supplementary submission, it is unclear what value Denison is applying as the screening criteria for un-ionized ammonia. The screening value provided in other tables (ex. Tables 8.2-2, 8.2-8, 8.2-10, 8.2-13, 8.2-14) all list the SEQG/CCME water quality guideline of 0.019 mg/L as the screening criteria.</p> <p>The recommendations for phosphorus and inclusion of the HC values in Table 3-1 are editorial and have no influence on the assessment results, therefore can be addressed in licensing.</p> <p>This IR is accepted for the purposes of the EA review, but Denison are expected to correct the remaining errors in Table 3-1 of the ERA in the final EIS submission package:</p> <ol style="list-style-type: none"><li>Un-ionized ammonia - The screening value of 0.0156 mg/L for un-ionized ammonia provided in Table 3-1 differs from what has been provided in other tables (ex. 0.019 mg/L in Tables 8.2-2 8.2-8, 8.2-10, 8.2-13, 8.2-14). Denison should confirm what screening criteria is used for un-ionized ammonia and which source it is referenced from.</li><li>Zinc – The screening value of 0.007 mg/L for zinc provided in Table 3-1 differs from what has been provided in other tables (ex. 0.013 mg/L in Tables 8.2-8, 8.2-10, 8.2-13, 8.2-14). Denison should confirm what screening criteria is used for zinc and which source it is referenced from.</li><li>Manganese – The CCME value of 0.26 mg/L for zinc provided in Table 3-1 differs from what has been provided in other tables (ex. 0.21 mg/L in Tables</li></ol>	Accepted	n/a

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							8.2-8, 8.2-10, 8.2-13, 8.2-14). While a minor difference, the 0.21 mg/L value appears to be the correct value calculated using site-specific hardness and pH. Denison should verify which value is correct. 4. Molybdenum – the screening criteria used for the EcoRA is the SEQG of 31 mg/L. This is significantly higher the CCME guideline of 0.073 mg/L. The CCME guideline is outdated, however the SEQG guideline does not have a safety factor applied to it, and is significantly higher than other guidelines for Molybdenum. The BC WQG of 7.6 mg/L is both up-to-date and has a safety factor applied. Use of this guideline aligns with the principles of the Precautionary Approach and does not lead to any changes in risk conclusions in ERA (i.e. Molybdenum is still not screened into EcoRA assessment as the predicted effluent concentration is 2.5 mg/L and does not exceed screening criteria). It is recommended that in alignment with CSA N288.6 and the Precautionary Approach that Denison update the screening criteria for molybdenum for the EcoRa to utilize the BC WQG of 7.6 mg/L.		
IR-194	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.1.1.2 and Section 3.1.2.3	<p><b>Context:</b> In the ERA, COPCs should be selected for further assessment based upon the following factors:</p> <ol style="list-style-type: none"><li>COPC concentrations in effluent that exceed selected water quality guidelines for the protection of aquatic biota, and</li><li>Baseline COPC concentrations in the LSA that exceed selected surface water and sediment quality guidelines for the protection of aquatic biota.</li></ol> <p>However, only COPCs that had concentrations in effluent that exceeded guidelines were assessed further. Baseline concentrations of COPCs in sediment were not considered. In addition to this, not all COPCs that require monitoring under the MDMER had predicted effluent concentrations. From Section 8.2.3.3 Table 8.2-2 of the Aquatic Environment Report, it appears Aluminum in McGowan Lake and Whitefish Lake South and North, and pH in Whitefish Lake North exceed water quality guidelines. Predicted effluent concentrations or near-field surface water concentrations for Aluminum and pH are not provided.</p> <p><b>Rationale:</b> It is not possible to determine if there is risk from effluent to the receiving environment and aquatic receptors based on the current information provided.</p>	<ol style="list-style-type: none"><li>As noted in IR-114, provide the information on predicted effluent quality for COPCs with required monitoring under the MDMER.</li><li>Provide the information on predicted maximum receiving environment surface water concentrations for COPCs with required monitoring under the MDMER in IR-114.</li><li>Update the ERA to assess the risk of any additional MDMER COPC concentrations in effluent that exceed water quality guidelines.</li><li>Update the ERA to assess the risk of COPCs that had elevated baseline water and sediment quality concentrations in the receiving environment.</li></ol>	<p>There are multiple elements of this IR outstanding. This IR is being conditionally accepted, but these issues will need to be resolved during the licensing process. It is expected that a fully revised ERA that both incorporates revisions following closure of EA related IRs and addresses outstanding issues that will be further assessed during the licensing review.</p> <p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>Item one of the IR has been met. However additional information is required for items two, three, and four. Similar to ECCC’s rationale provided for IR-124, “the ERA primarily relies on modelling results to identify the maximum predicted levels of COPCs in the receiving environment.” However, due to the upper bound discharge rates being the only model input evaluated, it is unclear whether the model considered scenarios where maximum COPCs might occur as the exclusion of other environmental variables may have resulted in inaccurate maximum environmental concentrations of the COPCs.</p> <p>The Proponent’s responses regarding baseline exceedances of COPC thresholds in the receiving waterbodies requires additional information. The modeling of surface water and sediment COPC’s described in Appendix 10-A, Figures 6-1 and 6-2 respectively, show results for the receiving waterbodies. However, it is unclear if these modeled values are based on the worst-case scenarios that account for environmental variables such as seasonal changes in hydrology and chemistry, or if they have only accounted for changes in operational effluent discharge scenarios to consider the upper bound discharge rates. Including the upper bounds of operational effluent discharges regardless of the variability of the receiving environmental conditions is important factor for determining whether the baseline data and risk assessment fully considered the effects of the</p>	Accepted	n/a



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							operations of the proposed mine, including environmental concentrations of the COPCs, on water quality.  The Proponent should provide baseline data and a risk assessment that includes consideration of maximum COPC scenarios for the receiving water bodies, including seasonal variability and sediment depositional areas. The Proponent should provide supplemental information to identify if the environmental model has considered environmental variability such as seasonal changes in water levels, flows and sedimentation. The Proponent should also demonstrate that the model has considered a reasonable expected worst case scenario, such as a 100 year return.		
IR-195	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.1	<b>Context:</b> Figure 3-2 depicts modelled concentrations of COPCs in the receiving environment surface water during all Project phases. Effluent discharge rates during Operations and Decommissioning are not anticipated to differ significantly. However, COPC concentrations seem to decrease rapidly after the end of the operations period despite effluent releases continuing into the decommissioning phase.  <b>Rationale:</b> There has been no information provided on predicted changes in effluent COPC concentrations and discharge rates during the decommissioning phase. It remains unclear how COPC concentrations would decrease so quickly following the end of operations.	1. Provide further information on modelled maximum COPC concentrations for each individual Project phase with estimated timing for peak concentrations to appear in the receiving environment.  2. Provide further information on predicted effluent quality during the Project decommissioning phase.  3. Update ERA figures and conclusions as needed.	Following Denison’s July 2 <sup>nd</sup> , 2024 supplementary submission, this IR is Accepted.	Accepted	n/a
IR-196	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Section 3.1.2.3	<b>Context:</b> Table 3-6 provides predicted maximum sediment concentrations of COPCs compared to sediment quality guidelines. Several selected sediment screening values are not the most stringent sediment quality guidelines, with no justification provided. Additionally, copper and lead appear to be missing guidelines that are available from the Burnett-Seidel and Liber (2013) study.  <b>Rationale:</b> The most stringent guidelines should be used for the sediment quality risk assessment in the ERA. Use of the most stringent guidelines will allow the most protective assessment to analyze risks to the receiving environment, aquatic and terrestrial biota.	1. Provide further information and justification for the selection of less stringent thresholds.  2. Update the ERA as needed.		Accepted	n/a
IR-197	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 3.2	<b>Context:</b> It remains unclear if atmospheric deposition from Project related emissions has been incorporated into modelling for the ERA and surface water and sediment quality assessments.  <b>Rationale:</b> While expected Project air emissions are unlikely to have direct impacts on the aquatic receiving environment and aquatic biota, this Project effect pathway may have indirect effects through accumulation of COPCs over time or deposition of contaminants that are not expected in effluent, which should be evaluated with predicted emissions data incorporated into water quality modelling predictions.	Incorporate atmospheric deposition from Project-related emissions into water quality modelling and assess any Project related effects to aquatic receptors from this pathway.	In Denison’s July 5 <sup>th</sup> , 2024 supplementary submission, items one, two, and three were addressed. However, the sample calculation was not added to Section 2.2 of Appendix A, which would support the February 2024 statement that atmospheric deposition is negligible.  This IR is accepted for the purposes of the EA review, but Denison is expected to add this sample calculation in the final EIS Submission package.	Accepted	n/a



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IR-198	-	HC	Change to an environmental component due to radiological contaminants	Appendix 10-A (ERA) Appendix B, Tables B.7 and B.8 Ref. 19-2638  Appendix 10-A (ERA), Table 4-3 Ref. 19-2638 (p. 4.17)	<p><b>Context:</b> Section 10 Appendix 10-A (ERA) contains Table 4-3 (p. 4.17), which lists ingestion rates for traditional foods and includes the category “organs” for Mammals.</p> <p>Tables B.7 and Table B.8 in Section 10 Appendix 10-A (ERA) Ref. 19-2638 provide the predicted concentrations of radionuclides for ecological receptors during the Project phases and during future centuries, respectively. They list the concentrations of radionuclides in moose and in moose organs, which is presented as a single cumulative organ value. Other terrestrial and aquatic animals (such as the black bear and woodland caribou) that are a part of the traditional diet of nearby Indigenous communities have higher concentrations of radionuclides than moose, yet concentrations are not provided for organs of these species.</p> <p><b>Rationale:</b> While Health Canada is not aware of transfer factors to individual organs, or to organs in animals that are not ruminants, it would be beneficial to have a better understanding of radionuclide concentrations in the organs of other animals that may be consumed by local Indigenous communities.</p>	<p>1. Provide more clarification on how the mammalian organ ingestion rates are calculated (which animals and relative contribution percentages).</p> <p>2. Provide a rationale for why concentrations of radionuclides were not assessed in organs of animals (other than moose) that are consumed as country foods by Indigenous people harvesting in the area.</p>	<p><i>This IR is accepted for the purpose of the EA review, but the following outstanding issues will be further assessed as part of licensing technical reviews, prior to the granting of a licence:</i></p> <ol style="list-style-type: none"><li>It is stated that the transfer factor (TF) for moose organs was scaled based on the beef organs transfer factor. What was this scaling value and was it similarly done for the caribou organs? (TF’s for beef, moose, and caribou are presented in Table 2).</li><li>In Table 2, Denison used the feed-to-animal TFs for “Beef-liver” provided in Table G.3 of N288.1-20 for each of their listed RNs. Nowhere in Table G.3 is a TF for Lead-210 provided. Denison is requested to provide the reference for this TF value for Lead-210.</li><li>CNSC staff are interested in the worked calculations for one of the estimated tissue concentrations presented in Table 3.</li></ol>	Accepted	n/a
IR-198	IR-198-R1	HC	Change to an environmental component due to radiological contaminants	<a href="#">Annex 1 Response to Information Requests (Denison Mining) – August 18, 2023</a>  IR-198 Response from Denison – COPC Concentrations in Organs ( <i>Pages 74, and 354-357 of 419</i> )  Appendix 10-A (ERA)	<p><i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of radionuclides based on their mass concentrations in country foods (the assessment is only based on radionuclide concentrations).</p> <p><b>Context:</b> As part of the response to IR-198 estimated Pb-210 concentrations in moose organ and caribou organ of 7.15 and 49.4 mg/kg (ww) are reported, respectively. However, Appendix 10-A: <i>Environmental Risk Assessment for Wheeler River</i> (September 9, 2022) does not include an assessment of lead among the non-radionuclide COPCs.</p> <p>Using the organ meat consumption figure from the Patuanak community (16.2 g/day), exposure to Pb-210 from caribou organ meat is estimated at over 11 ug/kg bw per day (based on the response to IR-198) which would be close to 10 times greater than the 95<sup>th</sup> percentile dietary lead exposure estimates for the general Canadian population consuming retail foods.</p> <p><b>Rationale:</b> While the abundance of radionuclides may pose a health risk with respect to radioactivity, their presence as chemical contaminants may also have an impact on health. This is demonstrated by the case of Pb-210 described above. Due to their potential toxicological significance to human health, Health Canada recommends assessing arsenic, cadmium, lead and mercury as part of country food assessment, regardless of the method employed to determine COPCs.</p>	<p>1. Provide a rationale on why radionuclide mass concentrations were not assessed for their impact to human health.</p> <p>2. Provide an assessment of Lead (Pb) as a chemical contaminant (non-radionuclide) COPC to better understand potential health risks and inform management, mitigation, monitoring and/or follow-up planning.</p>	<p>Version 2 of the Commitment Register (July 17, 2024) included a commitment (ID 8-44) related to monitoring mercury in country foods. The wording of this commitment is specific to methylmercury. It was identified that the draft text provided to Denison by CNSC in the May version of the IR review that the request for commitment was missing the following details:</p> <p>“...monitoring lead and mercury in country foods, as well as including <b>arsenic, cadmium</b>, lead, and mercury in any further assessment conducted to determine their potential risk to human health from consumption of country foods”.</p> <p>The wording for Commitment 8-44 should be revised to fully capture these other COPCs.</p> <p>As well, CNSC staff noted that in their responses to IR-212-R2 and IR-100-R3, Denison has proposed a conceptual trigger-response mechanism framework. It is unclear to CNSC staff if this is referring to the monitoring detailed under Commitment 8-44, or if it is separate. If the latter, this conceptual trigger-response framework should be submitted to CNSC for review before it is finalized for implementation, for review as part of the licensing process.</p> <p>This IR is accepted for the purposes of the EA review, and the following must be corrected in the final EIS submission package:</p> <ol style="list-style-type: none"><li>Revise the wording for Commitment 8-44 to fully capture the other COPCs that Denison intends to include in their country foods monitoring.</li><li>Clarify if Commitment 8-44 will also include Denison’s proposed conceptual trigger-response framework.</li></ol> <p><i>The following elements of this commitment will be further assessed as part of</i></p>	Accepted	n/a

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							<i>licensing technical reviews, prior to the granting of a licence:</i> <ol style="list-style-type: none"><li>Establishing/confirming baseline concentrations of Hg in water, sediment, and fish tissues before construction;</li><li>Regular monitoring during construction, operation and post-closure; and,</li><li>Undertaking an HHRA should monitoring results exceed established/confirmed baseline levels, to inform decisions on adaptive management and mitigation measures</li></ol>		
IR-199	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 10-A (ERA), Sections 3.2.1 and 3.3.1, Wheeler River Project IMPACT Model	<p><b>Context:</b> Model calibrated concentrations of selenium, uranium, and lead- 210 are under-predicted compared to measured baseline concentrations for water quality in the IMPACT modelling based on Figure 3-2. Calibrated concentrations of cobalt are under-predicted and there is poor agreement between model calibrated and measured concentrations of arsenic, lead-210, polonium-210, and radium-226 for sediment quality in Figure 3-3.</p> <p><b>Rationale:</b> It is unclear how poor agreement between model calibrated and measured baseline concentrations of COPCs impacts the near-field and far-field modelling predictions of COPCs during all Project phases. It is also unclear why measured concentrations of COPCS could not be used directly as model inputs when there was poor agreement.</p>	<ol style="list-style-type: none"><li>Provide justification as to why model calibrated concentration inputs of COPCs were preferable for use in predictive modelling of water and sediment quality over measured baseline concentrations.</li><li>Provide a rationale detailing how under- or over-predicted model calibrated COPC concentration inputs influence IMPACT model predictions and uncertainty for water and sediment quality. Provide specific details on how this may impact the risk analysis for parameters that have been highlighted as having poor agreement between calibrated and measured concentrations (i.e., arsenic, selenium, uranium, lead-210, polonium-210, and radium-226).</li></ol>	<p><i>This IR has been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a Licence.</i></p> <p>The Proponent has not fully responded to either item for this IR. In the response for item one, the table provided in the response supports the statement added to Section 3.2.1 of Appendix A from Appendix 10-A, that there is little difference between the geometric and arithmetic means for parameter concentrations in water. It is important to clarify if this is also the case for sediment. Apart from arsenic and radionuclides, all modelled sediment concentrations are at or below geometric mean for sediment. Given that geometric means are typically lower than arithmetic means (and at most equal) this might indicate a consistent underestimation by the model for parameter concentrations in sediment. The proponent indicates that the geometric mean is more representative of the central value of the data distribution. ECCC does not support this view because a median or mode would be used to find a central value, depending on what was meant. The geometric mean may have been used because it is less influenced by outlier values, but these should be analyzed and removed if necessary before calculating the mean, as described in Section 6.3.3.6 of CSA N288.6:22. The only reference to geometric means in CSA N288.6:22 is for calculating means of literature values. Otherwise, when considering field data, an arithmetic mean is referred to.</p> <p>Typically, parameter concentration statistics are calculated individually for each site to highlight differences and help identify more sensitive sites. Differences between sites are expected because of differences in lake size, catchment area and other environmental factors. Pooling data from all sites smooths out high and low values, which compounds the smoothing done by using a geometric mean. This reduction in precision causes unreliability when evaluating model predictions, since the range of parameter concentrations at baseline is not well characterized.</p> <p>To address the lack of clarity, the Proponent should provide a table comparing arithmetic and geometric means for parameter concentrations in sediment, as they have done for water concentrations. If differences are significant, then modify graphs in Figure 3-3 of Appendix A from Appendix 10-A to compare arithmetic means of baseline data with modelled results. For parameters with sufficient data to calculate meaningful statistics, the Proponent should demonstrate that concentrations in Russell Lake are not significantly different</p>	Accepted	n/a

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							<p>than those in McGowan and Whitefish Lakes. If water quality is significantly different between lakes, then the Proponent should modify graphs in Figure 3-2 of Appendix A from Appendix 10-A to compare lake-specific baseline and modelled concentrations.</p> <p>In the response to item two, the statement “<i>it is not appropriate to calibrate the model to baseline conditions as we are most interested in impacted conditions</i>” is incorrect, because the point of calibration is to demonstrate the model correctly simulates site conditions to predict concentrations. Inaccurate model predictions during baseline indicate the site and its system of interactions is not well understood, and the model would not be able to produce accurate predictions during operations either. Section 7.3.6 of CSA N288.6:22 states “<i>The models may be calibrated to give the best possible agreement with available monitoring data so that risk assessors can have confidence in model-predicted concentrations for areas and media that are poorly represented in monitoring programs.</i>” The monitoring data is insufficient to characterize baseline concentrations for most of the parameters in water since there are often less than 50% of samples with concentrations above the detection limits. This limits the parameters that can be used to evaluate the model to concentrations in water of chloride, sulphate and arsenic, as well as concentrations in sediment. The Proponent should demonstrate the accuracy of the model by comparing model outputs with measured concentrations for those parameters where there is sufficient data to calculate meaningful averages, quantify model uncertainty, and discuss the influence of uncertainty on risk assessment conclusions.</p> <p>Denison is expected to:</p> <ol style="list-style-type: none"><li>1. Calculate the model to baseline conditions, compare arithmetic and geometric means for parameter concentrations in sediment;</li><li>2. Calibrate model to baseline conditions;</li><li>3. Calculate parameter concentration statistics individually for each site; and</li><li>4. Modify graphs as needed if significant differences are observed.</li></ol>		
IR-200	-	HC	Indigenous Peoples' health / Socio- economic conditions	Section 10 (p. 4.10)  Appendix 10-A (ERA), Table 4-4 (p. 4.19)	Indigenous consultation should be included in the Country Foods analysis.  <b>Context:</b> The Proponent obtained country food consumption data through engagement with a single local fisher/trapper and from a dietary survey administered by CanNorth to the English River First Nations (ERFN) in 2017. However, the potential health risks to consumers of traditional food were only assessed using the data obtained from the CanNorth dietary survey. Section 10 of the EIS <i>states the following:</i> “The diet assumptions for the fisher/trapper are conservative and are based on engagement with a local fisher/trapper. The diet of the fisher/trapper is representative of one person, who consumes a unique composition and quantity of traditional foods (e.g., ingestion rate of 175 kg/yr of caribou, equivalent to approximately 2 to 3 servings per day). Most people fishing, hunting, and trapping in the Local Study Area and Regional Study Area would consume traditional foods more consistent with the average traditional foods consumer diet which was developed from the ERFN country foods study. In	1. Evaluate the suitability of using the 2017 EFRN survey results and consider surveying additional community members (such as local hunters/trappers) to obtain more representative country food consumption rates for use in the traditional foods risk assessment, and for communicating the results to the communities.  2. Additionally, consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.		Accepted	n/a

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					<p>comparison, the ERFN country foods study in Section 10 Appendix 10-A (ERA) Table 4- 4 indicates a caribou ingestion rate of 2.6 kg/yr (1 to 2 servings per month) and a total game ingestion rate of 21.3 kg/yr” (p. 4.10).</p> <p><b>Rationale:</b> Health Canada is in general agreement that the dietary habits of the local fisher/trapper may be an outlier and not necessarily representative of most of the local population. However, a rationale has not been provided to demonstrate whether and how the 2017 ERFN dietary survey results are representative of consumption patterns of local Indigenous communities. Also, it is unclear whether or how the ERFN dietary survey results account for the consumption patterns of vulnerable or more sensitive subgroups (e.g., heavy consumers, children and women of child-bearing age)</p>	<p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends providing the community with the opportunity to validate the ERFN 2017 survey results.</p>			
IR-200	IR-200-R1	HC	Indigenous People” health / Socio- economic conditions	<p>Section 10 (p. 4.10)</p> <p>Appendix 10-A (ERA), Table 4-4 (p. 4.19)</p> <p>IR-200 Response from Denison</p>	<p>The traditional foods risk assessment should be updated to include an “Intense Land User” scenario and consider all relevant sub-groups.</p> <p><b>Context:</b> See ‘Rationale for Status’ in IR-200</p> <p><b>Rationale:</b> Health Canada notes that the response to IR-1 confirms that the use, diet and consumption rates used to assess the “Trapper” receptor are representative of “intensive land users” from the ERFN and possibly others. This change in the assumption is significant and should be integrated into the traditional foods risk assessment. Suggestions and follow-up measures have been provided to assist in responding to this information request, which benefits from the clarity provided in response to IR-1.</p> <p>Health Canada also notes that the response to IR-200 did not consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately.</p>	<p>1. Update assumptions used in the risk assessment to reflect the new information provided in response to IR-1. (e.g., the <i>ERFN Trapper’s use of the area as <b>representative</b> of current and future land users</i>).</p> <p>2. Update the risk assessment in the EIS and ERA for the “Trapper” receptor (i.e., Intensive Land Users) to account for the <b>representative</b> nature of their described diet (i.e., consumption rates and composition).</p> <p>3. Update the rationale and decisions related to management, mitigation, monitoring and follow-up. Include a specific discussion for those COPCs that contribute to elevated health risks among “intensive land users” and those raised by Indigenous communities (i.e., selenium, mercury &amp; cadmium).</p> <p>4. Revise receptor’s descriptor/title from “Trapper” to “Intensive land users” throughout the EIS and ERA to be consistent with proposed revisions made in response to IR-1.</p> <p>Consider evaluating consumption patterns (and applicable TRVs) of sensitive or vulnerable populations (e.g., elders, toddlers, women of childbearing age) in the traditional food risk assessment and provide risk levels for these sub-groups separately. Alternatively, provide a fulsome rationale to justify their exclusion.</p>		Accepted	n/a
IR-201	-	ECCC	Aquatic species	Appendix 10-A (ERA), Section 5.0	<p><b>Context:</b> For the ERA methodology the Proponent followed CSA N288.6-12 for the assessment of risk to aquatic biota from radionuclide and non-radionuclide COPCs. This is the 2012 version, and a more recent 2022 version was publicly released.</p> <p><b>Rationale:</b> The Proponent should review the most up-to-date version of the standard to ensure no changes to the methodology of the COPC exposure assessment are required for the ERA.</p>	<p>Update the COPC exposure assessment methodology in the ERA using the most recent CSA N288.6-22 standard, as needed.</p>		Accepted	n/a

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IR-202	-	CNSC	QA/QC	Appendix 10-A (ERA), Section 6.0- Quality Assurance	<p><b>Context:</b> This section provides only Quality Assurance (QA) of the ERA, including planning and preparation of the ERA.</p> <p><b>Rational:</b> The Quality Control (QC) aspects are not included. Both QA and QC aspects provide confidence that ERA results are defensible and fit for use in decision-making.</p> <p>The N288.6 (Clause 10.2) requires that “Appropriate QA/QC requirements shall exist for all aspects of the ERA and should be specified prior to conducting the ERA”.</p>	Please include appropriate QC aspects, as per a Clause 10.2 of the N288.6.		Accepted	n/a
IR-203	-	CNSC	Sediment Quality and Benthic Invertebrates	Appendix 10-A (ERA), Section 6.2 Future Centuries Sensitivity Analysis	<p><b>Context:</b> This section of the ERA states “If treated effluent was released at the maximum upper bound discharge rate, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines.” It appears from Figure 6-2: “Comparison of maximum concentrations of COPCs in sediment at expected and upper bound discharge rate” that cadmium and vanadium would be over their sediment quality guidelines indicated if maximum upper bound discharge rates are used.</p> <p><b>Rationale:</b> It is not clear which is correct; the statement that no exceedances of sediment quality guidelines when considering the maximum upper limit effluent release, or the figures indicating there could be exceedances for cadmium and vanadium. This discrepancy in the ERA should be explained and corrected.</p>	Please provide clarity on if cadmium and vanadium are expected to be over the sediment quality guidelines for the maximum upper bound discharge rate scenario.		Accepted	n/a
IR-204	-	CNSC	Human health with respect to hazardous contaminants	Appendix 10-A (ERA), 7.1.1, Non-radiological Human Health Risk Assessment	<p><b>Context:</b> In the human health risk assessment of the non-radiological COPCs, it was determined that the Project incremental HQ was predicted to remain below 0.2 for all non-carcinogens and all pathways during all phases of the Project, except for selenium for the fisher/trapper at Russell Lake from the fish ingestion pathway.</p> <p><b>Rationale:</b> Given that the fisher/trapper receptor will likely be exposed to higher concentrations of selenium from the consumption of fish at Russell Lake, there is an elevated risk of selenosis in exposed individuals. This potential for selenosis would be further exacerbated in individuals who consume fish taken from other lakes closer to the mining operation. There is, however, no discussion of mitigation of these risks to exposed individuals.</p>	<p>Please provide a discussion of measures that could be applied to mitigate the risk of selenosis in exposed individuals who consume fish from Russell Lake and other waterbodies closer to the mining operation.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> CNSC recommends the following:</p> <ul style="list-style-type: none"><li>Selenium abatement technologies may be considered to eliminate or reduce selenium in effluent entering the lake system.</li><li>If HQs continue to exceed 0.2, then it may be necessary to post fish consumption advisories, in consultation with the Medical Officer of Health for the jurisdiction where the Project is located.</li></ul>		Accepted	n/a
IR-205	-	CNSC	Geology and Groundwater	Section 7, appendix H	<p><b>Context:</b> In this appendix the analytical concentration of various groundwater samples taken from monitoring wells is reported.</p> <p><b>Rationale:</b> There is one sample labeled as “Tracer Tank” with no definition available in the current report. It is difficult to judge whether the results presented are relevant to the EIS and how it may impact the findings therein.</p>	Please clarify the definition of “tracer tank”.		Accepted	n/a
IR-206	-	CNSC	Current use of lands and resources for	Section 11 Section 12 Section 15	<p><b>Context:</b> Impacts to Lands and Resources Use have been identified by Indigenous Nations and communities.</p>	Please describe any outstanding or residual issues or concerns raised by Indigenous Nations and communities that Denison was unable to address. In addition, outline any plans to find		Accepted	n/a



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			traditional purposes	Section 16	<b>Rationale:</b> Additional information is required to demonstrate whether Indigenous Nations and communities were engaged directly by Denison regarding the cumulative effects assessment, significance determination and residual effects, and thus the overall conclusions on potential adverse impacts of the Project on the potential or established Indigenous and/or treaty rights and effects of changes to the environment on Indigenous peoples, pursuant to paragraph 5(1)(c) of the CEAA 2012.	solutions or continue discussions with the potentially impacted Indigenous Nations and communities.			
IR-207	-	CNSC	Current use of lands and resources for traditional purposes	Section 11, Perceived Risks to Lands and Resources	<p><b>Context:</b> The EIS states: “Resource users may also experience changes in their perception of the quality of resources for consumption such as the palatability of fish or wildlife or have apprehensions about the safety of resources for consumption. These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning. The ERFN refer to this indicator as a “psycho-social’ effect, meaning that even if people know their fears are “<i>perceived fears, the fear ... is real and has real impacts on ERFN members’ perception of their overall health and well-being</i>” (ERFN and SVS 2022a).” (p. 11-11)</p> <p>Resource harvesters may experience Project-related disturbances and, depending on how these changes are perceived, it may cause some resource harvesters to avoid the Project Area.</p> <p>Reductions in harvests may occur based on fear or uncertainty about the ongoing quality of country foods. For example, “<i>People stopped picking berries in this area when Key Lake mine was established because of concerns about health impacts</i>” (ERFN and SVS 2022b).</p> <p><b>Rationale:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS will document specific suggestions raised by Indigenous groups for mitigating the effects of changes to the environment on Indigenous peoples (section 5(1)(c) of CEAA 2012). For the mitigation measures intended to address the effects of changes to the environment for Indigenous peoples, the Proponent must discuss the residual effects with the Indigenous groups prior to submitting the EIS.”</p> <p>These changes may affect the patterns of ILRU during all Project phases including Post Decommissioning.</p>	<p>How does Denison plan to work directly with Indigenous Nations and communities who currently use the potentially impacted areas, including the RSA, to mitigate and monitor the perceived risks and/changes to the RSA?</p> <p>Has Denison had discussions with the potential impacted Indigenous Nations and communities on how fear and avoidance behaviors and related impacts on traditional land use will be mitigated, especially within the RSA?</p> <p>Additional information is needed to determine if Denison has engaged directly with the Indigenous Nations and communities to develop potential mitigation measures to address fear and avoidance impacts, such as a community monitoring program, which could help to reduce the perceived risk to lands and resource use through education, collaboration, and long-term monitoring with Indigenous Nations, in order to build trust.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> It is recommended that Denison consider engaging with potentially impacted Indigenous Nations and communities on the collaborative development and implementation of a monitoring program to help address concerns about potential impacts on lands and resources as a result of the Project. The program(s) could help to monitor changes over time related the potential perceived risk of contamination of the land from Project activities and subsequent effects on the quality of fish, vegetation, and wildlife resources, which in turn could affect the safety of traditional foods and human health, and impacts on culture practices, and overall community well-being that travel to region yearly.</p>	Response is accepted, but also see AD-60 in the Advice to Proponent table.	Accepted	n/a
IR-208	-	CNSC	Indigenous physical and cultural heritage	Tables 11.1-3, 11.1-4 and 11.1-5 Section 11.1.3.2.6	<p><b>Context:</b> Black bear is listed as a species hunted by several Indigenous nations, including Pinehouse residents. CNSC participated in an in-person engagement with Pinehouse residents in October 2022 and bears eating waste was identified as a concern for hunting and consumption.</p>	Please specify measures that Denison will take to ensure bears and other animals do not scavenge from waste facilities.		Accepted	n/a



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					<b>Rationale:</b> Perceived risk of eating animals that are contaminated by hazardous or radiological wastes could deter community members from harvesting animals that are normally part of their traditional diet. Fencing for waste was specified as a deterrent for human trespassers, not animals.				
IR-209	-	CNSC	Indigenous Peoples' health / Socio-economic conditions	Section 12.1.4.2.1 (p. 12-22)  Section 12.1.5 Section 12.1.6.2	<b>Context:</b> KML indicates that working at a mine camp could inhibit community members from participating in cultural activities and sharing them with family and community members, resulting in a loss of cultural knowledge and language, thus impact knowledge transmission (p. 12-22).  <b>Rationale:</b> Denison addresses this by briefly identifying culturally sensitive policies which would eliminate residual effects (p. 12-30)	Please provide detailed proposed mitigation measure for KML's concerns related to loss of cultural knowledge and language should they work for Denison.		Accepted	n/a
IR-210	-	CNSC	Current use of lands and resources for traditional purposes	Section 12.1.4.2.2, Potential Effect 2: Change in Traditional Diet, Perceived Suitability of Country Foods (p. 12-26)	<b>Context:</b> The EIS states: “Project activities could change the perceived suitability of country foods. An ecological risk assessment (ERA) was conducted to consider both radiological and toxicological risks to ecological receptors such as terrestrial and aquatic invertebrates, terrestrial and aquatic vegetation, fish, and terrestrial and aquatic mammals and birds. Results for the radiological assessment predicted no exceedances of the radiation dose benchmark for the ecological receptors. For non-radiological COPCs, no exceedances were predicted except for selenium in fish from Russell Lake, based on a conservative dietary assumption for one resource user. The traditional foods diet for the fisher/trapper is conservative as it assumes that their annual fish consumption (183 kg of fish per year) would be obtained from Russell Lake, meaning the exceedance of the benchmark for selenium from fish would only occur if fish were only sourced from this one lake. This one exceedance could potentially change the perceived safety of country foods for community members and make country foods a less desirable part of a traditional diet.  <u>Experience from other uranium operations in northern Saskatchewan suggests that resource use will continue despite the potential selenium exceedance. An examination of members of the Hatchet Lake Denesųtiné First Nation who live in Wollaston Lake near the Rabbit Lake operation found that over years of being active on the landscape both with and without the presence of the uranium industry, members had developed their own culturally appropriate practice of risk assessment and management based on their relationship with the land. Hatchet Lake Denesųtiné First Nation members appear to be more concerned with the direct effects of uranium mining on the local environment and less concerned about uranium mining’s effects on their health through consumption of plants and animals. This is likely due to their high level of confidence in recognizing affected plants and wildlife and avoiding them (Elias et al. 1997).</u>  The usage patterns of the ERFN Trapper have similarly allowed for continued use and access to areas proximal to other uranium operations. The ERFN Trapper had a positive relationship with other uranium operations in the ILRU LSA. He also continued to trap (i.e., used his trapline in Fur Block N-18), fish, and opportunistically pick berries, and consumed those resources during operations (KPI Program 2021). Good relationships between Denison and a	Given concerns with psycho-social impacts and the influence of perception discussed by ERFN earlier on in the EIS, does Denison have information on the perspectives from Indigenous Nations and communities to validate this conclusion is applicable?		Accepted	n/a

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					<p>new trapper who eventually takes over the trapline from the ERFN Trapper would promote continued use.” (p. 12-26)</p> <p><b>Rationale:</b> The underlined reference suggests that negative perceptions may not prevent traditional resource users from continuing to consume, due to adaptation to potential risks in the environment.</p>				
IR-211	-	CNSC	Accidents and Malfunctions	Section 14.6.1, Bounding Scenario 1, Vehicle Accident and Aquatic Release of Radioactivity	<p><b>Context:</b> Scenario 1 describes a spill of uranium concentrate into the lake. It’s not clear how the ecological risk assessment was performed. It is stated that sediment concentrations in post-remediation conditions are expected to exceed the benthic invertebrate benchmark and that these results indicate that a spill of uranium concentrate could potentially affect benthic invertebrate populations following a spill, but the spatial extent would be limited. For water, it is stated that when evaluating the potential effect, a comparison was made between the results of the estimated short-term water quality 1,892 µg/L (1.892 mg/kg) and the guideline (33 µg/L). This indicates that there may be some aquatic species that could be affected, but the effects are expected to be transient as the water concertation quickly drops to a long-term level of 0.19 µg/L. However, when looking at dose to other receptors, the results of the ecological risk assessment indicated short-term ingestion of contaminated water resulting from an accident would not result in potential risks to grouse, vole, or deer, however rationale for how these receptors were chosen is not provided.</p> <p><b>Rationale:</b> It’s not clear from the EIS, why the receptors grouse, vole, and deer were chosen to evaluate ecological effects from a potential spill, and why they differ from receptors in the ERA. It is also not clear if the pathway from sediment ingestion/contact was considered for semi-aquatic receptors as they could be exposed to the increased concentrations post-spill. It is also not clear if SARA species exposure to sediment and water post-spill was considered.</p>	Please clarify why grouse, vole, and deer were chosen as receptors for the ecological risk assessment performed for accidents and malfunctions scenario 1 and clarify if the sediment pathway to receptors post-spill was considered, as well as if SARA species were considered.		Accepted	n/a
IR-212	-	HC	Human health with respect to hazardous contaminants	Section 14 (p. 14-3)  Appendix 16-C (p. 14 & 15)	<p>The follow-up plan does not sufficiently describe how various parties will be engaged in the design, implementation, and review of monitoring programs.</p> <p><b>Context:</b> Section 14 of the EIS states that “The overarching fear of contamination from the mine is woven in to almost every other concern noted by participants in the TK study. It is worth acknowledging this concern separately given the potential for mental health impacts related to people’s experiences of fear and anxiety” (p. 14- 3).</p> <p>The commitment regarding monitoring and follow-up activities appears limited to “<i>shar[ing] information in a transparent manner with the General Public, and specifically those Communities of Interest and Nearby Land Users with whom Denison is regularly engaging about the Project. Such an information-sharing program would consider the involvement of the Regulators to make sure the information available addresses the issues identified as concerns</i>” (p. 14).</p> <p><b>Rationale:</b> Country food safety is not regulated federally unless foods are sold</p>	<p>1. Provide details of how local, provincial and federal authorities, and Indigenous Nations and communities will be engaged in developing the follow-up and monitoring program, including the information-sharing program.</p> <p>2. Describe the steps that will be taken if there are any exceedances of established benchmarks or deviation from predictions.</p> <p><b>Suggestions for mitigation and follow-up measures:</b> Health Canada recommends that the Proponent’s plan for communicating follow-up results (environmental and country foods) aims at, among other things, responding to community concerns regarding country foods to minimize avoidance of this resource. This goes beyond a passive dissemination of information and developing a strategy based on dialogue and</p>		Accepted	n/a

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					commercially. Certain aspects of country food safety and availability may be covered by provincial regulators. It is unclear whether and how various levels of government and potentially affected communities would be involved in the development of the follow-up and monitoring program. It is also unclear what the information sharing program entails and how it would inform any adaptive management if monitoring results deviated from the prediction	the direct involvement of communities in monitoring, surveillance, and risk communication activities.			
IR-213	-	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A	<p><b>Context:</b> The Proponent states that the assessment of accidents and malfunctions began with the initial identification of hazard scenarios. Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components.</p> <p>The hazard identification was conducted to identify a comprehensive list of potential project-related accident and malfunction scenarios associated with the key project components and activities with further details provided in Appendix 14-A. The initial hazards were then screened qualitatively based on likelihood and consequence to determine overall risk level using a risk matrix approach. Bounding scenarios were then selected from this initial list of hazard scenarios.</p> <p>The results of numerical analyses (RESPEC, 2021) of detailed strip model suggest that the deformation imposed on the cemented steel casing from downward movement of the rock mass may exceed the assumed casing-strain yield limits and the failure limit locally after extracting the uranium ore. However, this potential hazard is not identified in the hazard identification.</p> <p><b>Rationale:</b> Exceedance of steel casing yield limits and failure limit would either compromise the steel casing integrity or damage the steel casing and result in the leakage of injected solution, which could impact on mine operation and contaminate the surrounding groundwater.</p>	Please include the hazard of steel casing yield or damage in the table of hazard identification evaluation and conduct an initial risk screening and further detailed assessment as required.		Accepted	n/a
IR-214	-	CNSC	Accidents and Malfunctions	Section 14.5.3 Appendix 14-A, section 3.2.3	<p><b>Context:</b> Hazard scenarios were identified using a systematic approach that considered the existence of sources of hazards and initiating events for the Project in consideration of Project activities and components. Details for how each of these project components and activities are considered in the initial hazard scenario identification process are provided in the accidents and malfunctions TSD (see Appendix 14-A; Ecometrix 2022).</p> <p>However, in Table 3-1 to Table 3-14 in Appendix A of Appendix 14-A, the following inconsistencies were identified:</p> <ul style="list-style-type: none"><li>i. consequences for the hazards ID# 1.1, 1.5, 1.7, 14.2 include occupational major injuries; however, the severity (S) is denoted as number 2 that appears to be inconsistent with consequence rating number in Figure 14.5-2</li><li>ii. Hazard ID# 1.5 has a L=2, but it is described as a highly unlikely event, which is inconsistent with the term in Figure 14.5-2</li><li>iii. Hazards ID# 3.6 and 3.7 have a L=1, but they are described as low probability event that is inconsistent with the term in Figure 14.5-2</li></ul>	Please clarify or correct all inconsistent and/or inaccurate information in Tables 3-1 to 3-14 in Appendix A of Appendix 14-A.		Accepted	n/a

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					<p>iv. Hazards ID# 8.2, 8.3, 9.1, 10.1 to 10.5, 11.1, 11.5 have a L=1, but they are described as unlikely events, which are inconsistent with the term in Figure 14.5-2. Rationale needs to be provided how stockpile erosion is considered to have a L=1</p> <p>v. Hazard ID# 12.1 has a L=2 and S=3, but it’s risk ranking is moderate, which is inconsistent with the term in Figure 14.5-2</p> <p>vi. Hazard ID# 13.3 has a L=2. Based on the operation experience in the similar projects in the northern Saskatchewan, ponds lining failure and leakage is a very likely event. Rationale needs to be provided to support L=2 or change the number for L.</p> <p><b>Rationale:</b> Inconsistent or inaccurate/incorrect information was included in Accidents and Malfunctions assessment.</p>				
IR-215	-	CNSC	Human health with respect to hazardous contaminants	Section 14.6	<p><b>Context:</b> One of the potential risks of a uranium mine and mill is a spill of untreated effluent.</p> <p><b>Rationale:</b> In the EIS, it doesn’t appear that the scenario of a spill of untreated effluent to the environment has been considered.</p> <p>A failure of the piping containing the untreated effluent could result in an uncontrolled release to the environment and could affect the groundwater, soil quality, and terrestrial biota.</p>	Please evaluate and provide the results for a bounding scenario of a spill of untreated effluent or provide justification for its exclusion.		Accepted	n/a
IR-216	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.1 Section 14.6.7 Appendix 14-A	<p><b>Context:</b> Radiological doses to human receptors, including workers (i.e., driver(s) of the vehicles), from the Bounding Scenarios 1 (Vehicle Accident Including Rollover, Collision, Run Off Road) and 7 (Vehicle Accident Including Rollover, Collision, Run Off Road) have not been assessed.</p> <p><b>Rationale:</b> An estimate of the effective doses to human receptors, including workers, are required to determine whether the expected doses meet the dose limits set out in the Radiation Protection Regulations.</p>	Provide estimates (including calculations) of the potential radiological doses to human receptors, including workers, resulting from Bounding Scenarios 1 and 7.		Accepted	n/a
IR-217	-	CNSC	Accidents and Malfunctions	Sections 14.6.1 and 14.6.2	<p><b>Context:</b> Highway 914 crosses the Wheeler River 10 km southwest of the access road junction. A vehicle accident, including a rollover, collision, or run off road, at or near the bridge could potentially result in a release of uranium concentrate and release of fuels and chemicals into the surface water at this location. Denison believes that a release of uranium concentrate and a release of fuels and chemicals at this location would bound the releases at any other water crossing along the transportation corridor. However, no information on what other water crossings along the transportation corridor exist and how bounding scenarios 1 and 2 would bound the risk of releasing uranium concentrate and fuels and chemicals at other crossings.</p> <p><b>Rationale:</b> The release of uranium concentrate and fuels and chemicals at water crossings would contaminate the water body at the crossings and pose a risk to the environment and public health.</p>	Please provide information on all water crossings along the transportation corridor and justification why bounding scenarios 1 and 2 would bound the effects of the accidental releases of uranium concentrate and fuels and chemicals at these crossings.		Accepted	n/a

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IR-218	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1 and 14.6.1.4	<p><b>Context:</b> Table 14.6-1 indicates that the average flow of Wheeler River south of Russel Lake is 17,340 L/s or 17.34 m3/s. This rate is used for uranium dissolution rate calculation. However, in section 14.6.1.4, it states that the average annual flow is 24.3 m3/s. In Table 14.6-3, the last two rows appear to be added wrongly.</p> <p>It also states that sediment quality results are shown in Table 14.6-5 for post-remediation conditions. During minimum flow conditions, the affected volume is expected to be smaller, resulting in a higher sediment concentration. In comparison, higher flow conditions are expected to result in a greater footprint and lower concentrations. However, in Table 14.6-5, the average sediments concentration and porewater concentration appear to be incorrect and switched between average flow and maximum flow.</p> <p><b>Rationale:</b> Inconsistent/inaccurate information provided in the EIS.</p>	Please clarify and correct the inconsistent information on average flow rate of Wheeler River at the crossing and incorrect information in Table 14.6-3, and average sediment concentration and porewater concentration under average and maximum flow conditions in Table 14.6-5.		Accepted	n/a
IR-219	-	CNSC	Accidents and Malfunctions	Sections 14.6.1.1.1 and 14.6.1.4.1;  Sections 5.1.1 and 8.1 of Appendix 14-A	<p><b>Context:</b> When assessing the release characterization of Bounding Scenario 1, the Proponent assumed that 95% of the released uranium concentrate can be recovered from the release location without sufficient justification, and that different water column depths, i.e., 10 cm and 5 cm, and average water depth of 1.2 m at the release location were used without explanation.</p> <p><b>Rationale:</b> As the recovery rate of the uranium concentrate would have an impact on the assessment of its potential effects, it is necessary to understand how the recovery rate and water level were selected for assessing this bounding scenario.</p>	Provide further rationale for assuming 95% recovery rate and for using different water column depths for uranium concentrate release characterization.		Accepted	n/a
IR-220	-	CNSC	Accidents and Malfunctions	Section 14.6.1.1.1  Appendix 14-A, Section 5.1.1	<p><b>Context:</b> The Proponent states that based on drum deformations performed in a previous analysis (McSweeney et al. 2004), if a drum experienced a crush force of 100,000 lbs., then the deformation of the drum would cause the lid to detach from the drum. Using this drum failure mechanism, and assuming the drums weigh 450 kg and are arranged four across in the truck, at a speed of 48 km/h, the front 25% of the drums would fail, at 60 km/h to 97 km/h 55% would fail, at 145 km/h 75% would fail, and at ≥193 km/h all would fail. Given that the speed of the truck is likely between 60 km/h to 97 km/h, it was concluded that less than 55% of the drums would fail upon a traffic accident scenario.</p> <p>It is assumed to be 40 drums per shipment, so some stacking or rows of drums should be expected in this scenario. The drums stacked above could be at greater risk of deformation in a traffic accident. It is not clear whether drums stacking was considered in the previous study cited by the Proponent and whether less than 55% fail is still an adequate percentage of drum failures in such traffic accident scenarios if drums stacking is needed.</p> <p><b>Rationale:</b> Drum failure percentage will impact the release quantity of uranium in such an accident scenario and then impact the consequence assessment. Therefore, the drum failure should be adequately assessed and supported with sufficient information and justification.</p>	Please provide information and/or rationale as to whether drum stacking would impact drum failure at different speeds and confirm whether 55% drum fail for such an accident is still valid.		Accepted	n/a



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IR-221	-	CNSC	Accidents and Malfunctions	Section 14.6.1.3,  Appendix 14-A, Section 7.1	<b>Context:</b> It is projected that there would be about 100 drums packaged per mill operating day. One trip per day for 330 days per year is assumed for the probability evaluation. This means 100 drums per trip, which is inconsistent with description in section 14.6.1.1.1 where assuming 40 drums in one shipment per day.  <b>Rationale:</b> Shipments per day will impact the probability evaluation, and number of drums per trip will impact the release of uranium during an accident.	Please clarify the number of shipments per day and number of drums per shipment that are expected and re-calculate the probability as necessary.		Accepted	n/a
IR-222	-	CNSC	Accidents and Malfunctions	Section 14.6.2.4	<b>Context:</b> Bounding Scenario 2 consists of the aquatic release of fuel and hazardous chemicals due to traffic accidents. The EIS states that amongst the fuels considered for this scenario, the consequences of the release of gasoline and solvents are bounded by the consequences associated with the release of diesel. Both gasoline and solvents are lighter with higher vapour pressure; therefore, they have a shorter half-life in the aquatic environment and a lesser tendency for adsorption to sediments and suspended solids in the water column. There is no other justification provided to show that the release of diesel can bound other chemicals such as sulfuric acid and sodium hydroxide that are heavier than diesel.  <b>Rationale:</b> The release of either sulfuric acid or sodium hydroxide during accident could change the water PH significantly at the releasing location, which would post a negative impact on the local environment.	Please provide further justification that the consequences of the release of sulfuric acid and sodium hydroxide can be bounded by the consequences associated with the release of diesel.		Accepted	n/a
IR-223	-	CNSC	Accidents and Malfunctions	Section 14.6.4.1  Appendix 7-A, Appendix K	<b>Context:</b> The EIS states that the 3D strip numerical model predicted that stresses and displacements did not show instability in the altered sandstone or basement rock at the location where a freeze wall would be placed around the Phoenix Deposit boundary (RESPEC 2021). The potential damage to the freeze wall due to mine-induced stresses and displacements under this scenario is excluded.  <b>Rationale:</b> One outer section of the freeze wall (i.e., north-east freeze wall of the phase 4 mining area) and some internal cross walls are located in the desilicified zone. The RESPEC 2021 report (i.e., Appendix K of Appendix 7-A) appears not to have included the desilicified zone in the geomechanical modeling, nor is provided the stresses and the displacements/deformation of the area northeast of the phase 4 ore body where a significant extent of the desilicified zone exists.	Please provide information on the stresses and displacements/deformation of the area northeast of the phase 4 ore body from the geomechanical studies to demonstrate the resulted stresses and displacements will not impact on the freeze wall integrity after IRs for geomechanical studies for ore extraction are addressed.  <b>Technical Discussion Required:</b> Yes		Accepted	n/a
IR-224	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<b>Context:</b> For the Bounding Scenario 5 (Process System and Piping Failure), doses to receptors at distances of 100 and 500 metres (0.25 and 0.01 mSv respectively) are predicted. The assessment also indicated that the dose to the unprotected worker staying inside the processing plant during the spill could exceed the 50 mSv dose limit specified by CNSC if workers did not leave the area quickly after the spill.  The Proponent did not provide the dose calculations for deriving the dose estimates.  <b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 5 (Process System and Piping Failure).		Accepted	n/a



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					is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.				
IR-225	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.5.4  Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 5 (Process System and Piping Failure), the Proponent states that Denison ensures that the process is designed to include control measures to reduce the exposure to both workers and members of the public as low as achievable. The measures would ensure that the processing plant is adequately ventilated, and that spills or leaks are detected by loss of system pressure, observation, or flow imbalance.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 5, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 5, have been formally documented and incorporated in the engineered design of the processing facility.		Accepted	n/a
IR-226	-	CNSC	Accidents and Malfunctions	Sections 14.6.6.1 and 14.6.6.4	<p><b>Context:</b> It is stated that in the case of the accident and for a release amount of 1 kg inside the processing plant, the dose to offsite receptors at 200 m from the Project site was calculated to be less than the CNSC public dose limit of 1 mSv. The analysis also indicated that the dose to a worker in a full-face-piece powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p> <p><b>Rationale:</b> Section 14.6.6.1 indicates that 2 kg of uranium concentrate could be released in case of the accident. No rationale is provided why 1 kg rather than 2 kg uranium concentrate is used for dose calculation. If 2 kg is used as the source term, the dose to offsite receptors at 200m and workers in the area would be higher.</p>	Please provide the rationale for using a source term of 1 kg rather than 2 kg of uranium concentrate for the dose calculation to offsite receptors and workers. If sufficient rationale cannot be provided, the doses to offsite receptors and workers should be recalculated using 2 kg uranium concentrate, and the results provide.		Accepted	n/a
IR-227	-	CNSC	Accidents and Malfunctions	Section 14.6.6.1.1	<p><b>Context:</b> Bounding Scenario 6 involves a fire and/or explosion within the processing plant, resulting in the release of a large amount uranium to the atmosphere. The airborne source term for this scenario is estimated with equation developed by the United States Department of Energy (USDOE), where the respirable faction is assumed to only include particles of 10 mm and smaller.</p> <p><b>Rationale:</b> No rationale was provided to support the consideration of only 10 mm and smaller particles. As provided in Table 14.6-3, the particle size of uranium &lt;15 mm is less than 20%. Majority of the uranium particle size is larger than 10 mm. The airborne source term is an important factor for the effects assessment and should be calculated with transparent and justified information/data.</p>	Provide rationale for only considering 10 mm and smaller particles for the respirable fraction.		Accepted	n/a
IR-228	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4  Appendix 14-A	<p><b>Context:</b> For the Bounding Scenario 6 (Facility Fire and/or Explosion), the predicted dose is less than 1 mSv to a member of the public 200 metres away from the Project site. The analysis also indicated that the dose to a worker in a full-face powered air-purifying respirator who stays in the area would be 88 mSv, which exceeds the annual worker dose limit of 50 mSv.</p>	Provide the dose calculations for deriving the dose estimates for workers and members of the public for Bounding Scenario 6 (Facility Fire and/or Explosion).		Accepted	n/a

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					<p>The Proponent did not provide the dose calculations for deriving the dose estimates.</p> <p><b>Rationale:</b> The method used to estimate effective, equivalent, and committed dose is required to be verified. Sample dose calculations should be included, to confirm use of acceptable input data.</p>				
IR-229	-	CNSC	Human Health with respect to radiation exposure	Section 14.6.6.4 Appendix 14-A	<p><b>Context:</b> With the Bounding Scenario 6 (Facility Fire and/or Explosion), the Proponent states that Denison would ensure that the design of the plant includes control measures to reduce the exposure to both workers and members of the public to levels that are as low as achievable. The measures would ensure that the processing plant is adequately ventilated.</p> <p>It is not indicated where these additional measures have been detailed/elaborated within the EIS.</p> <p><b>Rationale:</b> Control measures to reduce the exposure to both workers and members of the public as low as achievable, that are identified in the assessment of Bounding Scenario 6, must be formally documented to ensure that they are carried over into the engineered design of the processing plant.</p>	Provide details on how the control measures to reduce the exposure to both workers and members of the public, identified in the assessment of Bounding Scenario 6, have been formally documented and incorporated in the engineered design of the processing facility.		Accepted	n/a
IR-230	-	CNSC	Accidents and Malfunctions	Section 14.6.7.4	<p><b>Context:</b> It is stated that a conservative penetration time of 15 min was applied in the assessment. Based on this assumption, the maximum depth of contamination could be 90 cm (for penetration rate of 0.1 cm/s). It is not clear why the penetration time of 15 minutes is considered conservative as the penetration time would depend on the time needed for the emergency response team to respond.</p> <p>It is also stated that the wide range of the calculated velocities is a result of variation of soil conditions and the slope of the surface. The distance that the groundwater can travel under these extreme (i.e., conservative) conditions ranges from 0.15 m to 100 m. It is not clear how the groundwater travel distance of 0.15m and 100m is calculated.</p> <p><b>Rationale:</b> The penetration time will influence the penetration depth of the released materials, which in turn, considering the groundwater travel distance, will impact the potential areas and volumes of contaminated soils and shallow groundwater.</p>	Please provide justification for applying 15 minutes of penetration time, and why it is considered conservative. In addition, please provide information on how the groundwater travel distance of 0.15 m and 100 m was obtained.		Accepted	n/a
IR-231	-	CNSC	Accidents and Malfunctions	Sections 14.6.6.4 and 14.6.6.5	<p><b>Context:</b> The EIS states that in the unlikely event of an unmitigated accidental release of uranium due to a dryer explosion, doses to the workers are expected to have a moderate effect, while doses to members of the public are expected to have a minor effect. Based on this evaluation, the severity of the consequences of this accident and malfunction scenario is predicted to be moderate. In consideration of both probability and consequences, the overall risk related to Bounding Scenario 6 is predicted to be low.</p> <p><b>Rationale:</b> When there is an explosion within the process plant, it is likely there will</p>	Please re-evaluate the consequence and the risk of Bounding Scenario 6 by considering the potential worker fatality resulted from an explosion.		Accepted	n/a

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					have worker fatality. The severity of the consequences of an explosion would be catastrophic and the risk of Bounding Scenario 6 would be higher.				
IR-232	-	ECCC	Change to an environmental component due to hazardous contaminants	Appendix 14-A, Table 3-7, ID# 7.1  Appendix 14-A, Table 5-5	<p><b>Context:</b> The Proponent indicates in Appendix 14-A, Table 3-7 that a release of sulfuric acid is a low consequence event therefore would not require further assessment. However, according to a Safety Datasheet on high concentrated sulfuric acid (ICSC–0362 - SULFURIC ACID, concentrated (&gt; 51% and &lt; 100%) (ilo.org)), the substance is incompatible with certain materials and can give off toxic fumes. Furthermore, it reacts with various metals to produce hydrogen gas, which is explosive.</p> <p>The Proponent provides estimates of chemicals, including sulfuric acid, to be transported to site in Appendix 14-A, Table 5-5. The annual consumption of sulfuric acid is estimated at 15,417 m3, in 617 trucks per year, but the concentration is not stated.</p> <p><b>Rationale:</b> Given the high reactivity and inherent corrosive nature of sulfuric acid combined with the volume and concentration that may be stored on site, ECCC requests that the Proponent provide a detailed risk assessment related to a terrestrial spill of sulfuric acid, specifically at the processing plant.</p>	1. Provide the volume and the concentration of sulfuric acid that will be stored on site.  2. Provide a detailed risk assessment of the fate and behavior of sulfuric acid during a release into the environment.		Accepted	n/a
IR-233	-	HC	Human health with respect to hazardous contaminants	Appendix 14-A, Section 8.7 (p. 8.10)	<p>An effects assessment for a transportation accident scenario involving radioactive materials was not included.</p> <p><b>Context:</b> The Proponent provided an effects assessment relating to a diesel spill on the ground (Section 14 Appendix 14-A, Section 8.7). However, no information was provided regarding the potential human health effects of a uranium concentrate release at the two locations considered (Section 14 Appendix 14-A p. 8.10).</p> <p><b>Rationale:</b> An accident involving radioactive material may have an impact on human receptors, based on the proximity of receptors and the proposed response protocols.</p>	1. Assess and describe the potential health effects (chemical and radiological) of a transportation accident involving a uranium concentrate spill at the following locations: a) km 160 of Hwy 914, which is the location of a cultural camp that has been established by the ERFN. b) km 67 of Hwy 914, which is a gathering location for the Kineepik Métis Local associated with the Northern Village of Pinehouse. c) All other potential sites of importance for the public and Indigenous peoples.		Accepted	n/a
IR-234		CNSC	Effect of Environment	Section 15.2.2	<p><b>Context:</b> Effects of seismic events on the uranium extraction and post decommissioning are not assessed.</p> <p><b>Rationale:</b> Seismic events could further exacerbate the stability of the voids induced by the uranium extraction, which will result in extra stresses and displacements/deformation in the overlying rock formations. These extra stresses and displacements/deformation could impact on the mine operation and post decommissioning groundwater flow and contaminant transport.</p>	Please provide an assessment of seismic events on the mine-induced voids stability and the resulted effects on the mine operation and post decommissioning.  <b>Technical Discussion Required:</b> Yes		Accepted	n/a
IR-235	-	ECCC  CNSC	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> In this section it is stated that: “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit, following the RPC4.5 and RCP8.5 scenarios, respectively, as indicated by the Climate Atlas (PCC 2019).”</p> <p>RCP4.5 represents predicted climate conditions of a moderate carbon future.</p>	1. Provide the source of the data displayed in Max 1-Day Precipitation (mm) category in Tables 15.5.1 and 15.5-2.  2. Provide detailed calculations for the following average values:		Accepted	n/a

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					<p>RCP8.5 represents predicted climate conditions under a high carbon future.</p> <p>The values shown in Tables 15.5-1 and 15.5-2 show averages of 25.9 and 26.7 mm for RCP4.5 and 25.9/27.5 mm for RCP8.5. These values do not correspond to the source indicated by the Proponent.</p> <p><b>Rationale:</b> Based on the Proponent’s description we would expect to find the same values for “Max 1-Day Precipitation (mm)”in the Climate Atlas for RCP4.5 and RCP8.5 scenarios. ECCC was unable to duplicate the results.</p> <p>ECCC queried the Climate Atlas for Tomblin Lake and returned a result of “Region Geikie River.” <a href="https://climateatlas.ca/find-local-data">https://climateatlas.ca/find-local-data</a></p> <p>ECCC then queried the Climate Atlas for Max 1 Day Precipitation (mm). <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_85/line</a> <a href="https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line">https://climateatlas.ca/data/grid/782/maxdaypr_2030_45/line</a> The results displayed an array of values ranging from 83.6 mm (2050) to 87.3mm (2092) for a Regional Concentration Pathway RCP8.5 scenario and values ranging from 48.9mm (2050) to 89.5 mm (2083) for an RCP4.5 scenario.</p> <p>These values do not match the averages shown in Tables 15.5-1 and 15.5-2.</p>	<ul style="list-style-type: none"><li>25.9 mm 26.7 mm in Table 15.5-1: Predicted Climate Conditions of a RCP4.5 Moderate Carbon Future</li><li>25.9 mm 27.5 mm in Table 15.5-2: Predicted Climate Conditions of a RCP8.5 High Carbon Future</li></ul> <p>3. Explain how the data shown in Tables 15.5.1 and 15.5.2 were used in the precipitation risk assessment.</p> <p>4. Denote the differences between “mean”, “value/max value”, and “fluctuation”, in the calculation of extreme event risk.</p> <p>5. Compare model derived data against:</p> <ol style="list-style-type: none"><li>Natural variability of the observed data.</li><li>Variability in the statistics generated via observation based time series.</li></ol> <p><b>Technical Discussion Required:</b> Yes</p>			
IR 236	-	ECCC ERAD	Fish and fish habitat	Section 15.5.2, Expected Environmental Conditions	<p><b>Context:</b> It is stated that, “Table 15.5-1 and Table 15.5-2 summarize the predicted mean values of the climate variables for the Tomblin Lake regional grid unit...”</p> <p>As per the Proponent’s description, Tomblin Lake was chosen as representative location for Wheeler when Climate Atlas was used as data source.</p> <p><b>Rationale:</b> In those two tables, for the “Max 1-Day Precipitation (mm)” the historical average is given as 24.1mm. Local time series analysis for the climatic region in which Wheeler Project is located provide averages (for 1-day max precipitation) of approximately 30+ mm.</p> <p>It is the Proponent’s responsibility to keep the required database current and up to date, because the length of the time series influences all derived statistics. Statistical analysis of extreme events is highly dependent of the mean with extreme values reaching values 3 to 4 times higher than the mean.</p>	<p>1. Provide a clear explanation on how the historical mean for 1-Day Max Precipitation was calculated.</p> <p>2. Compare the values obtained via various means (ex: copied from the internet, modeled via some online algorithm, derived from specialty literature), against time series analysis based on observations.</p> <p><b>Technical Discussion Required:</b> Yes</p>		Accepted	n/a

Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale (March 2023)	Information Requirement (IR) (March 2023)	Rationale for Status (October 2024)	Status	Denison Response to CNSC Comments, October 18, 2024
IR-237		CNSC	EA follow-up and monitoring program	Appendix 16-C throughout, including Table 1.5-1: Wheeler River Monitoring and Follow-up Program Summary (p. 8-15)	<p><b>Context:</b> CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a> state: “The EIS should provide discussion on the follow-up program’s requirements, and include:</p> <ul style="list-style-type: none"><li>objectives and structure of the follow-up program and the VCs targeted by the program</li><li>tabular summary and explanatory text of the main components of the program including:<ul style="list-style-type: none"><li>a description of each monitoring activity under that component</li><li><u>which of the two generic program objectives the activity is relevant to (e.g., verify EA predictions, determine effectiveness of mitigation measures)</u></li><li>the specific statement from the EA that goes along with that generic objective and will be the focus for that activity (e.g., program objective: verify predicted effects; environmental assessment effect: no potential adverse effects)</li><li>the specific monitoring objective for that activity</li><li>planned schedule</li></ul></li><li><u>roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the program results</u></li><li><u>possible involvement of independent researchers</u></li><li><u>program funding sources</u></li><li>information management and reporting (reporting frequency, methods and format)</li><li><u>possible opportunities for the Proponent to include the participation of the public and Indigenous groups, during the development and implementation of the program</u></li></ul> <p><u>The follow-up program plan should be sufficiently described in the EIS to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures.”</u> (Section 11)</p> <p><b>Rationale:</b> The Summary of Monitoring and Follow-up Programs provided in Appendix 16-C contains very high-level information, and while some of the aspects detailed in the Generic EIS Guidelines are included, the aspects underlined are missing or appear incomplete.</p> <p>Further, all information from throughout the EIS should be incorporated into this Summary. For example, the EIS notes that: “Groundwater samples will be collected at least monthly and semi-annually in the wells within the freeze wall and on the freeze wall perimeter, respectively” (p. 7-109) and that “At least five to seven multi-well clusters are proposed across the mined area (Figure 7.8-2). Sampling will include KI parameters or the full suite of COPC at different times in the remediation process” (p. 7-111).</p> <p>These details (only examples) are not included in Appendix 16-C.</p>	<p>It is recognized that this document will evolve over the planning process and be finalized prior to the EA Decision; however, as plans are developed and revised, CNSC staff expect that updates will be made to this document and provided with any future versions of the EIS.</p> <p>Appendix 16-C Summary of Monitoring and Follow-up Programs must include sufficient details to allow CNSC staff to determine the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them) and confirm the effectiveness of mitigation measures. This includes concrete monitoring plans (sampling locations, frequency, etc.).</p> <p>Additionally, please incorporate any relevant information included in the EIS into this Summary.</p>		Accepted	n/a



Original IR#	Follow-Up IR #	SME	Project Effects Link	Reference to EIS, appendices, or supporting documentation	Context and Rationale (March 2023)	Information Requirement (IR) (March 2023)	Rationale for Status (October 2024)	Status	Denison Response to CNSC Comments, October 18, 2024
IR-238	-	CNSC	Current use of lands and resources for traditional purposes	Various sections of the EIS, including: Section 8 Section 9 Section 10 Section 11 Section 12 Section 15 Section 16  Appendix 16-C (p. 3)	<p><b>Context:</b> The EIS indicates that “further detailed [follow-up and monitoring programs] will be developed as Project designs are finalized that may influence the nature, frequency, and locations of monitoring. In addition, input from regulatory agencies, the public and Indigenous Peoples will be considered.” (Appendix 16-C, p.3)</p> <p>It is not clear in several section(s) of the EIS and the Indigenous Engagement Report, whether Denison has provided the interested Indigenous Nations and communities with the opportunity to participate in the development, implementation, and review of monitoring and mitigation measures, as per the guidance of REGDOC-3.2.2 and CNSC’s Generic EIS Guidelines.</p> <p><b>Rational:</b> As outlined in Section 11 of CNSC’s <a href="#">Generic Guidelines for the Preparation of an EIS</a>, please include roles and responsibilities to be played by the Proponent, regulatory agencies, Indigenous people, local and regional organizations and others in the design, implementation and evaluation of the monitoring program results as well as possible opportunities for the Proponent to include the participation of the public and Indigenous Nations and communities, during the development and implementation of the program.</p>	<p>Please provide additional information to demonstrate whether Indigenous Nations and communities were engaged directly on the potential mitigation and monitoring measures to address the concerns raised regarding potential impacts of the Project on the potential or established Indigenous and/or treaty rights.</p> <p>Provide a rationale if this engagement has not been completed. As the Project develops, please provide concrete actions Denison will take in the follow-up and monitoring programs to engage Indigenous Peoples to alleviate concerns and incorporate their interests, and when this engagement is planned to take place.</p>		Accepted	n/a

**Additional Lung Cancer Mortality from PM2.5: Recommended Approach and Sample Calculation**  
Health Canada, Water and Air Quality Bureau, October 2022

Health Canada (2022) provides a quantitative estimate of the risk of lung cancer associated with exposure to PM2.5 in Canada. The pooled hazard ratio (HR) for lung cancer mortality in the Canadian population is 1.127 (95% CI: 1.085, 1.170) per 10 µg/m3 increase in long-term exposure to ambient PM2.5. The slope coefficient (β) for this relationship is 0.01196, as derived below:

$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = \textit{pooled hazard ratio per 10 }\mu\text{g}/\text{m}^3$$
$$e^{(\beta \times 10 \text{ }\mu\text{g}/\text{m}^3)} = 1.127$$
$$\beta \times 10 \text{ }\mu\text{g}/\text{m}^3 = \ln 1.127$$
$$\beta = (\ln 1.127)/(10 \text{ }\mu\text{g}/\text{m}^3) \text{ `}$$
$$\beta = 0.01196$$

The additional lung cancer mortality (over the baseline rate) from PM2.5 derived from a given source can be determined using the equation below, based on the attributable fraction or (HR-1)/HR (Greco et al. 2020):

$$ALCM = \left[ \frac{\left( e^{\beta \cdot Exposure} - 1 \right)}{e^{\beta \cdot Exposure}} \right] \cdot Baseline \text{ rate} \cdot Years$$

ALCM = additional lung cancer mortality cases per 100,000 population

β = 0.01196 (slope coefficient from meta-analysis in Health Canada (2022))

Exposure = estimated PM2.5 exposure concentration from the relevant source(s) (µg/m3) (does not include baseline PM2.5 exposure)

Baseline rate = 45.5 per 100,000 (current Canadian Age Standardized Mortality Rate (ASMR) for lung cancer from Canadian Cancer Statistics Advisory Committee 2021); the Canadian baseline rate is appropriate as the slope coefficient was derived from Canada-wide studies and an updated ASMR of Canada (if available) would be appropriate for use in the calculation



Years = years of project or project phase

Sample calculation:

Project estimates an exposure from relevant source(s) of 0.067 µg/m3 over 50 years of operation

$$ALCM = \left[ \left( e^{\beta \cdot Exposure} - 1 \right) / e^{\beta \cdot Exposure} \right] \cdot Baseline\ rate \cdot Years$$

$$ALCM = \left[ \left( e^{0.01196 \cdot 0.067} - 1 \right) / e^{0.01196 \cdot 0.067} \right] \cdot 45.5 \cdot 50$$

ALCM = 1.8 additional lung cancer mortality cases per 100,000

**References:**

- [1] Canadian Cancer Statistics Advisory Committee in collaboration with the Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada. Canadian Cancer Statistics 2021. Toronto, ON: Canadian Cancer Society; 2021. Available at: [cancer.ca/Canadian-Cancer-Statistics-2021-EN](https://cancer.ca/Canadian-Cancer-Statistics-2021-EN)
- [2] Greco, S.L., MacIntyre, E., Young, S. et al. An approach to estimating the environmental burden of cancer from known and probable carcinogens: application to Ontario, Canada. BMC Public Health 20, 1017 (2020). <https://doi.org/10.1186/s12889-020-08771-w>
- [3] Health Canada. Lung cancer and ambient PM2.5 in Canada: a systematic review and meta-analysis.
- [4] Health Canada, 2022. Available online at: <https://publications.gc.ca/site/eng/9.907038/publication.html>

November 13, 2024

Nana Kwamena  
Canadian Nuclear Safety Commission  
Government of Canada  
280 Slater Street  
Ottawa, ON K1P 5S9

Dear Ms. Kwamena,

**Re: Wheeler River Project Federal Indigenous Review Round 4 Follow-up  
Clarifications for Information Requests 114 & 174**

During a November 8, 2024 discussion between the Canadian Nuclear Safety Commission (CNSC) and Denison (Kwamena - Switzer), and a subsequent discussion between the CNSC and Denison (Way-England) on November 12, 2024, the CNSC requested further information on two of Denison's Round 4 responses. Specifically, the CNSC requested Denison clarify whether the responses to Information Request (IR) 114 and 174 would alter the conclusions of the assessment. Denison confirms that the information provided in the response to these two IRs did not change the conclusions of the Environmental Impact Statement (EIS).

The enclosed memo provides further clarification in support of Denison's determination. Minor updates that have been made to the final EIS (October 2024), as part of Denison's response to the aforementioned IRs, have been noted in the memo.

Kindly,



Janna Switzer  
Vice President, Environment Sustainability & Regulatory  
Denison Mines

Cc Jessica Way (CNSC)  
Brianne England (Denison)

**Wheeler River Project Environmental Impact Statement (EIS)**  
**Round 4 Information Requests (IRs) 114 and 174 consideration of conclusions**  
**November 13, 2024**

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IR-114

For reference, we note that the nature of IR-114 has changed over the two-year review period. Initially the primary focus of IR-114 concerned inclusion of Metal and Diamond Mining Effluent Regulations (MDMER) parameters, the use of baseline receiving environment concentrations to derive water quality thresholds, and data and analysis for mercury / methyl mercury. The use of the copper (Cu) federal environmental quality guideline (FEQG), that is now the focus of IR-114, was raised by the federal-Indigenous review team (FIRT) in the draft Round 4 comments received by Denison in September 2024.

In response to Round 4 IR comments, the EIS technical team updated the EIS (final EIS; October 2024) as described in the following bullet points. Discussion regarding the updates is also provided for context and clarity:

- The changes requested to **Section 8 Aquatic Environment** were made. This includes corrections/revisions to table footnotes, removal of MDMER effluent limits for arsenic and total suspended solids as short-term screening criteria, and the inclusion of the Cu FEQG in the assessment. The following is noted regarding the Cu FEQG in particular as this seemed to be the most salient issue raised in the IR, specifically related to the calculation of the Cu FEQG. At baseline and reference conditions, the FEQG was calculated to be 0.0002 mg/L. When evaluating results predicted during operations, the FEQG was calculated in consideration to the toxicity modifying influence of the effluent – that is, the FEQG was calculated using the BLM model in consideration of the effluent-induced hardness in the receiver and the value of 0.00098 mg/L was used. As noted in the Round 4 response to this IR, Denison and its SMEs believe it is relevant to consider all aspects of the receiving environment and this includes induced hardness since the scenario being evaluated only occurs during periods of effluent discharge. This approach is used in other jurisdictions (e.g., water licences in northern Canada issued through local water boards) and therefore the concept of utilizing induced toxicity modifiers, like hardness, that would be associated with the receiving environment is not unique.

With the above in mind, the results show no exceedances of the adjust Cu water quality guideline as defined by the BLM derived FEQG in the operations phase during periods of effluent discharge. In consideration of this there is no rationale on which to change the conclusion of the EIS. Text has been added to the EIS documentation (see below regarding Appendix 10-A) that considers the FEQG reflecting baseline and reference conditions from a sensitivity analysis perspective which Denison and its SMEs believe is an appropriate treatment of the information. The sensitivity acknowledges the perceived increased risk to aquatic biota at the lower, baseline FEQG since the predicted copper concentration is greater than the FEQG; however, this sensitivity analysis does not require a change to the overall conclusions of the EIS.

## Wheeler River Project Environmental Impact Statement (EIS)

### Round 4 Information Requests (IRs) 114 and 174 consideration of conclusions

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- Additionally, the following is noted:
  - The Surface Water Quality valued component (VC) is an intermediate VC, where a change in an intermediate VC has the potential to result in an effect on a receptor VC and receptor VCs are generally biological or integrated assessment endpoints. Significance determination is not completed on intermediate VCs, but integrated into the residual effect evaluation, residual effect characterization, and significance determination for related receptor VCs.
  - If a water quality guideline is exceeded, this does not directly correspond to an effect on receptor VCs or a significant effect on a receptor VC. A close review of Section 8 residual effect analysis was conducted. This included a review of the ratings for residual effect characteristics: direction, magnitude, geographic extent, duration, frequency, reversibility, context, and likelihood for aquatic environment VCs. The information contained in the revised draft EIS was acceptable, and it was determined that no updates to the assessment conclusions were required with the inclusion of the Cu FEQG. While some additional risk to sensitive receptors is possible, the overall integrity of the VC populations within the aquatic regional study area is unlikely to be changed.
  - The assessment is conservative on many fronts, and one of the central issues with copper is that the analytical lab's detection limit for surface water sample was at the background FEQG of 0.0002 mg/L. Additional surface water sampling with a lower detection limit was initiated in 2024 and will provide a more accurate value for baseline copper concentrations. Denison's commitment to collect more water samples prior to construction and incorporate new water quality data into Denison's application for a licence to operate, along with updated effluent quality data, in outlined in commitment 8-48. The conceptual environmental sampling plan for aquatic environment VCs included in the EIS is at the appropriate level of detail needed at the environmental assessment (EA) stage and does not need to be updated because of this IR.
- **Appendix 8-E Constituent Concentrations and Mixing Zone Assessment Report** has been updated to be consistent with the revisions to Section 8 described above, e.g., updating table footnotes, removing MDMER effluent limits as short-term screening criteria for arsenic and total suspended solids, and including the copper FEQG as appropriate.
- **Appendix 10-A Environmental Risk Assessment** a new section 6.2.4 *Copper Aquatic Toxicity Reference Values* was added to Appendix 10-A, Section 6.2 Sensitivity Analysis. The content of this new section is effectively the information provided to the CNSC in Attachment IR-114 Round 4.

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IR-174

For reference the following is noted with respect to the chronology and evolution of IR-174 for context. This IR was “not accepted” in the draft, Round 4 IRs provided to Denison in September; however, in the October 2024 version of the Round 4 IRs, this IR was deemed to be “under discussion.”

Despite this change in status, Denison nevertheless included a detailed response to IR-174 in the October 18, 2024, IR response package to address the specific comments contained in the draft IR-174 Round 4.

As part of Denison’s response to this Round 4 IR, clarification on data provided in the baseline bat detection map legend was provided and this was updated in the final EIS (October 2024) in Figure 2.9 of Appendix 9-F, methodology for future pre-construction baseline bat survey was provided, and commitment 9-37 was updated as requested.

The results of bat surveys (acoustic) completed in 2024 were provided to the CNSC (OMNIA memo dated October 29, 2024). Four bat species or species groups were detected during the surveys: little brown myotis (*Myotis lucifugus*), northern myotis (*M. septentrionalis*), hoary bat (*Lasiurus cinereus*), and western small-footed bat (*M. ciliolabrum*). Hoary bat and western small-footed bats were not detected during the 2019 acoustic survey.

The detection of different or additional bat species has no implications on the EIS baseline report (Appendix 9-B). The baseline report is an inventory of species detected during the focused surveys completed to support the EIS and reflects the information gathered to the date of publication; the OMNIA memo included with the IR response is now part of the EIS record and therefore the record includes documentation of all species encountered. The assessment and conclusions surrounding bat species in Appendix 9-D are unchanged in consideration of the results of the 2024 acoustic surveys and the reasoning for this is discussed below.

The assessment provided for bat species focussed on bat species at risk (SAR) including northern myotis and little brown myotis. The assessment is provided in Appendix 9-D and follows an accepted habitat-based assessment. The information provided in Appendix 9-D includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures (including project design measures, general mitigations for wildlife SAR, and species-specific measures for bat species), and anticipated residual effects on those species. Since the hoary and western small-footed bats occupy the same ecological niche and have similar life histories to northern myotis and little brown myotis, the information provided in Appendix 9-D applies equally to them (and all bat species with similar life histories and niche requirements), including the conclusions of the assessment. With that in mind, Denison and its SMEs do not have a rationale to alter the EIS conclusions in this regard.

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The above rationale is consistent with typical EA practice. The EIS was not designed to include an assessment of every species that has been detected at a given Project site, nor is such an assessment necessary considering the EA methodology used for the EIS. Scoping is completed to focus the assessment on key VCs, and this is considered EA best practice. This approach is outlined in within the EIS documentation, including Section 5 Approach and Methodology of the Assessment and Section 9 Terrestrial Environment.



**November 19, 2024**

**Wheeler River Project Environmental Impact Statement Review**

**Denison's Response to the CNSC's November 14, 2024 comment Round 5 IR-114**

**CNSC Round 5 IR-114 comment**

1. Update EA commitment 8-47 to include a linkage to IR-114 to ensure that additional sampling for alkalinity and nitrate will be conducted prior to construction activities as supporting information for IR-114, as indicated by Denison in their Round 4 responses.
2. Provide an updated Table 8.2-13 for review incorporating the correct short- and long-term benchmark values of 0.00011 mg/L and 0.00004 mg/L respectively, for Cadmium.
3. Provide an update to the ERA risk conclusions to remove reference to utilizing an "induced hardness" scenario calculating a copper FEQG with effluent concentrations of hardness (i.e. 250 mg/L) rather than the maximum predicted receiving environment concentrations of hardness (i.e. 9 mg/L as per EIS Table 8.2-10) as rationale for risk to receptors.
4. Confirm, in light of this new information, with appropriate justification, whether the EA predictions and conclusions remain valid, and whether the proposed mitigation measures remain adequate.
5. Make a commitment to assess and minimize copper concentrations in effluent through the BATEA assessment during licensing.

**Denison's response – to be considered in conjunction with the IR-114 responses provided to the CNSC on October 18, 2024 and November 13, 2024**

1. *Note: commitment 8-47 was a commitment related to wetlands. Commitment 8-48 has been updated in commitments register version 4 as shown here in track changes:*

ID (EIS Section-chronological number)	VC/KI (as applicable; related to mitigations)	Last Updated (register version)	Details of Commitment	EIS Section or IR/TRC	Project Phase	Commitment Tracker Method	Scope of Commitment
			methylmercury, and other relevant COPCs such as lead, arsenic, and cadmium as part of the constituents monitored in fish throughout all project phases.				
8-45	Water Quality / Project Description	1	Denison is committed to investigating BATEA and working with the province and CNSC to ensure discharge concentrations of all constituents including uranium are protective of the aquatic environment.	IR-18	All phases	Engineering Design; EMS; EA Follow-up Program	Regulatory Requirement
8-46	Wetlands / Fish Habitat	1	To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.	IR-101, Appendix 8-F	All phases	Engineering Design; EMS; EA Follow-up Program	FUP Requirement
8-47	Wetlands/Fish Habitat	1	Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.	IR-101, Section 8.3.5, Appendix 8-F	All phases	Engineering Design	Regulatory Requirement
8-48	Water Quality	<del>4p</del>	Denison <u>is in agreement</u> that regular water quality data collection should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). Sampling will be conducted monthly during the open water period and twice under ice <u>and will include analysis for alkalinity and nitrate</u> . Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data.	IR-107, <del>IR-114</del>	Prior to Construction	EA Follow-up	FUP Commitment
			Denison has committed to a pre-operational EEM study and will conduct that study in accordance with				

2. Excerpt of Final EIS (October 2024) Table 8.2-13 for the CNSC's review of cadmium screening criteria:

**Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water**

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Short-term Benchmark			Long-term Benchmark		
									Value	Reference	Notes	Value	Reference	Notes
Alkalinity	mg/L	NE	NE	12.4	12.4	NE	NE	NE						
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614				0.1	SEQG/CCME	(1)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368				5.74	SEQG/CCME	(2)
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199				0.019	SEQG/CCME	
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012				0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	0.00011	CCME	(3)	0.00004	SEQG/CCME	

(3) Cadmium criteria based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L [95th percentile of LA-5 and LA-6]).

3. and 4.

Baseline conditions for the Wheeler River include a background hardness of 5.26 mg/L, DOC of 2.24 mg/L, and pH of 6.61 (95th percentile of LA-5 and LA-6). Using ECCC's Biotic Ligand Model for copper, the calculated  $HC_5$  is below 0.0002 mg/L, however, 0.0002 mg/L is considered by the FEQG to be the lowest concentration routinely measured and therefore replaces the calculated  $HC_5$  value for this water chemistry. Therefore, at baseline conditions the FEQG is 0.0002 mg/L. Table 3-1, Table 3-3, and Table 3-5 of the ERA (Appendix 10-A) were updated to include the copper FEQG of 0.0002 mg/L as the screening criterion.

As identified in Section 5.3.1.1 of the ERA (Appendix 10-A), toxicity reference values (TRVs) for copper were obtained from the USEPA Ecotoxicology Database (ECOTOX) for aquatic organisms. The selected TRVs were 20% Effect Concentrations (i.e.,  $EC_{20}$  values), which are concentrations at which only 20% of the test organisms respond. The TRVs are shown in Table IR-114-1 below. Where the TRVs derived from ECOTOX were lower than the CCME guideline the CCME guideline was selected.

**Table IR-114-1: Copper Toxicity Reference Values Used for Aquatic Organisms in the ERA**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
Copper	Forage fish	0.002	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=237)	ECOTOX
	Predator fish	0.003	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=89)	ECOTOX
	Zooplankton	0.002	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=117)	ECOTOX; CCME
	Benthic invertebrates	0.002	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=264)	ECOTOX; CCME
	Phytoplankton	0.0092	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=101)	ECOTOX
	Aquatic plants	0.038	mg/L	5th percentile of estimated chronic $EC_{20}$ distribution (n=28)	ECOTOX

As requested in IR-114, the TRVs have been re-evaluated using the FEQG and the BLM. The BLM was run based on baseline site-specific conditions. The test species and concentrations identified as used to generate the BLM were evaluated to develop TRVs for the applicable biotic groups. The most restrictive effect concentration for each biotic group was identified. The test endpoint was either an  $EC_{10}$  or an  $IC_{10}$ . Based on the protocol identified in Table 5-11 of the ERA, the  $EC_{10}$  (or  $IC_{10}$ ) was multiplied by 2 to obtain an  $EC_{20}$ , which was then utilized as the TRV. A summary of the TRVs for baseline conditions is identified in Table IR-114-2.

Considering that while the facility is in operation it is expected that hardness in the receiving environment will increase to approximately 9 mg/L and pH will increase to approximately 7, the BLM was re-run under updated site conditions and the TRVs were re-evaluated based on the test species and concentrations used to generate the BLM. The copper TRVs under site conditions are presented in Table IR-114-3.

**Table IR-114-2: Copper Toxicity Reference Values from Baseline Conditions BLM**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
Copper	Forage fish	0.0052	mg/L	Fathead minnow, growth ( $IC_{10}$ = 0.0026 mg/L)	FEQG BLM
	Predator fish	0.0008	mg/L	White sturgeon, growth ( $EC_{10}$ = 0.0004 mg/L)	FEQG BLM
	Zooplankton	0.0009	mg/L	Daphnia magna, reproduction ( $EC_{10}$ = 0.0004 mg/L)	FEQG BLM
	Benthic invertebrates	0.0004	mg/L	Pond snail, growth ( $EC_{10}$ = 0.0002 mg/L)	FEQG BLM
	Phytoplankton	0.0091	mg/L	Rotifer, intrinsic ( $EC_{10}$ = 0.0046 mg/L)	FEQG BLM
	Aquatic plants	0.0212	mg/L	Duckweed, root length ( $EC_{10}$ = 0.01 mg/L)	FEQG BLM

Notes:

BLM based on hardness of 5.26 mg/L, DOC of 2.24 mg/L, pH of 6.61, temperature of 13°C.  
TRV is an EC<sub>20</sub>, adjusted from an EC<sub>10</sub> or IC<sub>10</sub>.

**Table IR-114-3: Copper Toxicity Reference Values from Site Conditions BLM**

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
<b>Copper</b>	Forage fish	0.01	mg/L	Fathead minnow, growth (IC <sub>10</sub> = 0.005 mg/L)	FEQG BLM
	Predator fish	0.002	mg/L	White sturgeon, growth (EC <sub>10</sub> = 0.001 mg/L)	FEQG BLM
	Zooplankton	0.002	mg/L	Daphnia magna, reproduction (EC <sub>10</sub> = 0.001 mg/L)	FEQG BLM
	Benthic invertebrates	0.001	mg/L	Pond snail, growth (EC <sub>10</sub> = 0.0005 mg/L)	FEQG BLM
	Phytoplankton	0.017	mg/L	Rotifer, intrinsic (EC <sub>10</sub> = 0.009 mg/L)	FEQG BLM
	Aquatic plants	0.015	mg/L	Duckweed, root length (EC <sub>10</sub> = 0.008 mg/L)	FEQG BLM

Notes:

BLM based on hardness of 9 mg/L, DOC of 2.24 mg/L, pH of 7, temperature of 13°C.  
TRV is an EC<sub>20</sub>, adjusted from an EC<sub>10</sub> or IC<sub>10</sub>.

The hazard quotients (HQs) for aquatic organisms were re-evaluated using both sets of TRVs, baseline conditions and site conditions during operation where hardness and pH are increased (Table IR-114-4). Consistent with Section 5.4.1 of the ERA (Appendix 10-A) an HQ less than or equal to 1 suggests low risk to the ecological receptor, and an HQ above 1 needs further investigation to determine if adverse effects are possible. Conservatively using baseline conditions, HQs for all aquatic organisms are less than 1 with the exception of predator fish in Whitefish Lake, and benthic invertebrates at all locations where HQs are slightly above 1. As such, further consideration was given to changes in site conditions when the facility is in operation. Using more realistic site conditions for hardness and pH, HQs for all aquatic organisms are less than 1 at all downstream locations, indicating no adverse effects to aquatic organisms from facility related copper. It is relevant to consider all aspects of the receiving environment and this includes induced hardness and pH since the scenario being evaluated only occurs during periods of effluent discharge. This approach is used in other jurisdictions (e.g., water licences in northern Canada issued through local water boards) and therefore the concept of induced hardness is not unique.

The copper predictions in the ERA are considered conservative based on the following assumptions:

- Baseline concentrations of copper are predominantly below the detection limit, indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The effluent predictions in the ERA are based on available information from test studies at the time the ERA was prepared. Denison will be refining the effluent quality through the BATEA assessment and licensing process.
- Based on the effluent quality and quantity released to Whitefish Lake, the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ. This is a conservative assumption.
- Once the facility is operational, site conditions will change which includes increased hardness and pH; therefore, the predicated HQs under baseline conditions are considered conservative and overestimate risk.

Denison is in the process of collecting additional baseline water quality data which will be used in future ERA iterations to reconsider the baseline copper concentration in the Wheeler River. The ERA is a living document that will continue to be updated at defined intervals and will integrate new data when it is available. Denison has also committed to an ongoing environmental monitoring program which will be used to determine if there are any adverse effects to aquatic organisms from copper and other constituents of potential concern.

**Table IR-114-4: Re-Evaluated Hazard Quotients for Copper in Aquatic Organisms**

Location	Maximum Copper Concentration in Water (mg/L)	Hazard Quotients (unitless) – Baseline Conditions						Hazard Quotients (unitless) – Site Operation Conditions					
		Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phytoplankton	Aquatic Plants	Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phytoplankton	Aquatic Plants
Kratchkowsky Lake (reference) <sup>1</sup>	6.22E-04	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03
Whitefish Lake North	6.20E-04	0.12	0.80	0.70	<b>1.49</b>	0.07	0.03	0.06	0.34	0.30	0.63	0.04	0.04
Whitefish Lake Middle	8.22E-04	0.16	<b>1.06</b>	0.93	<b>1.97</b>	0.09	0.04	0.08	0.46	0.40	0.84	0.05	0.05
Whitefish Lake South	8.17E-04	0.16	<b>1.05</b>	0.92	<b>1.96</b>	0.09	0.04	0.08	0.45	0.40	0.83	0.05	0.05
McGowan Lake	7.50E-04	0.14	0.97	0.85	<b>1.80</b>	0.08	0.04	0.07	0.42	0.37	0.76	0.04	0.05
Icelander River	7.49E-04	0.14	0.97	0.84	<b>1.80</b>	0.08	0.04	0.07	0.42	0.37	0.76	0.04	0.05
Russell Lake Inlet	7.17E-04	0.14	0.92	0.81	<b>1.72</b>	0.08	0.03	0.14	0.92	0.81	0.73	0.08	0.03

Note:

Bold and shaded value indicates hazard quotient greater than 1.

<sup>1</sup> Kratchkowsky Lake is a reference lake located upstream of the effluent discharge point, and as such, the site operation conditions were the same as baseline conditions.



In the Aquatic Environment section of the EIS (Section 8), the effects assessment is completed for aquatic VCs. To address the CNSC's concerns and to recognize the Cu FEQG in consideration of hardness of 9 mg/L, pH of 7, and DOC of 2.24 the BLM is 0.0005 mg/L and the following updates have been made:

- Section 8.2 Water Quality – long-term copper guideline presented is FEQG 0.0002 mg/L under background conditions in the nearfield model and 0.0005 mg/L under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 in regional surface water quality results and discussion.
- Section 8.3 Fish and Fish Habitat – with the inclusion of Cu FEQG under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 and some exceedances of this guideline in water quality section, the assessment for benthic invertebrates recognizes this slight increased risk by updating the magnitude for the characteristics ratings in relation to water quality from low to moderate.
- Section 8.5 Fish Health - with the inclusion of Cu FEQG under expected conditions of hardness 9 mg/L, pH of 7, and DOC of 2.24 and some exceedances of this guideline in water quality section, the assessment for fish health recognizes this slight increased risk by updating the magnitude for the characteristics ratings in relation to water quality from low to moderate.

Overall, we have updated Section 8 to recognize that while some additional risk to sensitive receptors is possible in consideration of the Cu FEQG without hardness mediation, the overall conclusions are unchanged. The residual effects of the Project are not expected to result in a change to the viability and persistence of aquatic VCs and associated KIs and were, therefore, predicted to be not significant.

The ERA was conservative in a number of ways in relation to copper, including:

- baseline concentrations of copper in water are predominantly below the detection limit (<0.0002 mg/L), indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The IMPACT model predicts how constituents travel through the environment and concentrations of constituents change as a result of interactions with natural flows and lake sediments. The Kds applied in the model have largely over predicted the baseline sediment copper concentrations throughout the lakes demonstrating that the model and model inputs are conservative.
- in the EIS, copper concentrations in effluent represented an upper bound; Denison is confident the actual effluent quality will be within the range of what was assessed and specifically, lower than what was used in the EIS, and the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ.

Monitoring programs will be implemented to assess the environmental performance of the Project relative to the predictive assessment that has been completed in support of the EA process. Such monitoring is needed since there is always some level of uncertainty associated with EA predictions. Effluent, water, and sediment sampling will be completed to verify the accuracy of the effects and effectiveness of proposed mitigation measures. Copper is included in planned monitoring as it is a deleterious substance under MDMER and must be monitored in effluent per MDMER Schedule 4 and is included in trace metal analysis for water and sediment samples. As such, there are no changes needed to the monitoring proposed in the EIS.

As part of commitment 8-48, Denison is collecting baseline water quality data which includes a lower detection limit for metals including copper. Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data. The following, recent information is provided as background context for the CNSC's review of this IR response:

- Initial 2024 results in Whitefish Lake show that copper is typically less than the new, lower detection limit of 0.00007 mg/L.
- We also note that information provided by Denison to the CNSC (November 1, 2024 Nagel to Gorzkowski) shows that copper in effluent is expected to be 0.0042 mg/L which is 5 times lower than the copper concentration in effluent used in the EIS (0.022 mg/L).

5. A new commitment (8-53) has been added to commitment register version 4 as shown here in track changes:



ID (EIS Section-chronological number)	VC/KI (as applicable; related to mitigations)	Last Updated (register version)	Details of Commitment	EIS Section or IR/TRC	Project Phase	Commitment Tracker Method	Scope of Commitment
8-53	Water Quality	4	Denison will assess and minimize copper concentrations in effluent through the BATEA assessment during licensing	IR-114 (Nov 2024)	Prior to Operation	EMS: EA Follow-up	Regulatory Requirement

November 22, 2024

Jessica Way  
Environmental Review Specialist  
Canadian Nuclear Safety Commission  
Via email: [Jessica.way@cnsccsn.gc.ca](mailto:Jessica.way@cnsccsn.gc.ca)

**Re: Submission of the Final Environmental Impact Statement for the Denison Mines Corp Wheeler River Uranium Mine under the *Canadian Environmental Assessment Act, 2012***

Dear Jessica Way:

As you are aware, the environmental assessment for the Denison Mines Corp (Denison) Wheeler River Uranium Project (the Project) was initiated in 2019, with submission of the draft environmental impact statement in October 2022.

On November 21, 2024, the Canadian Nuclear Safety Commission (CNSC) provided notice that Denison had resolved all information requests from the Federal-Indigenous Review Team, concluding the technical review for the Project under the *Canadian Environmental Assessment Act, 2012*. The notice allows Denison to submit the final environmental impact statement (EIS) for CNSC review and acceptance.

Denison is pleased to provide the final EIS to CNSC, which is enclosed with this letter. Denison confirms that all requested revisions and updates to the EIS resulting from the technical review were completed in a comprehensive and detail-oriented manner.

Along with the final EIS, the following files are included for CNSC review and acceptance:

1. Commitments Register Version 4,
2. Indigenous Engagement Report (updated to October 31, 2024), and
3. Public Comments Table.

Should you have further questions about this, please do not hesitate to contact me at [bengland@denisonmines.com](mailto:bengland@denisonmines.com).

Sincerely,



Brianne England  
Regulatory Manager

Cc: David Cates, Janna Switzer, Carolanne Inglis-McQuay (Denison)  
Nana Kwamena, Rain Noakes, Ryan Froess (CNSC)  
Candace Piper, Jeff Dereniwski (Saskatchewan Ministry of Environment)



December 24, 2024

Brianne England  
Regulatory Manager  
Denison Mines Corp.  
[bengland@denisonmines.com](mailto:bengland@denisonmines.com)

**Subject: Reflecting the CNSC staff's stance on CNSC responsibilities under CEEA 2012 and the Species at Risk Act**

Dear Ms. England,

This letter is to provide additional rationale and context for Canadian Nuclear Safety Commission's (CNSC) position on the need for Denison to meet the Government of Canada's [Amended Recovery Strategy for Woodland Caribou](#) (*Rangifer tarandus caribou*), Boreal Population, in Canada (the Strategy) for the purposes of the ongoing Environmental Assessment (EA) for the proposed Wheeler River project (Project).

There are 3 Information Requests (IRs) from the technical review by the Federal Indigenous Review Team that relate to meeting the federal recovery strategy for Woodland caribou, including IR-149, 149-R1A and IR-157 [1-2]. For the purposes of the EIS technical review, these IRs have been accepted, with the caveat that CNSC will recommend an EA condition to the Commission.

As responsible authority for EAs under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012) for this Project, the CNSC is responsible for ensuring that the requirements of the [Species at Risk Act](#) (SARA) are met. This includes applicable recovery strategies and action plans for species at risk (s.79(1) and (2) SARA), like the Amended Recovery Strategy for the Woodland Caribou, Boreal Population, in Canada.

CNSC and Environment and Climate Change Canada (ECCC) will jointly be recommending to the Commission an EA condition requiring alignment with the federal Strategy. The EA condition will be included in CNSC's Environmental Assessment Report and provided to the Commission for their consideration.

The remainder of this letter outlines the regulatory and legal basis for recommending an EA condition to meet the federal strategy for Woodland caribou.



## Shared jurisdiction over the environment

Other than fishing, issues pertaining to the environment are not specifically enumerated under the powers between federal and provincial governments as set out in sections 91 and 92 of the *Constitution Act, 1867* respectively. The environment is, therefore, a diffuse area which may be addressed under various federal and provincial legislative powers. There is, consequently, shared responsibility over the environment. With respect to the Project, caribou are not physically restricted to provincial or territorial boundaries. As a result, there are concerted, collaborative efforts to develop conservation and recovery measures for their protection. Therefore, the provincial and federal requirements for woodland caribou are not in conflict; both can be met by Denison for its Project.

## Regulatory requirements of the CNSC as responsible authority

Under subsection 79(1), SARA confers an obligation on the ‘person’ (Responsible Authority) to notify the competent minister or ministers of the project if the project is likely to affect a listed wildlife species or its critical habitat. The SARA notification requirement covers all species listed in Schedule 1 of SARA, regardless of whether they are found on lands managed by the federal, provincial or territorial governments. Under CEAA 2012, the person who is required to ensure that an EA is conducted is the Responsible Authority. Thus, in the case of projects where the CNSC is the regulator, the onus is on the CNSC, as the Responsible Authority, to comply with section 79 of SARA (see also section 181 (1) [\*Impact Assessment Act\*](#)).

Identifying the adverse effects of a project on a listed wildlife species and its critical habitat is a requirement under subsection 79(2) of SARA. This is reinforced by the requirement of paragraph 19(1)(a) of CEAA 2012 for every EA to consider the “environmental effects of the designated project”. Under subsection 79(2), SARA confers obligations on a ‘person’ (Responsible Authority) “to identify adverse effects of the project on a listed wildlife species and its critical habitat, and, if the project is carried out, to ensure measures are taken to avoid or lessen those effects and to monitor them. These measures **must be taken in a way that is consistent with any applicable recovery strategy and action plans**” (emphasis added); notably, this includes the Amended Recovery Strategy for the Woodland Caribou, Boreal Population, in Canada. These obligations are in addition to the requirements set out in CEAA 2012 for an assessment of the environmental effects of the designated project.

Additionally, permits issued by the CNSC are subject to s.77 of SARA which states:

**77** (1) Despite any other Act of Parliament, any person or body, other than a competent minister, authorized under any Act of Parliament, other than this Act, to issue or approve a licence, a permit or any other authorization that authorizes an activity that may result in the destruction of any part of the critical habitat of a listed wildlife species may enter into, issue, approve or make the authorization only if the person or body has consulted with the competent minister, has considered the impact on the species’ critical habitat and is of the opinion that

(a) all reasonable alternatives to the activity that would reduce the impact on the species’ critical habitat have been considered and the best solution has been adopted; and

(b) all feasible measures will be taken to minimize the impact of the activity on the species’ critical habitat.

Under paragraph 19(1)(d) of CEAA 2012, the Responsible Authority is required to identify “mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effect of the designated project”. In addition, subsection 79(2) of SARA establishes a requirement to avoid or lessen all adverse effects of a project on listed (i.e., scheduled) wildlife species and their critical habitat, regardless of the significance of those effects.

Subsection 79(2) of SARA also requires monitoring of the actual adverse effects of a project once it is carried out. Subsection 79(2) requires a Responsible Authority to ensure that measures are taken to monitor the actual adverse effects on the listed wildlife species or its critical habitat. This implies a need to understand the actual on-the-ground effects once a project is implemented. This may involve verifying the accuracy of the predictions and determining the effectiveness of the mitigation measures; however, this requirement is independent of the significance of the predicted effects, the technology involved in the mitigation measures, or any other factors. Subsection 79(2) of SARA also requires that such measures are consistent with any applicable recovery strategy or action plan.

### **ECCC as a specialist in federal assessments on matters concerning the protection of the environment**

The proposed Wheeler River Project is a designated project (*Regulations Designating Physical Activities*, SOR/2012-147) subject to a federal EA under CEAA 2012, for which the CNSC is the responsible authority (as defined by section 15(a) of CEAA 2012). As defined by section 2(1) and in accordance with section 20 of CEAA 2012, ECCC is a federal authority, serving the interest of the Crown to provide specialist or expert information or knowledge with respect to the EA of the Project; ECCC must provide the CNSC as the responsible authority with advice on matters concerning the protection of the environment. Beyond the statutory requirement, the cooperation is also set out in part II, subsection 3(b) of the [Memorandum of Understanding between the CNSC and EC \(signed in June 2012\)](#). With respect to species at risk, including boreal woodland caribou, per section 79 of SARA, ECCC provides expert advice and guidance to assist the CNSC in meeting its obligations under SARA as further outlined below. CNSC relies on its federal counterpart's advice.

### **Federal-Provincial Species at Risk Agreements**

The CNSC understands from ECCC and the province of Saskatchewan that they have been working to collaborate on species at risk, including caribou, through an Agreement. Specifically, in 2007 ECCC and the Province entered into a Agreement under [section 10 of the Species at Risk Act](#). The CNSC notes that section 3.4 of the Agreement states: “[it] does not create any new legal powers or duties nor does it alter the powers and duties established by the SARA, the Saskatchewan Wildlife Act, or any other federal or provincial legislation”.

The Canada-Saskatchewan Agreement on Species at Risk section 10 Agreement expired in 2017 (*cf s. 19.3 of the Agreement*). The CNSC understands that although the Agreement was not renewed, ECCC and the Province continue their working practice, keeping with the intent of the lapsed Agreement. The CNSC as a responsible authority under the SARA and its obligations are unchanged by the lapsed Agreement.

The CNSC has also been informed that ECCC and the Province have a s.11 SARA agreement for boreal woodland caribou, which has been extended to March 31, 2025 and that negotiations are underway for a renewed 5-year term.

### **Consideration of the precautionary principle and NSCA objects**

The CNSC also notes that the relevance and application of the precautionary principle. To the extent that the Project may cause harm, actions that may plausibly have potential for major or irreversible negative consequences to the environment should be mitigated, even if the extent of the consequences are not conclusively known. The CNSC also has as its statutory objects the obligation to regulate in order to prevent unreasonable risk to the environment, per section 9(a)(i) of the [Nuclear Safety Control Act](#).

### **Conclusions and Next Steps**

As responsible authority for CEAA 2012 EA relative to this Project, the CNSC is responsible for ensuring that the requirements of SARA are met, including parts that apply to recovery strategies and action plans for species at risk. An EA condition that reflects this will be included in CNSC's EA Report and provided to the Commission. Denison's plan for caribou offsetting will be required to align with the Amended Recovery Strategy for the Woodland Caribou, Boreal Population and SARA, in order to fulfil the EA condition. A draft EA condition will be shared with Denison prior to inclusion in the EA report.

Once Denison has shared a more detailed version of the caribou offsetting plan that is currently under development, CNSC staff will work with ECCC to provide additional guidance on whether or not the plan needs to be modified to meet the federal requirements. It is recommended that Denison consider the comments that have been provided through the EIS technical review to date, in order to avoid having to rework this approach later in the process.

CNSC and ECCC staff are available and willing to meet with Denison to discuss the path forward and to clarify expectations, as it relates to this requirement and the proposed EA condition.

Should you have any questions, please do not hesitate to contact me, directly by phone at 343-540-6213 or by email at [Jessica.Way@cnsccsn.gc.ca](mailto:Jessica.Way@cnsccsn.gc.ca).

Sincerely,

-Original signed by-

Jessica Way  
Environmental Review Officer  
Environmental Review Division

**c.c.:** CNSC: N. Kwamena, P. Burton, A. Levine, N. Frigault, S. Chari, R. Noakes, K. Gorzkowski, R. Froess  
Denison: K. Himbeault, J. Switzer, C. Inglis-McQuay, R. Nagel  
ECCC: J. Small, J. Crocker, V. Charlwood

**References:**

- [1] Letter, J. Way (CNSC) to B. England (Denison), *Outcome of the Federal-Indigenous Review Team technical review of the October 18, 2024 Responses to Information Requests for the proposed Wheeler River Project*, November 20, 2024 ([e-Doc 7410519](#))
- [2] Annex 6, Federal and Indigenous Review Team, *Wheeler River Project – Information Requests – Submission #4*, November 20, 2024 (e-doc [7389398](#))

Preparing an Offsetting Plan for Woodland Caribou, Boreal Population

In preparing an offsetting plan, the Proponent must use scientifically defensible methods and techniques and provide a rationale for the methods and techniques chosen.

Required information*	Supplemental CWS guidance for offsetting residual impacts to Boreal Caribou for the Wheeler River Project
Section 1: Description of the residual impacts of the activity to the species at risk, its residences, its habitat and/or critical habitat	
<ul style="list-style-type: none"><li>Describe the residual impacts that are likely to result from the activity, including the extent, duration and magnitude of the impacts on:<ul style="list-style-type: none"><li>The number of individuals killed, harmed, harassed, captured or taken; and</li><li>The area of habitat(s), biophysical attributes and location of critical habitat affected (e.g. destroyed, permanently altered, disrupted).</li></ul></li></ul>	<ul style="list-style-type: none"><li>Include details on the loss of Critical Habitat, including biophysical features in the project area, amount of direct and indirect habitat loss. Note that disturbed areas with biophysical features are considered critical habitat based on the definitions in the <a href="#">amended Recovery Strategy (aRS)</a>.</li><li>Include mapping at appropriate scales (i.e. regional and local-scale mapping) and summary statistics (e.g. amount of direct and indirect disturbance) of biophysical features and habitat potential, as well as the baseline information, including Indigenous knowledge, on caribou.</li></ul>
Section 2: Offset description	
<ul style="list-style-type: none"><li>Describe the proposed offset and explain how it will counterbalance the residual impacts of the activity.</li><li>Identify the location of the offset, including a map (e.g. scale of 1:50 000) and geographic coordinates.</li><li>Describe both the impact and offset sites, including existing land uses, present conditions, and relationship to the species, its residences and habitat and/or critical habitat.</li><li>Provide all timelines associated with the offsetting plan, including:<ul style="list-style-type: none"><li>When the impact of the activity will occur;</li><li>When the benefits of the offset measures are expected to be realized; and</li><li>The timelines for implementation of each element of the plan.</li></ul></li><li>Identify the parties, roles and responsibilities for implementing each aspect of the offset (including the party responsible for monitoring – see Section 6, below).</li></ul>	<b>Offset Location</b> <ul style="list-style-type: none"><li>Consider an offset <b>location in proximity to the Project</b> that has comparable ecosystem values for caribou, such as species composition, biophysical attributes, and habitat structure, as the habitat impacted by the Project.</li><li>The offset location should be selected to maximize benefits to caribou and should consider the needs of Indigenous communities local to the project, who are impacted by the Project.</li><li>The offset location should provide caribou habitat (some combination of undisturbed habitat, biophysical attributes, and/or connectivity) once restoration is complete.</li><li>The plan should include evidence-based support for the selected location outlining how it maximizes benefits for caribou.</li><li>The plan should describe how the Proponent will coordinate with other off-setting activities to maximize effectiveness. The location should be selected to maximize benefits to caribou habitat such as where several offsetting or</li></ul>

<ul style="list-style-type: none"><li>Describe the measures to avoid or mitigate any adverse impacts from the implementation of the offset itself. This includes the identification of the possible adverse impacts from the offset and analysis of how proposed measures will avoid or mitigate those adverse impacts, as well as the identification of the possible adverse impacts on other species, habitat or ecological processes.</li></ul>	<p>restoration activities are being conducted in a coordinated manner (ideally provincially coordinated).</p> <p><b>Offset Amount</b></p> <ul style="list-style-type: none"><li>The plan should result in No Net Loss to caribou habitat, including both undisturbed habitat and biophysical habitat.</li><li>The total area required to be offset does not include restoration of the Project area. To be clear, onsite restoration, either progressive or during the decommissioning stage is not an offsetting measure.</li><li>Offsetting requirement for this project, based on the calculated area of critical habitat destruction, should have a ratio between 4:1 and 17:1 to be consistent with the recovery objectives. The final offset amount will be based on the final amount of critical habitat destruction using the aRS methodology. The total destruction of critical habitat to which the offset ratio will be applied for the calculation for the total offset amount is: ((Project footprint + 500m buffer) - (overlapping area(s) already considered disturbed habitat) + (area(s) that contains the biophysical attributes required by boreal woodland caribou to carry out life processes)).</li></ul> <p>There are some key strategies that can help justify the reduction in the offset amounts required to achieve a no net loss outcome.</p> <ul style="list-style-type: none"><li>Minimizing time lags between impact occurrence and offset maturity is crucial for reducing required offset amounts, which can be achieved through implementing advanced offsets before impacts occur or by accelerating restoration outcomes to more quickly deliver functional ecological gains.</li><li>Enhancing offset quality effectively reduces multiplier requirements by targeting high ecological equivalence between impacted and offset sites, selecting locations with superior connectivity and landscape context, utilizing proven restoration techniques, and implementing offsets in areas with greater conservation priority or value.</li><li>Reducing long-term risks necessitates securing permanent legal protection for offset sites, implementing comprehensive monitoring programs with clear intervention triggers, and incorporating adaptive management frameworks</li></ul>
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	that allow for evidence-based adjustments to ensure continued ecological performance over time.
	<b>Offset habitat types</b> <ul style="list-style-type: none"><li>• The plan should undertake an ‘equivalency’ approach to offsetting such that the adverse effects of the Project are compensated by protecting, enhancing, or restoring equivalent ecological function at the offsetting site. The biophysical attributes described for SK1 in Appendix H of the aRS should be used as a guide to determine equivalency of habitat types for offsetting locations in SK1.</li><li>• The plan should focus on restoration of anthropogenically-disturbed caribou habitat (e.g. linear features and/or forest harvest operations) that will provide biophysical attributes when restored.</li><li>• If no locations are available in SK1 to meet the ‘equivalency’ approach, then CWS will consider an offsetting location in SK2 that treats anthropogenically-disturbed areas with potential to provide undisturbed habitat or biophysical attributes as described for SK2 in Appendix H of the aRS. If this approach is agreed to provide the best outcome for caribou, it should be noted that the offset amount may need to be adjusted to account for offsetting in a range that has not been impacted by the Project.</li></ul>
	<b>Offset Methods for Restoration</b> <ul style="list-style-type: none"><li>• Include a description of the intended restoration methods. The description should include the rationale for the methods selected, their appropriateness for the targeted habitat type, and potential risks of failure. The plan should indicate if the restoration methods are previously tested and proven techniques and provide examples if available.</li><li>• Coordinate with other offsetting activities to maximize effectiveness.</li><li>• On-the-ground restoration activities should have an Operational Plan and a mitigation plan, that includes response to the presence of caribou in the restoration area, particularly during calving season.</li></ul>
	<b>Timing of Restoration</b> <ul style="list-style-type: none"><li>• The plan should include a clear description and timeline of the intended restoration actions and methods, including a schedule of activities and</li></ul>

	evidence-based rationale that supports the use of the proposed method(s) for the habitat type(s) being restored.
<b>Section 3: Offset ownership</b>	
<ul style="list-style-type: none"> <li>Identify who owns the offset and provide proof that the offset can be undertaken by the relevant parties.</li> <li>Confirm that all commitments vis à vis the offset will be transferred to any new owner or operator.</li> </ul>	<ul style="list-style-type: none"> <li>The plan should include information on ownership of the offset and any plans for provincially led protection of offset.</li> </ul>
<b>Section 4: Offset assessment</b>	
<ul style="list-style-type: none"> <li>Describe the projected future conditions at the impact and offset sites (use conservative estimates): <ul style="list-style-type: none"> <li>Without the offset; and</li> <li>With the offset.</li> </ul> </li> <li>Describe the timing of the short term and long-term benefits, in particular in relation to the timing of the adverse impacts of the activity. <ul style="list-style-type: none"> <li>Describe the short-term and long-term benefits of the offset, including how they: <ul style="list-style-type: none"> <li>Compare to the anticipated residual impacts of the activity (from Section 1);</li> <li>Compare to the duration of the adverse impacts of the activity; and</li> <li>Contribute to the survival and recovery of the species, including attainment of the population and distribution objectives for the species in question (where the Government has established those objectives).</li> </ul> </li> </ul> </li> <li>Explain how the benefits of the offset were determined. <ul style="list-style-type: none"> <li>Include a description of the extent to which the type of offset has been demonstrated to be effective, particularly in similar circumstances;</li> <li>Describe all relevant uncertainties.</li> </ul> </li> <li>Demonstrate that the offset is additional: <ul style="list-style-type: none"> <li>Describe how the offset will provide benefits to the species above what is already taking place or planned. This must include the description of the business-as-usual scenario.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Include a risk assessment of the offset not functioning as intended, and design features to reduce risk of offset failure.</li> </ul>

<ul style="list-style-type: none"><li>○ If applicable, describe any government funding received to help pay for the offset.</li></ul>	
<b>Section 5: Contingency measures</b>	
<ul style="list-style-type: none"><li>• Describe and characterize the risks that the offset will not function as intended, and the potential impacts, accounting for the risks of partial and complete failure.</li><li>• Describe the design features to prevent risks from occurring.</li><li>• Describe the contingency measures that will be put in place if the offset does not function as intended.</li></ul>	<ul style="list-style-type: none"><li>• Include contingency measures should the offset not be successful.</li></ul>
<ul style="list-style-type: none"><li>• Describe the monitoring measures that will be used to assess the effectiveness of the offset, including:<ul style="list-style-type: none"><li>○ The methodology and parameters to be used to measure the effectiveness of the offset;</li><li>○ The methodology and parameters to be used to identify performance failures and to trigger contingency measures;</li><li>○ Timelines (expected frequency of monitoring).</li></ul></li><li>• Describe responsibilities and timelines for verification of offset implementation by a third party (can be an independent organization or a group of stakeholders).</li><li>• Provide the timelines and method for reporting.</li></ul>	<ul style="list-style-type: none"><li>• Include a commitment to report on progress and the level of success observed at off-setting location. The plan should list the types of information that will be provided to demonstrate success, and the frequency of the reporting/monitoring.</li></ul>

\* The Required information column was modified from the Species At Risk Act Permitting Policy (2016)



# Wheeler River Project Bulletin

## PROJECT OVERVIEW

Denison Mines Corp. (Denison) is proposing to develop an *in situ* recovery uranium mining and processing plant [the Wheeler River Project](#) - in the Athabasca Basin in Saskatchewan, approximately 600 kilometres north of the City of Saskatoon, and 35km by road north of the Key Lake mill. The proposed project is located within Treaty 10 territory, the homeland of the Métis, and within the traditional territories of the Dene, Cree, and Métis peoples.

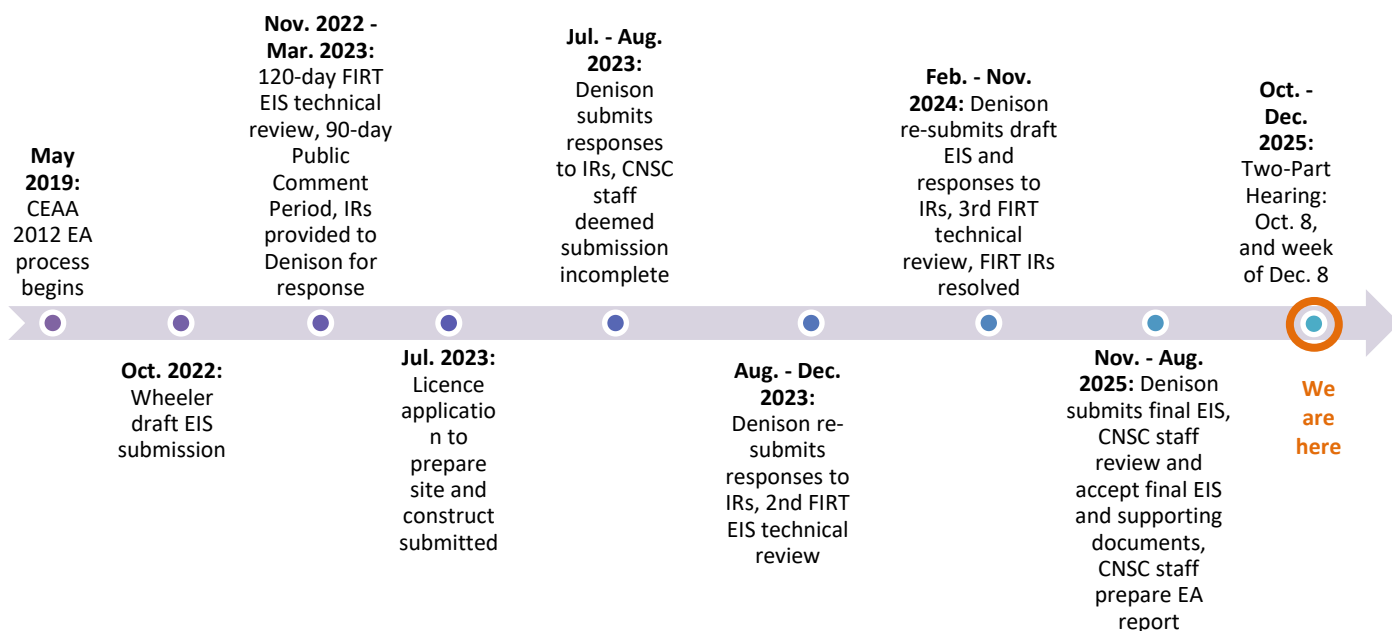
Since 2019, the proposal has been undergoing an [environmental assessment](#) (EA) as per the [Canadian Environmental Assessment Act, 2012](#) (CEAA, 2012). In July 2023, Denison submitted a licence application to prepare site and construct a mine and mill facility, which is currently before the Commission for their consideration. An EA decision is required before a licence can be issued. The project is also subject to a [provincial EA](#) as per the province of Saskatchewan's [Environmental Assessment Act](#).

## ENVIRONMENTAL ASSESSMENT REVIEW PROCESS

Denison submitted a draft environmental impact statement (EIS) in October 2022 and the federal and Indigenous review team (FIRT) completed a technical review of the draft EIS. On [March 20, 2022](#), CNSC staff requested that Denison submit responses to all [information requests \(IRs\) from the FIRT](#), along with a commitments report and an update on Indigenous engagement.

Since this original submission, the FIRT has reviewed multiple rounds of Denison's responses to IRs. On November 20, 2024, CNSC staff completed their review of Denison's responses to outstanding IR and deemed all IRs as accepted. On November 22, 2024, Denison submitted a Final EIS package including revised responses to the Consolidated Comments from Indigenous Nations and Communities and the Public on the Wheeler River Project. On December 24, 2024, CNSC staff completed their technical review of the final EIS package and deemed the final EIS acceptable.

## TIMELINE



## WHERE WE ARE NOW

On February 27, 2025, CNSC announced hearing dates for a public hearing on Denison's Wheeler River Project. To inform the Commission's decisions, CNSC staff have developed the CEAA 2012 [EA Report](#) summarizing the results of the EIS technical review and CNSC staff's recommendations to the Commission. The Commission Member Document is available online in 25-H9 [Volume 1](#), [Volume 2](#) and [Volume 3](#), which contains CNSC staff's review, assessment and recommendations regarding Denison's request for licence. This package includes the Indigenous Consultation Report, which details consultation and engagement activities conducted for the project and the CNSC's duty to consult as an agent of the crown. All hearing documentation can be found on the CNSC's website [here](#).

As part of the Commission's proceedings, decisions will be made on the EA, Denison's licensing application, and on whether the duty to consult with Indigenous Nations and communities has been met. These decisions will be made via a public Commission hearing, which will include opportunities for Indigenous Nations and communities, and public participation.

Part one of the two-part hearing took place on October 8, 2025, where staff from CNSC and Denison presented oral and written submissions, related to Denison's application. The second part of the hearing will take place the week of December 8, 2025, in person in Saskatoon where public intervenors will have an opportunity to intervene orally. The public hearing will be webcast live here:

<https://www.nuclearsafety.gc.ca/eng/the-commission/webcasts/>

During part two of the hearing, members of the public, Indigenous Nations and communities and any other parties are invited to present before the Commission. For those that will be intervening orally, PowerPoint presentations are due to the Commission Registry by November 24, 2025. For more information on the CNSC's intervention process, please visit the CNSC's [Notice of Public Hearing and Participant Funding](#) webpage.

## STAY INFORMED, STAY CONNECTED!

Subscribe to the updated [Canadian Impact Assessment Registry notifications service](#) to receive updates on the Wheeler River EA process, and any other EA or Impact Assessment Processes that you are interested in. When you subscribe to this notification service, you will receive a email when new content is posted on the Canadian Impact Assessment Registry for the projects you are following. Head over to [www.iaac-aeic.gc.ca](http://www.iaac-aeic.gc.ca) to sign up!



*Photo 1: Photo from CNSC's 2024 outreach trip to Pinehouse, Saskatchewan.*

### Wheeler River Project Bulletin

If you have any questions or suggestions on topics or issues that you would like to see covered, please do not hesitate to contact us:

Email : [WheelerRiver@cnsccsn.gc.ca](mailto:WheelerRiver@cnsccsn.gc.ca)

Project Page: <https://ceaa-acee.gc.ca/050/evaluations/proj/80178>

### Canadian Nuclear Safety Commission

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Website: [nuclearsafety.gc.ca](http://nuclearsafety.gc.ca)





## **Wheeler River Project**

Final Environmental  
Impact Statement

November 2024

*Powering*  
**PEOPLE, PARTNERSHIPS  
AND PASSION.**



# Wheeler River Project

## Final Environmental Impact Statement

### **Executive Summary**

November 2024



Denison Mines Corp.

345 4<sup>th</sup> Avenue South

Saskatoon, SK, S7K 1N3

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## Abbreviations, Acronyms and Units

Abbreviation / Acronym	Definition
AADT	Average annual daily traffic
ALARP	As low as reasonably practical
CEAA	Canadian Environmental Assessment Agency
CNSC	Canadian Nuclear Safety Commission
COPC	Constituent of potential concern
CSA	Canadian Standards Association
Denison	Denison Mines Corp.
DWWTP	Domestic wastewater treatment plant
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
ERFN	English River First Nation
GHG	Greenhouse gas
HRMP	Heritage Resources Management Plan
ILRU	Indigenous Land and Resource Use
IPCC	Intergovernmental Panel on Climate Change
IPP	Indigenous Peoples Policy
ISR	In situ recovery
IWWTP	Industrial wastewater treatment plant
KI	Key Indicators
LSA	Local Study Area
MLTC	Meadow Lake Tribal Council
MN-S	Métis Nation – Saskatchewan
MP	Measurable Parameters
NAD	Northern Administration District
NASA	National Aeronautics and Space Administration
NRC	Natural Resources Canada
OLRU	Other Land and Resource Use
PAGC	Prince Albert General Council
PCC	Prairie Climate Centre
PML	Patuanak Métis Local #82
Project	Wheeler River Project
RAP	Reconciliation Action Plan

Abbreviation / Acronym	Definition
RSA	Regional Study Area
SML	Sipishik Métis Local #37
TAADT	Truck average annual daily traffic
TSP	Total suspended particulate
UBS	Uranium bearing solution
VC	Valued Components
WTP	Water treatment plant
YNLR	Ya'thi Néné Lands and Resource Office

Units	Definition
%	percent
ha	hectares
km	kilometre
L/s	litres per second
m	metre
m <sup>3</sup>	cubic metres
mSv/yr	millisieverts per annum



## 1 Introduction

This Executive Summary is associated with the draft Environmental Impact Statement (EIS) for the Wheeler River Project (the Project) proposed by Denison Mines Corp. (Denison). Following the *Generic Guidelines for the Preparation of an Environmental Impact Statement Pursuant to the Canadian Environmental Assessment Act, 2012* (CNSC 2021a) and the provincial Terms of Reference for the Project (Denison 2019), this Executive Summary contains the following information:

- a high-level overview of the Project and Environment Assessment results (Section 2);
- a concise description of all key Project components and related activities (Section 3);
- a summary of the consultation conducted with Indigenous groups, the public, and government agencies (Section 4);
- an overview of the key environmental effects of the Project and proposed technically- and economically-feasible mitigation measures (Section 5);
- conclusions on the residual environmental effects of the Project after taking mitigation measures into account and the significance of those effects (Section 5); and
- sufficient details to support understanding of the Project, its potential environmental effects, mitigation measures, the significance of the residual effects and follow-up programs (Sections 3, 4, 5 and 6).

## 2 Project Overview

The Wheeler River Project (the Project) is Denison's proposed in situ recovery (ISR) uranium mine and processing plant:

- Location: northern Saskatchewan, Canada.
- Project components and activities: the central Project components are the ISR mine and the processing plant. Supporting Project components and activities include those needed for waste management, water management, distribution of electricity, and transportation, such as pads, ponds, buildings, roads, and an airstrip.
- Inputs: freshwater, chemicals (for mining, uranium processing, treating water), electricity, and fuel.
- Outputs: waste (organics, clean waste rock, special waste rock (drilling core), domestic waste, industrial waste, precipitates from the processing plant and water treatment, sewage), air emissions including greenhouse gas emissions (GHGs), noise, and treated effluent.
- Product:  $U_3O_8$  or yellowcake. The product Denison sells is ultimately used as fuel in nuclear power plants, supporting global efforts to reduce GHG emissions.

- Employment: Approximately 300 workers during Construction and 180 during Operation. The Project will be operated as a fly-in-fly-out operation.
- Project duration: Total of approximately 38 years, about 2 years for Construction, 15 years for Operation, 5 years for Decommissioning, and 15 years for Post-Decommissioning periods.

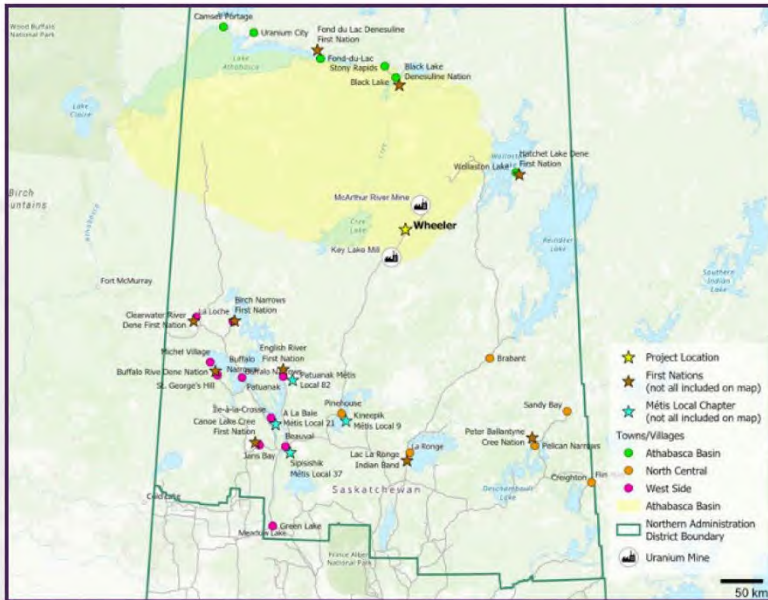
The environmental assessment (EA) outlined in this environmental impact statement (EIS) was transparent and conservative, following a standard, step-wise approach for evaluating Project effects including cumulative effects. In an effort to generate a conservative EA and provide operational flexibility, Denison developed an assessment basis for the EA which bound, or was higher than, the current understanding of the Project's engineering design basis. For example, the direct Project footprint based on engineering site plans is about 75 ha, but the EIS assumed the Project's area of disturbance was closer to 170 ha. Similarly, the annual production for current engineering design is 6 Mlbs  $U_3O_8$  per year over 10 years, but the EIS assumed production of 9 Mlbs  $U_3O_8$  per year over 15 years, with a peak production up to 12 Mlbs  $U_3O_8$  in a given year to allow for operational flexibility. This means that, for example, the EIS assessed inputs needed and outputs generated on an annual basis as being 50% more than expected.

Residual effects remaining after mitigation were largely linked to land clearing, increases in traffic, emissions to air, waste generation, and water management. Residual effects were evaluated for 32 Valued Components (VCs) and significance determined for receptor VCs. The evaluations and conclusions of the EIS are that the Project can be constructed, operated, and decommissioned while regional plant communities are stable and continue to function, regional fish and wildlife populations are viable and healthy, human health is protected, there is continued opportunity for land use activities, including exercising Indigenous rights, and there is continued social and economic viability of local economies. The EIS outlines mitigation measures, monitoring requirements, and commitments needed for Denison to have confidence that Project is operating as planned and that the actual effects resulting from Project Construction, Operation, and Decommissioning are at or below predicted effects.

Overall, the Project has the potential to achieve a superior standard of environmental sustainability when compared to conventional uranium mining operations. Owing, in large part, to the use of the ISR mining method, the Project has potentially fewer residual effects remaining after mitigation when compared to conventional open pit or underground mining methods and conventional milling activities.

Importantly, Denison has been proactively engaging with Indigenous communities and organizations, the general public, and regulatory agencies since 2016. The use of a collaborative approach to engagement and advancement of the Project is exemplified by the input these groups have provided to influence both project designs and the EA in various ways. Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous EA, licensing, and permitting process for a uranium mining facility in Canada.





## LOCATION

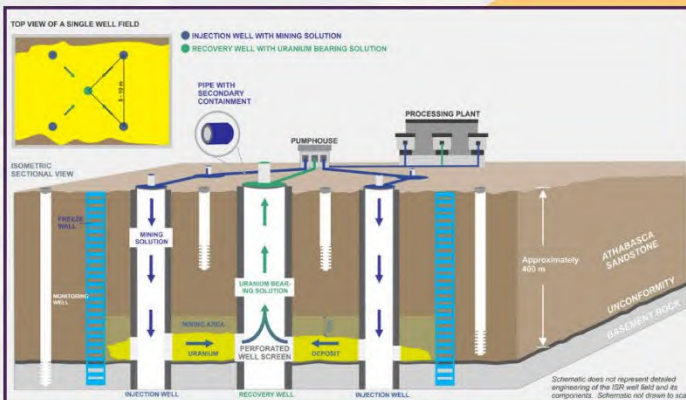
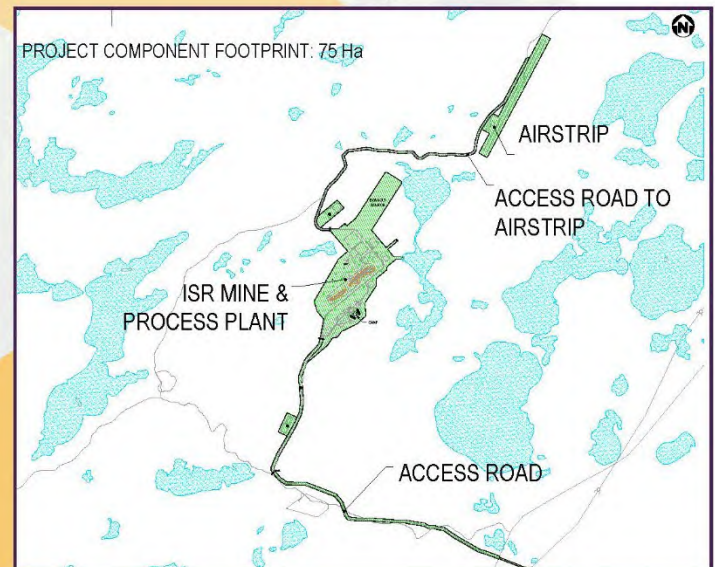
The Wheeler River Project is located in northern Saskatchewan in the Athabasca Basin.

## PROJECT FOOTPRINT

The main Project components are the in situ recovery mine and the processing plant.

## IN SITU RECOVERY

In situ recovery uses an acidic solution to leach uranium ores from the ground through a series of injection and recovery wells. The processing plant houses the tanks and equipment to process the uranium recovered from in situ recovery into yellowcake. Denison will sell the yellowcake to the market for use in nuclear power plants, supporting global efforts to reduce greenhouse gas emissions.



## VALUED COMPONENTS & PROJECT INTERACTIONS

Denison is assessing elements, called valued components, important to people or the environment, and the potential effects of the Project on these elements.



### 3 Project Setting

The Project is a proposed ISR uranium mine and processing plant located in the Athabasca Basin region of northern Saskatchewan, Canada (Figure 1).

More specifically, the Project site is located approximately 600 km north of Saskatoon and is found mid way between Cameco Corporation's Key Lake Operation and McArthur River Operation approximately 4 km west of Highway 914.

The Project is a joint venture between Denison (90%) and JCU (Canada) Exploration Company Ltd. (JCU) (10 %). Denison is also a 50% owner of JCU, which means that Denison has an effective 95% ownership interest in the Project. Denison is the operator of the Project and as such is the proponent in all regulatory matters.

The Project falls within the boundaries of Treaty 10, in the Nuhtsiye-kwi Benéne (Ancestral Lands) of English River First Nation (ERFN), in the traditional territory of the Kineepik Métis Local #9, in the homeland of the Métis, and within Nuhenéné, the traditional territory of the Athabasca Denesųliné. It is also located within the Northern Administration District (NAD) of Saskatchewan (Figure 1). The NAD of Saskatchewan includes approximately 250,000 square kilometers (about 44% of Saskatchewan's land area), and is home to 36,000 people, or approximately 3.2% of the Province's population (Statistics Canada 2022).



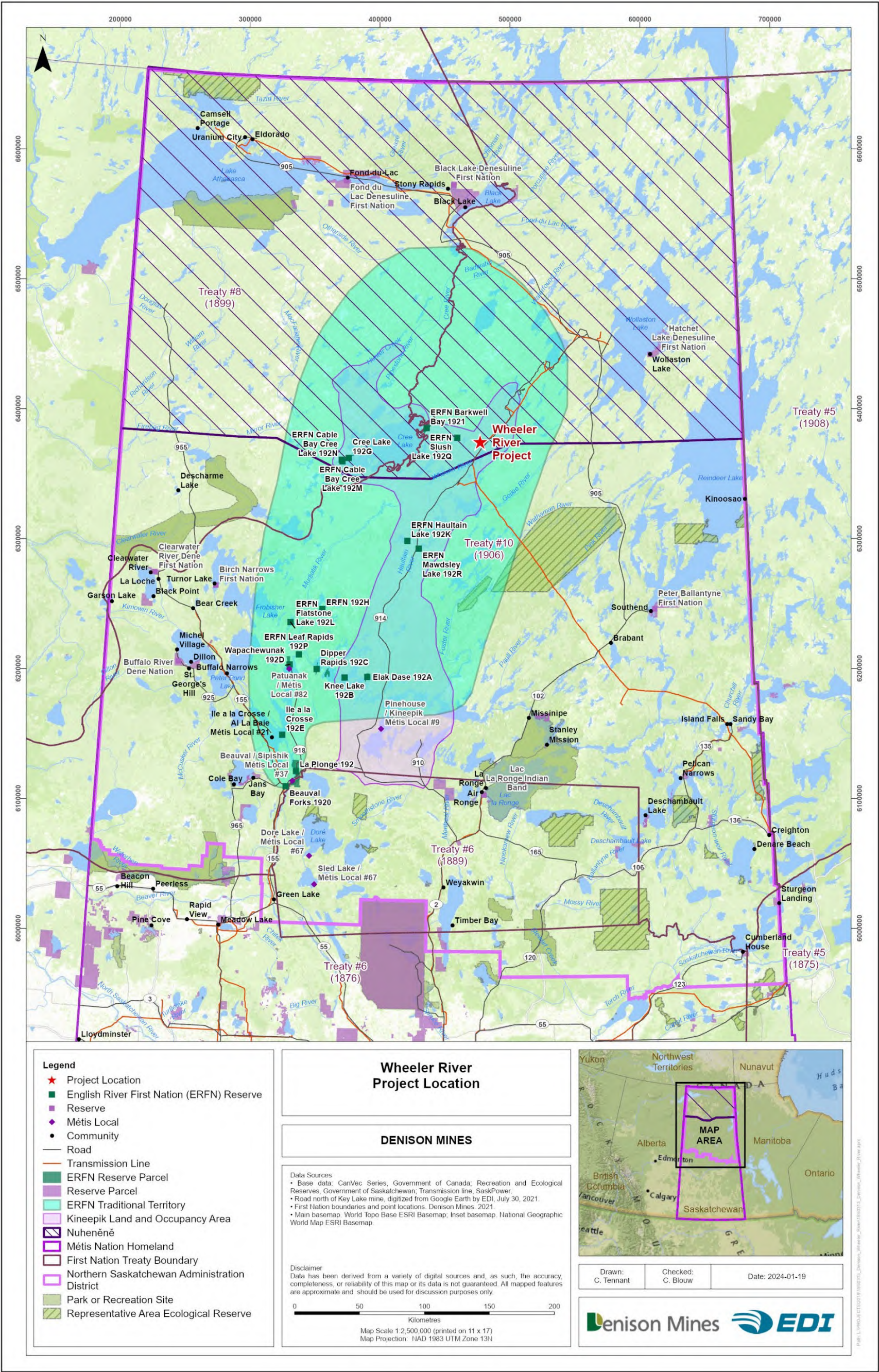


Figure 1: Wheeler River Project Location



No populated communities are located in the immediate proximity of the Project. Travelling by existing roads, the closest populated community to the Project is approximately 260 km away. Calculated using a straight line, the closest communities are approximately 150 km from the site. Recreational, industrial, and traditional resource user leases occur nearby. The closest recreational lease is located approximately 2.5 km away. The closest traditional resource user lease is approximately 12 km away.

### 3.1 Purpose of and Need for the Project

A recent report by the United Nations Intergovernmental Panel on Climate Change examined 89 climate change mitigation scenarios and concluded that achieving the 1.5°C target from the Paris Agreement will require an immediate reduction in global GHG emissions and an increase in nuclear power generation of approximately 2.5 times by 2050 (World Nuclear Association 2021). Without a significant contribution from nuclear energy, as the global power mix shifts to respond to climate change initiatives, the cost of achieving meaningful decarbonisation targets will steadily rise, or targets will simply go unmet. Nuclear energy is critical to global climate change objectives because of its unique combination of low carbon emissions, large scale, and high level of reliability.

Nuclear power is safe and reliable. The Canadian nuclear industry is one of the most closely monitored industries in the world. Major nuclear facilities are the most protected critical infrastructure in Canada. Not once has a nuclear incident caused a death in Canada and very few other industries have such a strong health and safety record. Canada's nuclear safety record is unmatched by any other industry in the world (Canadian Nuclear Association 2022). It is one of the few reliable energy sources that can reduce greenhouse gas emissions. The world's current use of nuclear power already reduces emissions by about 2.5 billion tonnes of carbon dioxide each year by avoiding fossil fuels (World Nuclear Association 2022a).

Mining of uranium is the first step in the nuclear fuel cycle, which ultimately concludes with the fabrication of nuclear fuel assemblies provided to nuclear power plants for the purpose of generating low-carbon, reliable, and low-cost baseload electricity.

Presently, the annual global uranium supply is less than annual global demand, and limited inventories have been accessed to make up the supply shortfall. In the upcoming decade, many new uranium mining projects will be required to meet the needs of existing global nuclear power plants, without considering additional demands from new plants (both conventional and emerging small modular reactor designs) and life extension of existing plants (World Nuclear Association 2022b).

The purpose of the Project is to construct and operate an ISR uranium mine and processing plant to provide uranium supply necessary to meet existing and increasing global demand for nuclear power generation. Facilitating global growth in nuclear through environmentally sustainable



uranium exports positions Canada and the Province of Saskatchewan to not only help Canada meet its climate change objectives, but to support numerous nations around the world to do the same. Canada has a unique endowment of uranium resources in northern Saskatchewan, and these resources are needed to help avert a global climate crisis.

The ISR mining method proposed for the Project has the potential to improve overall economics for smaller scale uranium deposits while minimizing disturbance to the land and resources in the area.

ISR mining uses a water-based solution, fortified with mining reagents, to dissolve naturally occurring uranium from within a host rock, while the host rock remains in place (in situ) below surface. This mining method allows for the removal the uranium mineralization without physically removing the host rock for processing on surface. Accordingly, the Project involves no underground or open pit mine workings, no heavy equipment is needed to excavate rocks, and people do not work underground. Taken together, ISR mining is an environmentally sustainable way to mine uranium, as minimal surface disturbance occurs, minimal waste rock is generated, and no long term storage of conventional tailings is required.

Denison recognizes the thriving culture and deep-rooted traditions of northern Saskatchewan communities and their aspirations of achieving economic growth and prosperity. Denison strives to achieve the development of the Project through positive partnerships with Communities of Interest, integrating information from Indigenous and non-Indigenous Interested Parties, and maintaining high standards for environmental protection and worker safety.

### 3.2 Project Proponent

Denison is a publicly traded uranium development and exploration company with interests focused in the Athabasca Basin region of northern Saskatchewan, Canada. The company trades on the Toronto Stock Exchange and NYSE American Exchange, and is headquartered in Toronto, Ontario, with offices in Saskatoon, Saskatchewan, and Elliot Lake, Ontario.

Denison (and its predecessor companies) has over 50 years of uranium mining experience in Ontario, Saskatchewan, and the United States. Today, the company is part owner (22.5%) of the McClean Lake Joint Venture, which includes the McClean Lake Operation in northern Saskatchewan. In addition, Denison provides expert mine decommissioning and care and maintenance services through its Closed Mines group, which is responsible for Denison's closed uranium mining operations in the Elliot Lake region of northern Ontario.

Denison currently holds licences with the Canadian Nuclear Safety Commission (CNSC) for its decommissioned uranium mine sites in the Elliot Lake region, and for the areas within the Wheeler River Property as part of feasibility field testing (Federal Nuclear Substance and Radiation Device Licence). Additionally, Denison holds a permit to Operate a Pollutant Control Facility with the Province of Saskatchewan in connection with the feasibility field testing at Wheeler River.

Denison's performance under its licences and permits exemplifies the company's commitment to the operation of its facilities in a manner that prioritizes safety, environmental protection, and sustainable development.

### 3.3 Regulatory Framework for the Environmental Impact Statement

#### 3.3.1 Federal and Provincial Cooperation and Legislation

The Federal and Provincial Environmental Assessment (EA) processes for the Project will be conducted in parallel. The Environmental Assessment and Stewardship Branch of the Saskatchewan Ministry of Environment (SK MOE) and the CNSC will cooperate in conducting a coordinated provincial-federal EA that will follow the spirit of the Canada-Saskatchewan Agreement on Environmental Assessment Cooperation (2005; Government of Canada 2016) to the extent possible. The agreement allows for cooperation in the assessment of projects that require regulation by both levels of government. The cooperation agreement creates opportunity for a single EIS that meets the requirements of both levels of government, such that each level of government can make an independent decision on the approval of the Environmental Impact Statement.

Denison has prepared the draft EIS to meet the requirements outlined in *The Environmental Assessment Act* (Government of Saskatchewan 2018) and has submitted the draft EIS to the SK MOE's Environmental Assessment and Stewardship Branch. The Project will require issuance of a ministerial approval under Section 15 of the *Environmental Assessment Act* as well as a permit to construction and operate a pollutant control facility before construction can begin. Denison will apply for the Provincial construction and operating permit at a later date.

The proposed Project will include the Construction, Operation, and Decommissioning of a uranium mine, processing plant, and supporting facilities on a site that is not within the boundaries of an existing licensed uranium mine or mill. As such, the Project is a designated project as set out in Section 31 of the Regulations Designating Physical Activities (Government of Canada 2014) and is, therefore, subject to an EA. The CNSC is the federal authority responsible for the EA and the EIS for the Project has been prepared to comply with the federal requirements of the *Canadian Environmental Assessment Act, 2012* (Government of Canada 2019).

### 3.3.2 Additional Information Related to the Regulatory Framework and Licensing/Permitting

In addition to regulatory requirements from federal and provincial Acts and regulations, Denison has applied several other guidelines, policies, standards, and codes to the Project while completing the EIS. These include, but are not limited to:

- technical guidance from the Impact Assessment Agency of Canada (formerly the Canadian Environmental Assessment Agency; e.g., CEAA 2015a, b, c);
- various CNSC regulatory documents (e.g., REGDOC-2.9.1 [CNSC 2020]; REGDOC-2.11-2 [CNSC 2021c]; REGDOC-3.1.2 [CNSC 2018]; REGDOC-3.2.2 [CNSC 2019]);
- various standards from the Canadian Standards Association (e.g., N288.4-10 [CSA 2010]; N288.5-11 [CSA 2011]; N288.6-12 [CSA 2012a]; N286-12 [CSA 2012b]; N288.7-15 [CSA 2015]; N294-19 [CSA 2019]; and
- guidance from the Government of Saskatchewan (e.g., Northern Mine Decommissioning and Reclamation Guidelines [Government of Saskatchewan 2008]; Saskatchewan Environmental Code and attendant standards [Government of Saskatchewan 2022]).

## 3.4 Project Description

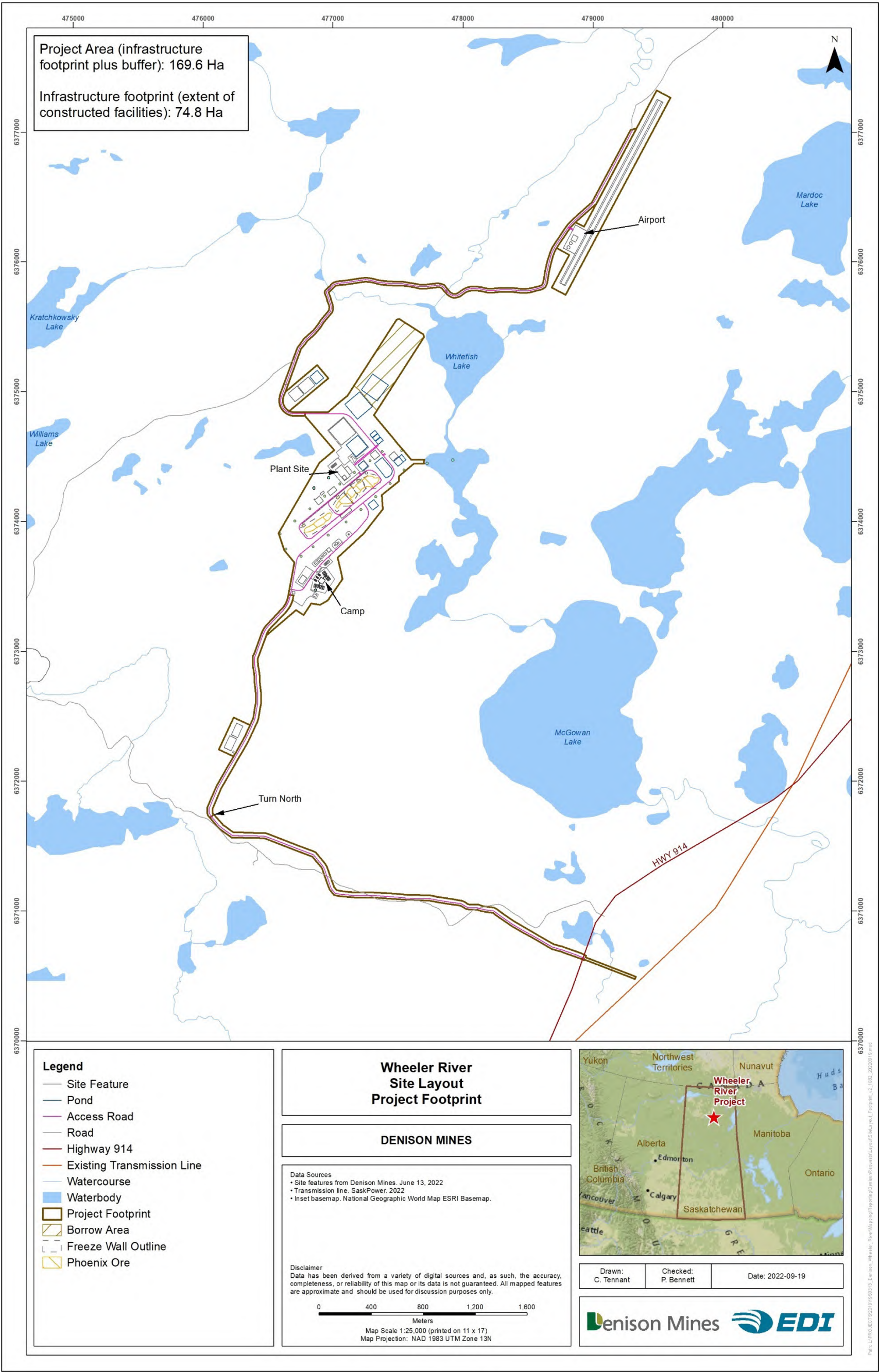
### 3.4.1 Project Area

The Project is anticipated to have a total footprint of 75 ha. By applying a buffer around these components, the maximum footprint of the Project was estimated to be 170 ha (Figure 2). This spatial area with the buffer is referred to as the Project Area in the biophysical and human environment assessments of the EIS.

### 3.4.2 Project Components

The proposed site layout for the Project is provided in Figure 3. Various components associated with the Project, which are described in subsequent subsections, include:

- mining;
- processing;
- water management;
- waste management;
- access and transportation;
- power and heating; and
- support facilities.





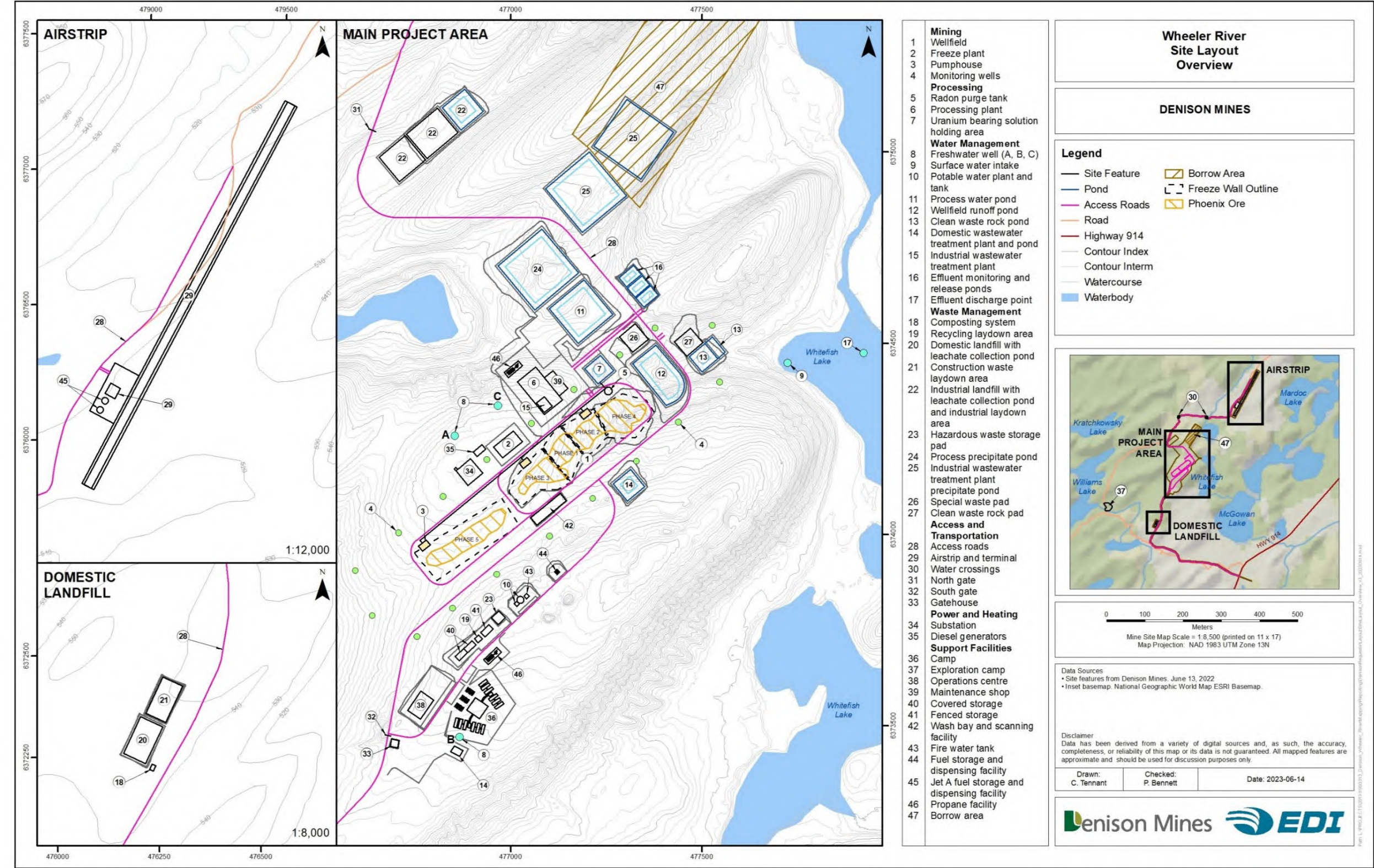


Figure 3: Wheeler River Project Proposed Site Layout



### 3.4.2.1 Mining

The uranium deposit is geologically situated at or above the unconformity between the Athabasca Basin sandstone and older basement rocks, approximately 400 m below the surface. The deposit has an average thickness of 5 m and extends approximately 750 m in length. Mining will be completed using an ISR method. A water-based low pH or acidic mining solution is injected from surface pumphouses via a series of injection wells, entering the uranium deposit mining area (approximately 400 metres below surface) via slotted well screens installed at the base of the injection wells. As the mining solution travels from an injection well towards a recovery well, uranium contained in the host rock is dissolved and transported to surface within the mining solution.

The mining solution will be prepared on site by adding reagents, likely sulphuric acid, hydrogen peroxide, and ferric sulphate, to water. Water will be sourced from either a shallow groundwater well or Whitefish Lake. The concentration of reagents required to create the mining solution will be based on previous field and laboratory test work.

The mining solution will be pumped underground to the uranium deposit via an injection well and recovered as uranium bearing solution (UBS; i.e., mining solution now containing dissolved uranium) through a series of recovery wells. Once UBS is recovered to surface, it will be pumped into the processing plant where the uranium will be removed. Typical extraction flow rates of the UBS are estimated to range up to 10 L/s and the production capacity is not expected to exceed 12 million pounds of  $U_3O_8$  per year during Operation. Mud rotary and diamond drilling, both well-established drilling techniques, are expected to be used to create the holes for the injection and recovery wells that make up the wellfield and the holes for various monitoring wells (Figure 4). Figure 5 provides an overview of Denison's current conceptual well installation sequence based on current level of engineering. Specific details may change as the Project advances through engineering design stages. The wellfield will comprise a series of injection and recovery wells in the general arrangement of one recovery well in the centre surrounded by four injection wells (Figure 5). The final wellfield is expected to include approximately 300 injection and recovery wells over an area measuring 90 m wide x 750 m long.

The mining area has been defined for this Project as the area inside the freeze wall (described below) and up to 50 m above the uranium deposit. Groundwater flow at the depth of the deposit (~400m below surface) moves at a rate of less than 1 meter/year. Containment of the mining solution and uranium bearing solution within the mining area will be achieved through a defence-in-depth approach with three levels of containment:

1. Design and operation of the injection and recovery wells

The wells are designed with both an outside and inside casing which will minimize the potential accidental release of mining solution or UBS into the sandstone above the mining area. The wells will be constructed of materials resistant to the mining solution that meet well design



specifications. Wells will be pressure grouted from the ore zone to surface and tested for mechanical integrity to confirm they are functioning properly. Operation of the wellfield will allow for monitoring of pressure changes and any pressure losses can be quickly identified by operators.

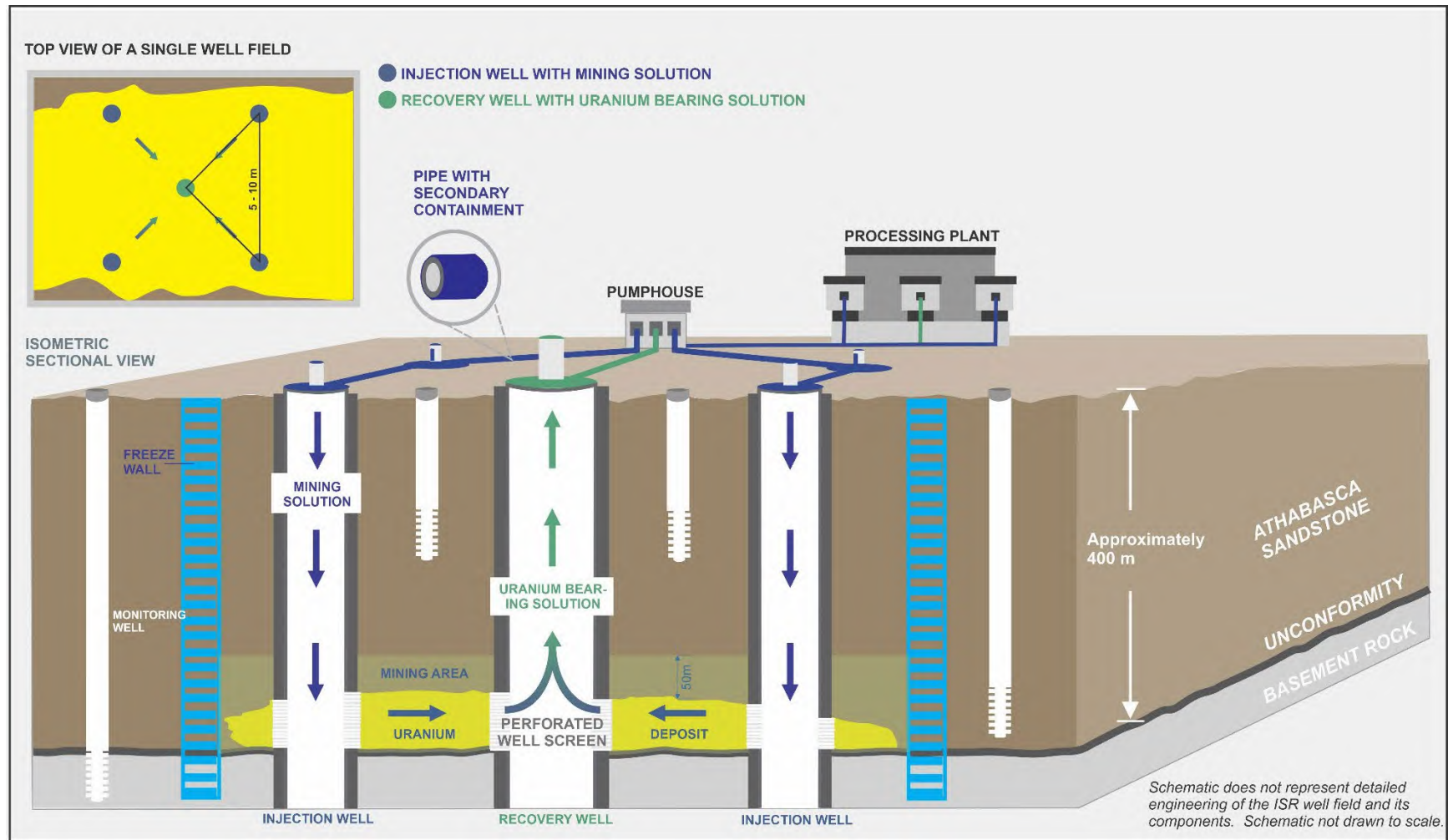
## 2. Inward hydraulic gradient from wellfield operation

A hydraulic gradient will be present in the mining area as the mining solution is pumped from an injection well (areas of high pressure) towards a recovery well (areas of low pressure). This consistent gradient in pressure causes the solutions to preferentially flow towards the low-pressure areas in a controlled manner. Hydrogeologic studies and models have been completed and show that mining solution within the mining area can be controlled by maintaining an inward hydraulic gradient.

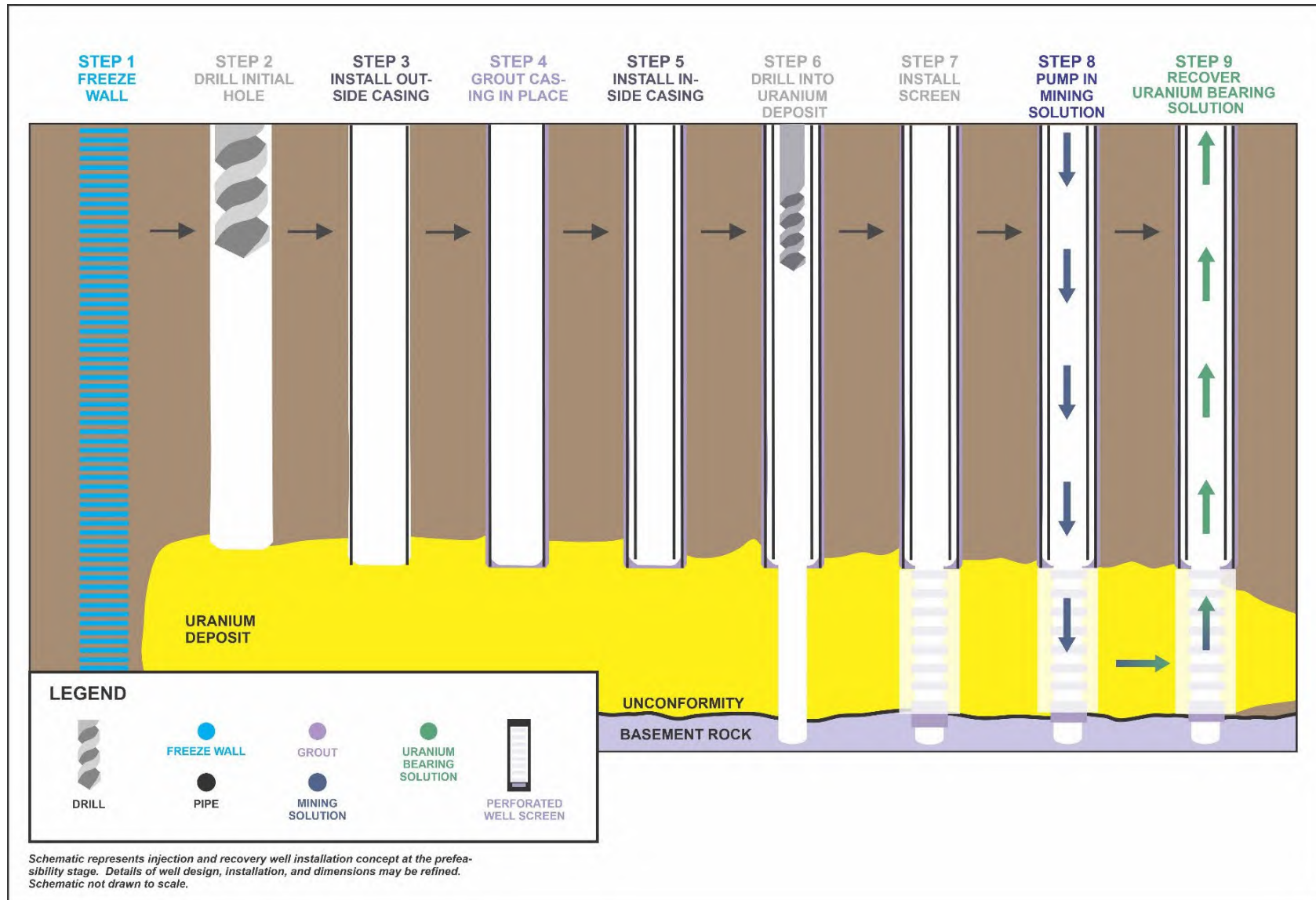
## 3. Creation of a freeze wall

Denison is proposing a freeze wall for tertiary containment of the mining solution. The engineered freeze wall will extend from the surface of land down to the basement rock below the depth of the uranium deposit. The very low permeability basement rock underlying the uranium deposit serve as a natural aquitard; however, the sandstone hosting the uranium deposit is permeable and groundwater can flow horizontally through the deposit. Ground freezing technology is well established throughout the world. Its use in a mining environment was pioneered in Saskatchewan's potash mining industry for shaft sinking activities, and later adapted for use in Saskatchewan's uranium industry. Ground freezing to control and eliminate groundwater from entering the mining areas is a fundamental component of two existing Athabasca Basin underground uranium mines: Cameco Corporation's McArthur Operation and Cigar Lake Operation. The freeze wall for the Project will be established ahead of the commencement of mining activities by drilling vertical holes (using common diamond drilling methods) from surface to the basement rock. These holes will be cased and outfitted to allow for the recirculation of a freeze brine, which will gradually reduce the temperature of the ground near the drill hole and ultimately freeze the water within the rock to create a continuous in-ground freeze wall around the perimeter of the mining area. A total of over 300 freeze holes are planned for the Project. Once completed, the freeze wall will create a physical boundary around the mining area that will completely isolate it from the surrounding regional groundwater.

Groundwater monitoring wells will be configured to demonstrate effective containment of solution within the mining area and provide early warning of any vertical migration of the mining solution or UBS within the perimeter of the freeze wall. Additional monitoring wells will be positioned to monitor groundwater pressures and quality outside of the mining area, including outside of the perimeter of the freeze wall. Monitoring groundwater conditions along the freeze wall perimeter also serves to monitor any loss of freeze capacity of the freeze wall. Groundwater samples taken outside of the mining area during Operations are expected to be comparable to regional groundwater quality.



**Figure 4: Overview of the In Situ Recovery Process**



**Figure 5: Proposed Injection and Recovery Well Installation Sequence**

### 3.4.2.2 Processing

Processing of the UBS to Triuranium Octoxide or  $U_3O_8$  (often referred to as the final uranium product or yellowcake) will take place in the processing plant. Denison's processing plans are based on numerous metallurgical tests completed as part of preliminary engineering activities.

When the UBS comes to surface, radon gas will naturally migrate out of solution and into the atmosphere. To keep radiation exposure of process plant worker as low as reasonably achievable (ALARA,) a radon purge tank will be used to remove an initial volume of radon before the solution enters the processing plant. A holding area for the UBS will be designed to safely store the UBS on surface prior to processing to allow for a controlled flow of UBS into the plant.

The processing plant includes a two stage precipitation circuit:

The first process precipitate circuit is designed to remove non-uranium constituents, including iron and radium-226 from the UBS. Process precipitates will be radioactive and contain between 2 to 3% uranium which is considered economical as feed for other mills in Saskatchewan. The process precipitates will be safely and temporarily stored on site for eventual off-site reprocessing and final disposal at an approved facility.

Then, through a series of tanks and filters, and with the addition of reagents, the uranium contained in the UBS is precipitated, dried, and packaged via the uranium circuit.

The final product will be transported off site to customers. Water generated in the processing plant will be treated in the industrial wastewater treatment plant to meet regulatory requirements, and either be recycled for use in the wellfield or process plant or released to Whitefish Lake.

An overview of the processing plant is provided in Figure 6.





### 3.4.2.3 Water Management

Water management for the Project involves distribution of freshwater, collection of runoff water, recycling and treatment of process water, and collection and treatment of industrial and domestic wastewater. As part of Denison's approach to sustainable mining at the Project, Denison intends to recycle process water to the greatest extent possible, thereby reducing the demand for fresh water supply and reducing the volume of treated effluent released.

A freshwater distribution system will be designed to provide fresh water for the fire water system, the potable water treatment plant (WTP), the processing plant including mining solution preparation, the wash bay, drilling, and batch plant operation. Water will be sourced from either a shallow groundwater well or Whitefish Lake.

A process water pond, double-lined with leak detection, has been designed to capture water from a variety of areas, including the process precipitate storage pad and special waste pad. The pond will be designed to hold up to 30,000 m<sup>3</sup> of water and will be located next to the processing plant. The pond will be able to receive water from all site ponds and monitoring wells. If required, water in this pond can be used directly in the process plant or be directed to the industrial wastewater treatment plant (IWWTP), located in the processing plant building.

Domestic wastewater, including greywater (e.g., water drained from sinks, showers, washing machines) and blackwater (i.e., sewage), will be generated at site will be piped or pumped to the on-site domestic wastewater treatment plant (DWWTP). Treated effluent from the DWWTP pond will be routed to the process water pond.

A three-stage IWWTP will be used to treat potentially contaminated waters produced from the processing plant and other various sources (e.g., wash bay sump water, leachate from the industrial landfill, wellfield runoff pond), routed to the IWWTP through the process water pond.

The first stage of water treatment will produce a radioactive precipitate which will be stored and handled with the precipitates generated in the process precipitate removal circuit, as they will be similar in composition. The second stage of water treatment will generate non-radioactive IWWTP precipitates, which will be permanently disposed of on site in an appropriately designed pond. At decommissioning, the non-radioactive material in the IWWTP precipitates will be covered and decommissioned in place. The third stage of water treatment is neutralization.

It is Denison's intent to incorporate treated water (to the extent possible) back into the mining water balance as make-up water in the processing plant to generate additional mining solution. Any excess treated water from the IWWTP will be pumped to the effluent monitoring and release ponds.

Denison plans to construct and operate three effluent monitoring and release ponds, which will receive treated water from the IWWTP. There will also be an option to recycle water from these



ponds back into the processing plant via the process water pond. Each pond will be operated with the following stages: 1) filling, 2) holding while awaiting quality confirmation, and 3) releasing to Whitefish Lake once water quality is confirmed to meet discharge limits. All effluent released to surface water will meet federal and provincial regulatory discharge criteria.

#### 3.4.2.4 Waste Management

Conventional waste, radiologically contaminated waste, and hazardous waste will be managed at the Project. Denison is committed to conducting stringent waste characterization throughout the life of the Project. This includes physical, radiological, and chemical characterization to maintain accurate waste inventories and determine how wastes will be dispositioned through either re-use, recycling, temporary storage, or permanent disposal (on or off site). This includes clearance of waste or materials that meets unconditional release requirements and can be safely removed from site.

Drilling activities will generate small volumes of two types of waste rock (drill cuttings): clean waste rock from the sandstone and special waste rock for the area close to the uranium deposit. Both waste rock types will be handled appropriately on surface, including contact water management. Clean waste rock will be used where possible in construction and special waste rock will be processed through the processing plant or disposed of off site.

The processing plant and IWWTP will generate two types of precipitates: process precipitates which have uranium and radioactivity, and the IWWTP precipitates which are non-radioactive.

Two waste landfills are included as part of the proposed Project. The design and operation of these facilities is consistent with best management practices both at northern Saskatchewan mine sites and from comparable jurisdictions. The two landfills are the:

- Domestic Waste Landfill
- Industrial Waste Landfill

The domestic landfill will have a composite liner system with leachate collection. The landfill will be fenced, contoured to direct runoff away from the facility, and managed to avoid attracting wildlife and birds.

The industrial landfill will have a double geosynthetic composite liner system. There will be an associated leachate collection pond immediately north of the industrial landfill, which will have a double liner system with leak detection. Radiologically material from operational activities that cannot be cleaned to pass radiological clearance (e.g., used wellfield piping, laboratory waste) will be disposed of in the industrial landfill and classified as low level radioactive material.

Additionally, a small pad designated for temporary storage of hazardous waste such as paints, solvents, hydrocarbons, and used oil, will be required to support the Project. The temporary

storage pad will have a composite liner system. Hazardous wastes will be stored temporarily on this pad before being taken off site by waste management service providers for proper recycling or disposal.

#### 3.4.2.5 Access and Transportation

Mainland access to the site will be from Highway 914. A 7-km section of road will be constructed from the highway to the Project site and a 5 km long road will also be constructed from the Project site to the proposed airstrip. Additional site roads will include a service loop to the camp.

As a proposed fly in-fly out operation, the Project will require an airstrip to bring personnel to and from the site. A 1,600-m long airstrip is proposed to be positioned in a natural and relatively flat valley northeast of the Project site.

Access to the Project Area will be controlled by both a north and south security gate. The main, south gate will be located close to the operations centre and staffed as required. The north gate will be a simple locked gate.

#### 3.4.2.6 Power

Electrical service to the Project will be provided via an approximate 5-km extension tap from the existing 138 kV overhead transmission line that runs along Highway 914. The transmission line service owned and operated by SaskPower will terminate at an onsite electrical substation. Optimization of the precise line route will be completed as the Project advances.

Power transmission to the site (e.g., assessment, obtaining necessary permits, and construction) will be led by SaskPower is considered ancillary to this Project. Diesel generators will be installed to service the site and maintain essential functions during a power outage.

#### 3.4.2.7 Support Facilities

The following support facilities will be constructed on the Project site (see Figure 3):

- camp;
- operations centre;
- covered and fenced storage;
- wash bay and radiological clearance scanning area;
- fire water system;
- facilities to support hazardous substances management:
  - fuel storage and dispensing facility;
  - propane facility;
- borrow area.

### 3.4.3 Project Schedule and Activities

The proposed Project schedule and activities according to phase are summarized in Table 1.

**Table 1: Project Phase, Year, and Associated Activities**

Phase and Year	Description of Activities	
Construction Year 1 to 3	<ul style="list-style-type: none"> <li>• Development of access roads and air strip</li> <li>• Site preparation and earthworks; clearing, leveling and grading of the project area</li> <li>• Power generation – generators</li> <li>• Installation of main substation and distribution of power around site</li> <li>• Wellfield and freeze hole drilling; ground freezing</li> <li>• Batch plant operation (concrete); crusher at borrow area</li> <li>• Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)</li> <li>• Waste management (composting, domestic and industrial landfill operation, recycling)</li> <li>• Water management (including treatment and site run-off)</li> <li>• Groundwater supply</li> <li>• Surface water withdrawal</li> <li>• Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)</li> <li>• On-site and off-site operation of vehicles and transport of materials</li> <li>• Air transportation for workers</li> <li>• Regulatory site inspections</li> <li>• Engagement - site visit from Interested Parties</li> <li>• Employment and expenditures</li> </ul>	
Operation Year 3 to 18	<ul style="list-style-type: none"> <li>• Operation of the ISR wellfield</li> <li>• Wellfield and freeze wall drilling</li> <li>• Operation and expansion of freeze wall</li> <li>• Batch plant operation (grout and cement); crusher at borrow area</li> <li>• Expansion of pond and pads</li> <li>• Operation of the processing plant and production of uranium concentrate</li> <li>• Water withdrawal from groundwater or surface water body</li> <li>• Management of surface water (including seepage and site run-off)</li> <li>• Water treatment, both domestic and industrial</li> <li>• Water release to surface water body</li> <li>• Waste management (composting, domestic and industrial landfill operation, recycling)</li> <li>• Hazardous waste management (temporary storage, handling, and off-site transportation)</li> <li>• Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates</li> <li>• On-site and off-site operation of vehicles and transport of materials</li> <li>• Power supply – primarily power from the grid, also generators and back-up generators</li> <li>• Package and transport of nuclear substances</li> <li>• Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)</li> <li>• Air transportation for workers</li> <li>• Progressive decommissioning and reclamation</li> <li>• Regulatory site inspections</li> <li>• Engagement - site visit from Interested Parties</li> <li>• Employment and expenditures</li> </ul>	
Decommissioning Year 18 to 23	<ul style="list-style-type: none"> <li>• Site water management, treatment, and release</li> <li>• Mining horizon remediation and thawing of freeze wall</li> <li>• Process water treatment and release</li> <li>• Power generation – generators</li> <li>• Waste management (composting and landfill operation)</li> </ul>	

Phase and Year	Description of Activities	
	<ul style="list-style-type: none"> <li>• Closure of ISR and freeze wells and related infrastructure</li> <li>• Decontamination of surface facilities and injection, recovery, and monitoring wells</li> <li>• Asset removal (including site power transmission lines and electrical infrastructure)</li> <li>• Demolition and disposal of non-salvageable surface infrastructure and materials</li> <li>• Remediation of surface areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)</li> </ul>	<ul style="list-style-type: none"> <li>• Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)</li> <li>• On-site and off-site operation of vehicles and transport of materials</li> <li>• Reclamation of disturbed areas</li> <li>• Regulatory site inspections</li> <li>• Engagement - site visit from Interested Parties</li> <li>• Employment and expenditures</li> </ul>
Post-Decommissioning Year 23 to 38	<ul style="list-style-type: none"> <li>• Environmental monitoring</li> <li>• Regulatory site inspections</li> </ul>	<ul style="list-style-type: none"> <li>• Engagement - site visit from Interested Parties</li> <li>• Employment and expenditures</li> </ul>

### 3.4.4 Management Systems

A detailed management system, based on the CNSC's safety and control areas and focused on anticipated compliance verification criteria, will be developed to support licensing activities. For the EIS, an Environmental Management System (EMS) framework is provided to support review of the assessment and provide confidence in the significance determinations and overall conclusions.

Denison would develop an EMS for the Project consistent with the principals set out by CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use*, with consideration to applicable provincial and federal requirements and consideration of other guidance as may be deemed appropriate.

In general terms, the EMS is a framework that provides the means to proactively manage environmental risks and opportunities. The EMS provides processes, procedures, policies, assigned roles and responsibilities, and considers continual monitoring and improvement of organizational structures and practices. Within the specific context of the Project, the EMS provides an overall perspective on how potentially adverse effects would be minimized and managed over the Project life. In addition, the EMS establishes expectations (and associated mechanisms) for contractors and sub-contractors to comply with environmental commitments and policies including auditing and enforcement programs.

Denison is responsible for, and committed to providing, sufficient resources to: develop and implement the EMS to meet statutory/regulatory requirements; meet its corporate expectations with respect to environment performance; meet the expectations of its Interested Parties,

including Indigenous communities, with respect to environment performance; and fulfill any commitments made through the EA process and beyond through all Project phases.

Various Project design features have been proposed that serve to eliminate, reduce, or control potential Project effects on the biophysical and human environments through all Project phases.

### 3.4.5 Project Alternatives

Denison first evaluated potential production from the Project in 2010. Since that time, the Project has undergone significant design and review stages and has naturally evolved into the Project described herein. During the planning process, it is common to consider various means by which to fulfill a specific aspect of the Project.

Alternative means are the various ways Denison considered to implement Project components and activities. A systematic assessment of these alternatives is used to select preferred alternatives that are carried forward as Project design elements. These preferred alternatives ultimately become the basis upon which potential Project-related effects are evaluated in the EIS. The alternative means assessment was carried out as follows:

1. Identification of Alternative Means: Project components for which alternate means were considered are identified;
2. Consideration of Technical and Economic Feasibility: the technical and economic feasibility of these alternate means is considered—only alternate means that are deemed technically and economically feasible are carried forward;
3. Potential Residual Effects Associated the Alternative Means: the potential residual effects of each alternative, in consideration of mitigation, are described; and,
4. Evaluation of Alternative Means: a comparative evaluation of alternative means takes place that considers the potential residual effects for each alternative relative to various assessment criteria and indicators.

Based on these steps, a preferred alternative means for each respective Project component or activity evaluated was selected. Input received from Indigenous people and other Interested Parties was integral to the alternatives means assessment.

The alternative means assessment is conducted at a screening level, as is appropriate given the stage at which Project planning was when the alternatives were considered. The assessment considered both quantitative (where possible) and qualitative information available at the time. In addition, the comparative evaluation identified alternatives that were more preferred versus those which were less preferred.

As an example, five mining methods were evaluated through an increasingly rigorous process and considered factors such as: safety, environment, production rates, capital costs, operating costs,

schedule, operational flexibility, and risk. The top four mining methods considered for the Phoenix deposit were: jet boring, surface boring, micro tunnel boring, and ISR. Independent preliminary economic assessment or class 5 level assessments were completed on each of these four options in 2017. Ultimately, the alternative assessment results showed that ISR had advantages over boring and the other options including fewer environmental effects, lower costs, fewer technical risks, fewer safety risks for worker and positive feedback from Communities of Interest. Denison selected the ISR mining method for the Phoenix deposit in the 2018 prefeasibility study (PFS; Denison2018). Subsequent test work has validated the selection of the ISR mining method and accordingly, the ISR mining method was selected as the basis for the EA for the Project.

### 3.4.6 Greenhouse Gas Emissions

The Government of Canada requires that greenhouse gas (GHG) emissions be assessed in support of any project seeking federal approval. The GHGs that are required for emissions reporting include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), which are reported on an annual basis.

Direct or scope 1 emissions associated with combustion sources (e.g., using diesel or gas in mobile equipment, burning propane for building and process heat) are the main source scope 1 GHG emissions anticipated at the Project, with a minor contribution from the loss of a vegetation associated with the development of the Project Area during the first year of Construction. Indirect or scope 2 emissions are associated with the generation of electricity required to power the Project. Total emissions (direct and indirect) across all Project phases were estimated to be below 0.031 Mt CO<sub>2</sub>e per year. For comparison, the average annual province-wide total GHG emissions (2014 to 2019) were 75.2 Mt CO<sub>2</sub>e. The majority of GHG emissions in Saskatchewan as a percentage of province-wide totals are from the oil and gas sector (30%), agriculture (24%), Electricity (20%), and transportation (15%).

Denison will look to optimize the use of energy, including the potential to reduce combustion sources from fossil fuels through further electrification or alternative energy sources during upcoming engineering and design phases.

### 3.4.7 Project Benefits

The Project will provide an input source of uranium to nuclear power plants, contributing to clean energy production globally. The amount of uranium produced during the life of mine from the Project could supply power to 1 000 000 Canadian homes for 100 years. (WNA, 2022, Stats Can, 2019).

Direct financial benefits will be realized by the Province of Saskatchewan through royalties during the Operational phase of the Project. Additionally, federal and provincial governments will benefit from corporate and personal income tax collected as a result of mining the operation.



Denison will concentrate initial and sustained efforts towards employment and training initiatives for the Project targeted at the Communities of Interest. Best efforts will be made to make sure employment is maximized within the Communities of Interest and beyond that, with Indigenous people and Residents of Saskatchewan's North. Denison will work with the leadership of the Communities of Interest to assist in determining appropriate hiring practices during all phases of the Project.

Approximately 300 workers are expected to be required during Construction. During Operation, about 180 people will be employed annually to operate the wellfield and processing plant, and provide various supporting activities such as security, camp operations, operation of the water treatment and potable water plants, environmental monitoring, and maintenance of roads, equipment, and buildings.

Positions expected throughout Construction and Operation include supervisory and management positions, trade positions, professional and technical positions, as well as labour positions. Training applicable for various positions is offered through Saskatchewan Indian Institute of Technologies, Saskatchewan Polytechnic, and other institutions in northern Saskatchewan. Specific training for the Project will be developed through a systematic approach including a needs analysis.

Denison has established a procurement approach that requires the procurement of all goods and services for the Project to first consider businesses based within the Communities of Interest prior to looking elsewhere in northern Saskatchewan, southern Saskatchewan, and/or outside of Saskatchewan. Throughout all phases of the Project, Denison will prioritize procurement efforts within the immediate vicinity and region.

Programs and actions focused on producing socio-economic benefits for Communities of Interest have been initiated for the Project. Denison's corporate Indigenous Peoples Policy (IPP) reflects the company's belief that reconciliation is advanced through collaboration with Indigenous peoples and communities to build long-lasting, respectful, trusting, and mutually beneficial relationships, while aspiring to avoid adverse effects of Denison's activities and operations (Denison 2021).

### 3.4.8 Indigenous Knowledge

Denison recognizes the value Indigenous Knowledge (IK) and Local Knowledge (LK) adds to project planning, the completion of the EIS, and throughout the lifespan of the Project. Denison has recorded and stored information regarding IK, LK, and engagement activities in an Engagement Database referenced throughout the EIS. Indigenous perspectives can be complementary to the Cumulative Effects Assessment (CEA) for the Project. ERFN and KML have shared their Indigenous Knowledge on past, present, and predicted cumulative effects, through the following sources:

- *Wheeler River Project – Summary of Health and Socio-Economic Study Results* (ERFN and SVS 2022a);

- *Wheeler River Project - Summary of Traditional Knowledge Study Results* (ERFN and SVS 2022b); and
- *Kineepik Valued Ecosystem Components – KML Pre-statement for Denison EIS* (KML and NVP 2022).

The Métis Nation – Saskatchewan shared their Métis knowledge study which included secondary literature approved for use by the MN-S and primary information collected during interviews with nine Métis citizens from Northern Region 1 (NR1) and Northern Region 3 (NR3), as the following source:

- *The Wheeler River Project: Métis Knowledge Study Report* (MN-S and Two World Consulting 2023).

The Ya'thi Néné Lands and Resources Office also shared a report with Denison that, focused primarily on the Athabasca Denesųliné First Nations including Hatchet Lake, Black Lake, and Fond du Lac, as the following source:

- *An Exploration of Recorded Athabasca Denesųliné Traditional Knowledge, Land Use and Occupancy Information in the Vicinity of Denison Mines Wheeler River Project* (Ya'thi Néné Lands and Resources Office 2022).

Denison has brought this Indigenous Knowledge and Traditional Knowledge together with western science throughout the EA process. Additionally, Denison is supporting several processes to aid community-led collection of IK. These processes are at different stages of completion. Denison will continue to consider and integrate results from any forthcoming materials provided by communities as it advances the EIS process.

## 4 Summary of Engagement

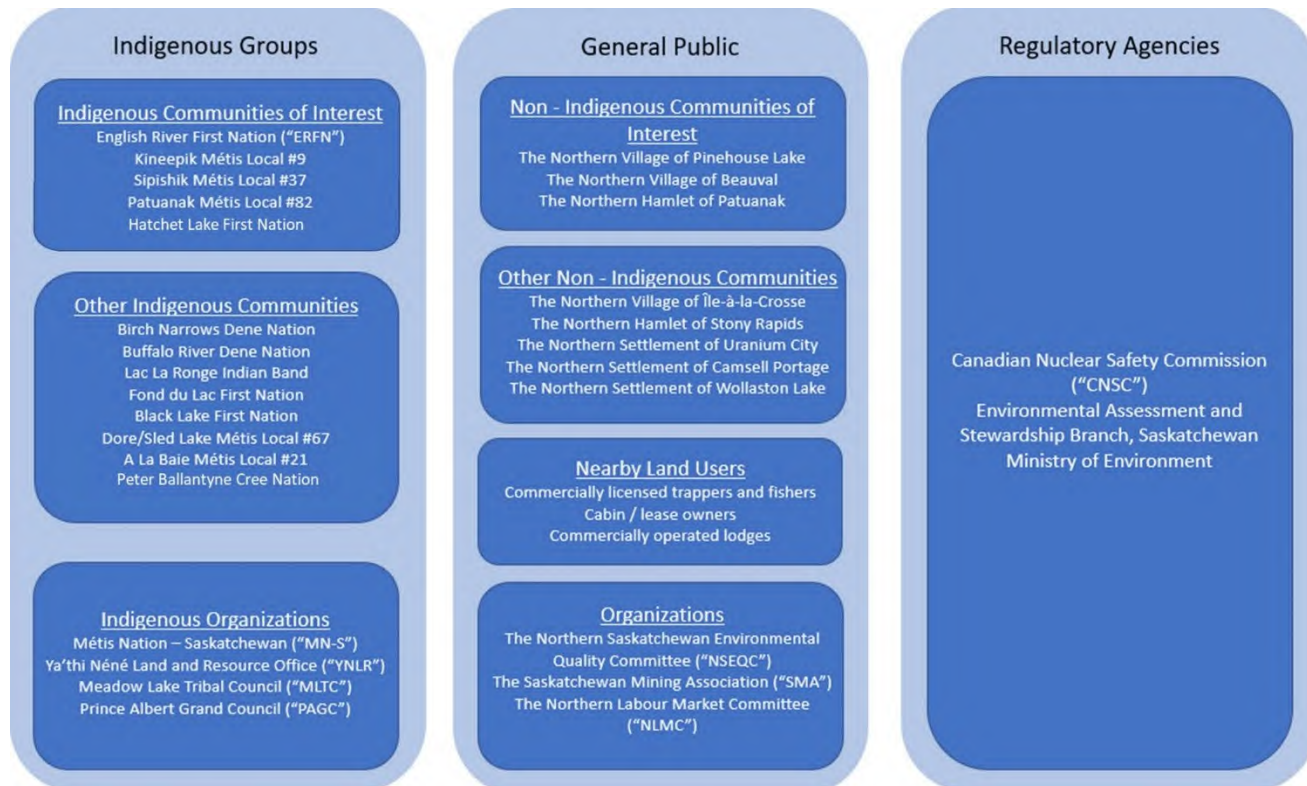
### 4.1 Introduction

Denison understands the importance of engaging with local and Indigenous communities, residents, businesses, organizations, land users and the various regulatory authorities, which are collectively referred to herein as Interested Parties. Since 2016, Denison has engaged with Interested Parties to develop meaningful relationships and facilitate a collaborative approach to engagement and the advancement of the project. Interested Parties are further categorized into three broad groups, each with several sub-categories:

- Indigenous Groups
  - Indigenous Communities of Interest (COI)
  - Other Indigenous Communities
  - Indigenous Organizations
- General Public

- Non-Indigenous COI
- Other Non-Indigenous Communities
- Nearby Land Users
- Organizations
- Regulatory Agencies

A list of the Interested Parties for the Project can be found below.



**Notes:**

- 1 The Métis Nation – Saskatchewan (MN-S) holds the delegated Duty to Consult for Dore/Sled Lake Métis Local #67 and A La Baie Métis Local # 21, Sipishik Métis Local #37 (SML), and Patuanak Métis Local #82 (PML).
- 2 Engagement activities with the Athabasca Basin First Nations and Communities (Fond du Lac, Black Lake, Hatchet Lake, Stony Rapids, Camsell Portage, Uranium City and Wollaston Lake) occur through YNLR.

Denison has developed and implemented an engagement plan to guide and structure engagement activities related to the Project.

The implementation of the engagement plan for the Project has faced various challenges, most notably the COVID-19 pandemic. Adopting an adaptive approach has been key to the successful implementation of an effective and meaningful engagement process for Interested Parties.

Additionally, in 2021, Denison announced the adoption of the IPP (Denison 2021). The IPP reflects Denison's recognition of the important role of Canadian business in the process of reconciliation with Indigenous peoples in Canada and outlines Denison's commitment to take action towards advancing reconciliation. The IPP was developed based on Denison's experiences with, as well as feedback and guidance received from, Indigenous communities with whom Denison is actively engaged. This approach was designed to make sure the IPP appropriately captures a mutual vision for reconciliation. The IPP identifies five key areas of action that support the ongoing development of a continuously evolving Reconciliation Action Plan (RAP): Engagement; Empowerment; Environment; Employment; and Education. Through the RAP, Denison is striving to interweave the principles of reconciliation throughout all areas of the company's operations.

## 4.2 Engagement Approach and Methods

Interested Parties are categorized into three broad groups, each with several sub-categories. These include Indigenous Groups, the General Public, and Regulatory Agencies. As part of our adaptive approach, engagement activities for each of these groups of Interested Parties have been tailored to comply with both federal and provincial regulatory legislation and, importantly, meet the expectations of each Interested Party.

Engagement is defined as the sharing and gathering of project-related information from Interested Parties, and the collaboration with Interested Parties, in good faith, with the goal of developing mutually acceptable resolutions to issues identified. Developing authentic relationships with Interested Parties to facilitate productive engagement is expected to play an integral role in the long-term success of the Project.

Engagement activities for the Project can and will evolve over time – as information is gathered that is pertinent to Denison's understanding of the Interested Parties and their relationship to, and interest in, the Project.

Engagement methods have included in-person, remote (audio only, virtual, and digital), and print and have generally occurred in alignment with the following phases:

- Pre-Project Description (April 2016 to May 2019);
- Post-Project Description (July 2019 to October 2022);
- Environmental assessment outcomes and relationship to licensing/approvals (October 2022 to January 2024); and
- Future Activities (following Final EIS Submission).

Planned methods of engagement were reviewed in March 2020 in response to the onset of the COVID-19 pandemic in Canada. Activities that included direct in-person interaction, such as site visits, were not possible in 2020 and 2021 and necessitated a shift to a remote style of engagement.

For each engagement activity, any perspectives that were shared by an Interested Party were recorded and consolidated into a single Engagement Database. Since 2016, this has culminated in over 2,000 unique entries, comprised of stand-alone comments, questions, queries, issues, concerns or other. The perspectives associated with the unique entries have been, where appropriate, interwoven into and throughout elements of the EA for the Project, highlighting how engagement outcomes have influenced various considerations in the EIS. Where appropriate, appendices of EIS sections contain summary tables that provide details on each unique entry that has been used in or otherwise informed an element of that section of the EIS, including information on issues raised and Denison's responses.

### 4.3 Engagement with Indigenous Groups

Denison is committed to conducting meaningful engagement with Indigenous communities and organizations potentially affected by the Project, and to maintain collaborative relationships with these communities and organizations throughout all phases of the Project.

Indigenous peoples have a unique relationship with the environment, and importantly, Indigenous and Treaty Rights, which must be fully respected during the process of Project development, Construction, Operation, and Decommissioning. To this end, Denison's objectives with respect to Indigenous engagement associated with the Project are as follows:

- build and maintain relationships built on trust and transparency;
- create a respectful dialogue that promotes communication between Denison and Indigenous communities and organizations, in a timely and accurate fashion; and
- understand how the proposed development of the Project may affect the ability of Indigenous peoples to exercise collective Indigenous/Treaty Rights.

Consistent with the history associated with other uranium mining projects located within the Northern Administration District (NAD; Figure 7), Denison recognizes that many Indigenous communities located within the NAD typically have some level of interest in uranium mining activities. Given potentially varied interests of multiple Indigenous communities, criteria was established to guide the development of the engagement program.

Through a process of (i) discussion with potentially interested Indigenous groups, (ii) consideration of applicable criteria, and (iii) interaction with representatives of the SK MOE and the CNSC, Denison identified the following Indigenous Communities of Interest:

- English River First Nation (ERFN);
- Kineepik Métis Local #9 (KML);
- Sipishik Métis Local #37;
- Patuanak Métis Local #82; and

- Hatchet Lake First Nation.

To formalize Denison's early commitment to work together, Memoranda of Understanding were signed with some communities and organizations in 2018. More recently, participation and funding agreements have been reached to provide capacity for interested parties to actively participate in the environmental assessment process.

Denison recognizes other Indigenous communities exist with potential interests in the Project, including Indigenous communities that have been identified by a Regulatory Agency as having a potential interest in the Project. These other Indigenous communities have been identified to include Birch Narrows Dene Nation, Buffalo River Dene Nation, Lac La Ronge Indian Band, Fond du Lac First Nation, Black Lake First Nation, Peter Ballantyne Cree Nation, Dore/Sled Lake Métis Local #67, and A La Baie Métis Local #21.

Denison also recognizes certain Indigenous organizations offer a single point of contact to member communities to facilitate information sharing and collection. In many cases these organizations have been delegated the right to represent an Indigenous community or group of Indigenous communities in connection with the Project. The four Indigenous organizations that have been identified include the Métis Nation – Saskatchewan (MN-S), Ya'thi Néné Lands and Resource Office (YNLR), Meadow Lake Tribal Council (MLTC), and Prince Albert Grand Council (PAGC). The Project is located within the MN-S homeland.



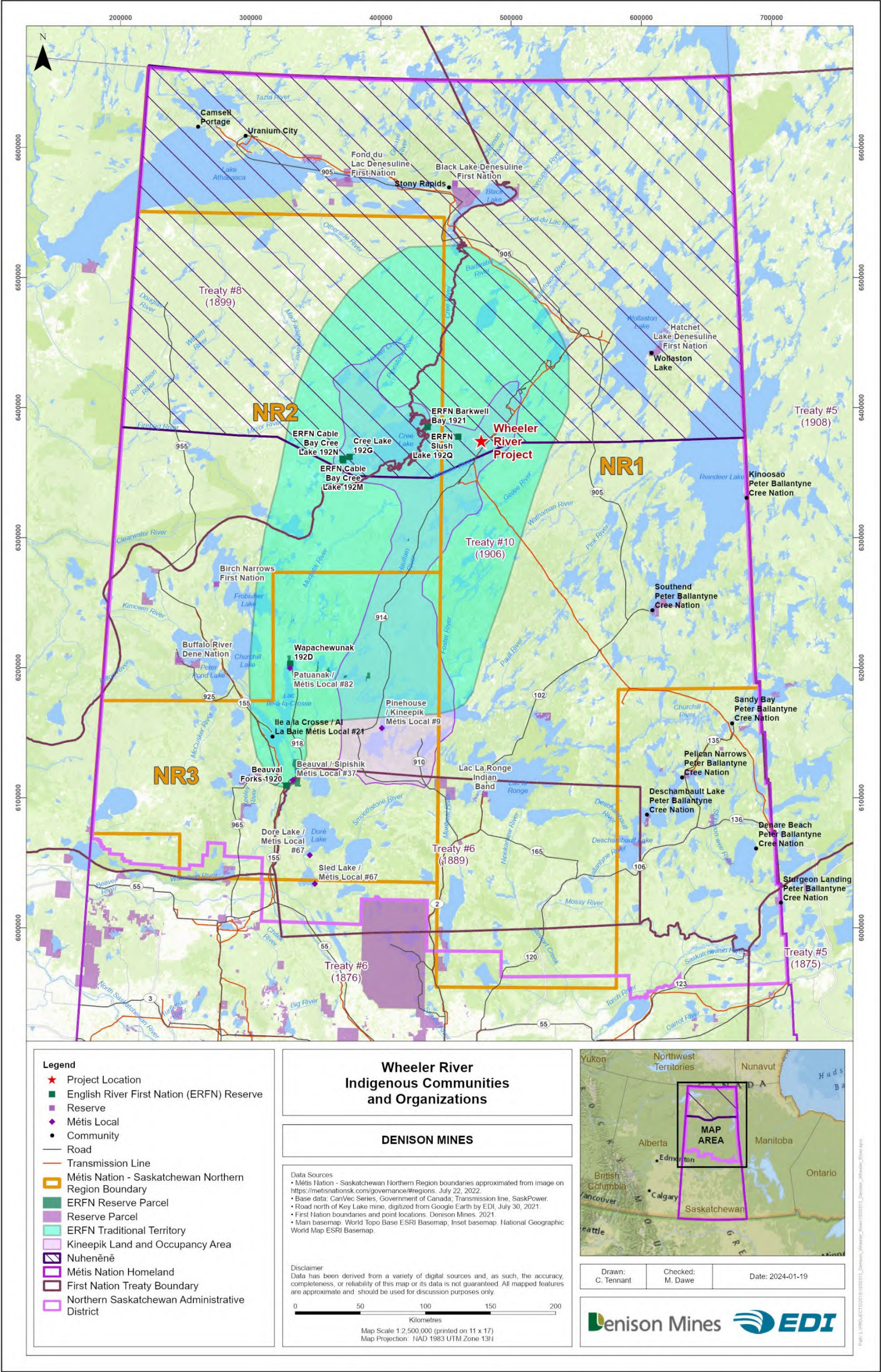


Figure 7: Identified Indigenous Communities and Organizations



A summary of engagement activities with each of the Indigenous Communities of Interest is provided in Table 2 and key results from engagement with Indigenous Groups are summarized in Table 3.

**Table 2: Summary of Engagement Activities with Indigenous Community of Interest**

Year	Engagement Activity	Total Number				
		English River First Nation (ERFN)	Hatchet Lake First Nation (HLFN)	Kineepik Métis Local #9 (KML)	Sipishik Métis Local #82 (SML)	Patuanak Métis local #82 (PML)
2016	Meeting	2		1	1	
2018	Workshop	1		1	1	
2019	Site Tour	1		1	1	1
	Meeting		1	1	1	1
2020	Due to the development of the Covid-19 pandemic, Denison suspended the EA and related engagement activities in 2020.					
2021	Virtual Meeting	3	1	From 2019, the MN-S has been representing Kineepik Métis Local #9, Sipishik Métis Local #37 and Patuanak Métis Local #82 in respect of engagement with Denison for the Project.		
	Virtual Leadership Meeting		1			
	Nuhtsiye-kwi Benéne Committee Meeting	3				
	Survey	1	1			
2022	Open House	2		1	In late 2021, Kineepik Métis Local #9 revoked their delegated Duty to Consult to the MN-S and Denison re-engaged directly with them	
	Leadership	1		1		
2023	Meeting	1	1	2		
	Site Tour	1		1		
2024	Workshop	1				
	Meeting		1	1		
	Site Tour			1		

**Note:** Before 2019, Denison undertook engagement activities in the Patuanak area (including with Patuanak Métis Local #82) more broadly through work done in relation to the ERFN Wapachewunak reserve, consistent with the strong interconnections in the area.

**Table 3: Key Results from Engagement with Indigenous Groups**

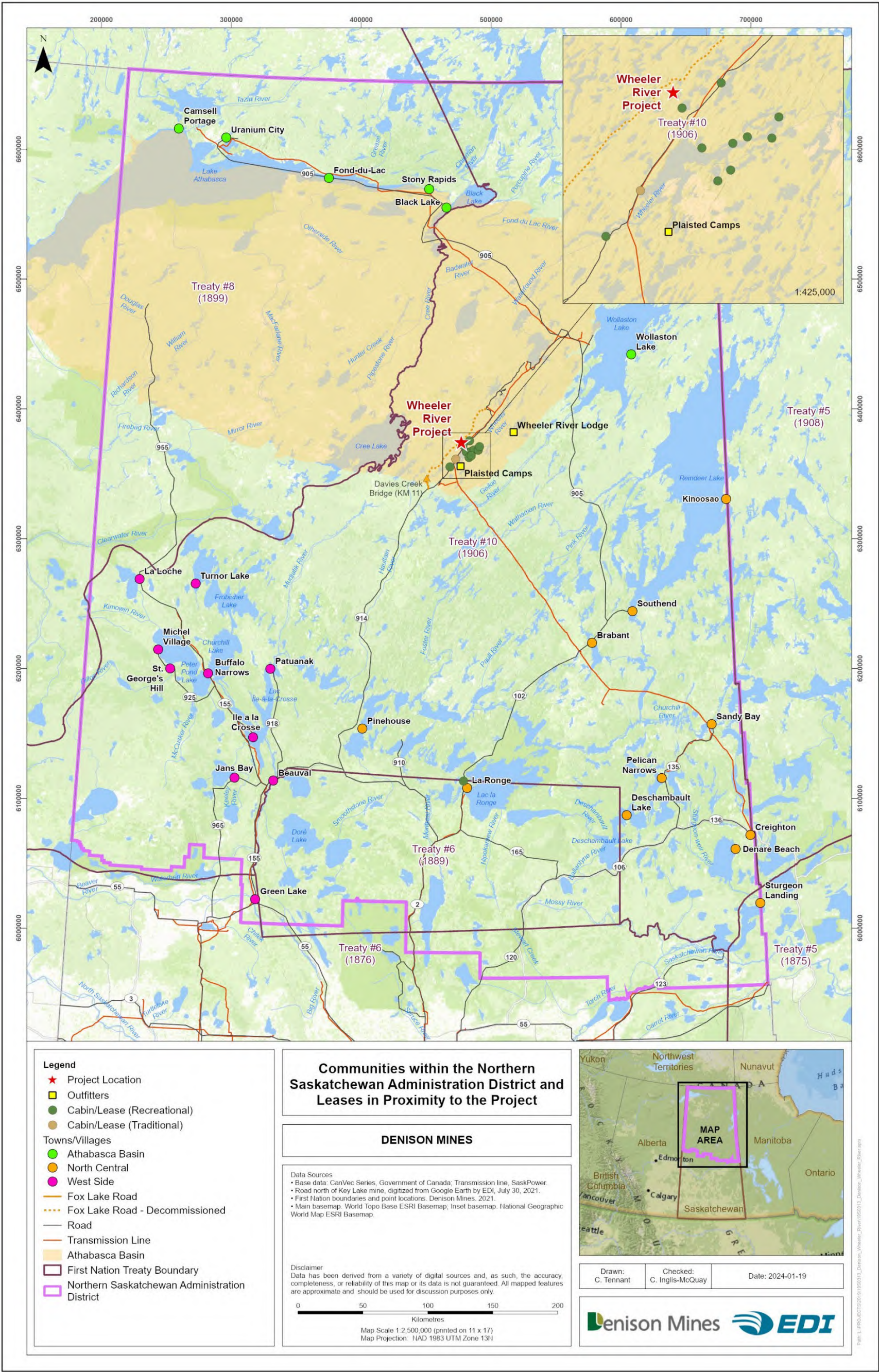
Topic	Summary of the Issue, Interest, or Concern	How Comment was Addressed/Considered in the Draft Environmental Impact Statement
Project Description	Questions and clarifications on ISR mining methodology, including freeze wall technology and Project power requirements.	<b>Section 2</b> provides information about the ISR mining method, freezing technology and wastewater treatment process.
Economics	Concern and interest in economic opportunities associated with the Project and education and training to facilitate access to employment.	<b>Section 13</b> summarizes local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.
Human Health	General concerns are expressed about radiation levels, and treated effluent quality in relation to overall water quality in the area.	<b>Section 8</b> provides information on expected effluent release and how this will be mitigated and monitored. <b>Section 10</b> provides information on how potential human health effects of the Project are considered, mitigated, and monitored.
Indigenous Knowledge	Concern for the appropriate inclusions of Indigenous knowledge in the assessment process	<b>Section 3</b> describes how the inclusion of Indigenous Knowledge was approached across all topics in the assessment process.
Terrestrial - Wildlife	Concerns were shared about the potential effects of Project construction on wildlife, including possible effects on game for hunting. Noted desire to document pocket (location) for caribou calving as well as an ongoing role in the mitigation of any possible effects.	<b>Section 9</b> describes existing wildlife environment and anticipated effects associated with Construction, as well as plans for ongoing mitigation and monitoring.
Aquatic	Interest in understanding existing water flows and existing fish species composition, size, and quality.	<b>Section 8</b> provides information on the baseline study program that was completed to understand aquatic species present today and documents any differences before, during, and after the Project.
Water	Effects to surface water quality and quantity from effluent release and water taking, including groundwater.	<b>Section 8</b> describes how surface water quality and groundwater is considered within the EIS, including in relation to withdrawals.
Land Use	Interest in sharing Indigenous Knowledge and history, and integration of this information in EIS.	<b>Section 11</b> documents how and what Indigenous Knowledge was shared and how it was integrated throughout the EA process. <b>Section 13</b> provides more information about the traditional economy and how it was integrated in the economic assessment of the Project.
Quality of Life – Community Wellbeing	Concern with racism and other factors in workplace affecting employee retention.	<b>Section 12</b> describes the various policies and programs in place to support worker and community well-being, along with worker rotation.
Monitoring	Interest in having transparency of environmental monitoring data for operating mines.	<b>Section 16</b> describes anticipated monitoring programs and approach.
Cumulative Effects Project Description	Interest in understanding cumulative effects associated with the construction of the processing facility and the potential to accept material from other deposits or companies.	<b>Section 2</b> provides information about the Project development elements. <b>Section 16</b> summarizes project cumulative and residual effects.

#### 4.4 Engagement with the General Public

The General Public includes (i) Non-Indigenous Communities of Interest, which are located near existing transportation infrastructure used by the Project (Figure 8), and (ii) nearby Land Users, such as commercial trappers or fishers, cabin/lease owners, or commercially operated lodges, are in the vicinity of the Project. Several relevant groups or organizations represent various of the general public interests relevant to the Project.

Engagement activities with these Interested Parties have included information sharing, in-person and virtual meetings, workshops, and site visits. In some cases, opportunities to confirm specific elements relative to the Project, such as nearby land use activities, have informed aspects of the EA.







The main forms of engagement with the General Public included correspondence to share information with leadership, community meetings, a workshop on early infrastructure options, a site visit, two online surveys (2021 and 2022), and a meeting and information session on preliminary effects and mitigation. Due to the COVID-19 pandemic, engagement switched to virtual meetings in 2020/2021. In mid-2022, appropriate engagement activities moved back to in-person. Key results from engagement with the general public are summarized in Table 4.

**Table 4: Key Results from Engagement with the General Public**

Topic	Summary of the Issue, Interest or Concern	How Comment was Addressed/Considered in the Draft Environmental Impact Statement
Project Description	Questions and clarifications on ISR mining methodology, road options, and waste.	<b>Section 2</b> provides information about the ISR mining method, wastewater treatment and road options.
Economics	Concern and interest in economic opportunities associated with Project and education and training to facilitate access.	<b>Section 13</b> summarizes local, provincial, and federal Project benefits and Denison's approach to employment, training, and business participation opportunities for communities.
Human Health Quality of Life	Questions were asked about hauling of products, what routes would be used and concern over radioactivity.	<b>Section 12</b> provides information on the traffic and road infrastructure considerations of the Project. <b>Section 10</b> Human Health provides information on the considerations for human health and safety (including radiation exposure).
Aquatic	Interest in information about surface water sampling programs.	<b>Section 8</b> describes how surface water quality is considered within the EIS.
Land and Resource Use	Russell Lake was noted of particular importance for recreational/ commercial fishing.	<b>Section 11</b> provides information on how the Project will interact with land and resources including how potential effects will be mitigated.
Quality of Life – Community Wellbeing	Concern with racism and other factors in workplace affecting employee retention.	<b>Section 12</b> describes the various policies and programs in place to support worker and community well-being, along with worker rotation.
Monitoring	Interest in having transparency of environmental monitoring data for operating mines.	<b>Section 16</b> describes anticipated monitoring programs and approach.
Cumulative Effects Project Description	Interest in understanding cumulative effects associated with the construction of the processing facility and the potential to accept material from other deposits or companies.	<b>Section 2</b> provides information about the Project development elements. <b>Section 16</b> summarizes project cumulative and residual effects.



## 4.5 Engagement with Regulatory Agencies

The Project will undergo a joint provincial-federal EA process led by SK MOE's Environmental Assessment and Stewardship Branch and the CNSC. As both the Provincial and Federal government entities are involved in the assessment and regulatory process, Denison began engaging with the CNSC and the SK MOE in 2018 to provide staff an overview of the Project.

Denison holds regular (monthly) meetings with the CNSC and the SK MOE to discuss the proposed components of the Project, the EA approach and assessment methodologies. Additionally, Denison ensures the regulatory agencies are provided with the opportunity to attend Denison's engagement activities with other Interested Parties (either virtually or in-person). Attendees from the CNSC and SK MOE have attended most of Denison's key engagement activities with Interested Parties in 2019 (site visit), 2020 / 2021 (virtual meetings), 2022 and 2023 (in-person meetings and site visits), and 2024 (in-person meetings). Denison plans to continue this approach during the Future Activities engagement phase (following Final EIS Submission).

## 4.6 Future Engagement Activities

Denison believes that the development of positive and effective working relationships with Interested Parties will not conclude with the completion of the environmental assessment and licensing process, but that it is iterative and ongoing. Denison is committed to offering sustained opportunities for engagement with Indigenous communities and organizations, the general public, and regulatory agencies throughout the Project lifespan, and adapting and adjusting those activities on an as-needed basis.

# 5 Overview of the Environmental Assessment

## 5.1 Approach and Methodology of the Assessment

Denison considers the EA to be a planning and decision-making tool that assesses the potential effects of the Project in a careful and precautionary manner, so that mitigation can be designed and applied to support the approval of the Project by the appropriate regulators (i.e., SK MOE and the CNSC). As such, the EA is a process for identifying the Project's potential interactions with the biophysical and human environment, predicting adverse effects, identifying mitigation measures, and evaluating residual and cumulative effects remaining after mitigation. The EA also outlines the proposed efforts for monitoring and reporting to verify compliance with the terms and conditions of approval and the follow-up necessary to assess the accuracy and effectiveness of predictions and mitigation measures presented in the EA.

In carrying out the various assessments, it has been assumed that an average of 9 million pounds of  $U_3O_8$  will be produced each year with up to 12 million pounds  $U_3O_8$  produced in any individual year, and that Operation could last up to 15 years. The intent of the assessment case is to allow for a

conservative assessment of the Project and to facilitate operational flexibility from one year to the next.

The EA approach involves “overlaying” the Project onto the existing environment to identify and describe whether, how, and to what degree components of the environment are likely to change due to the Project. Changes remaining after mitigation measures have been considered are called residual effects, and these are the changes that are further evaluated and characterized (Figure 9).

The key elements of the EA for the Project involve:

- defining the scope of the assessment in terms of Valued Components (VCs), selected Key Indicators (KI) for each VC, Measurable Parameters (MPs), and the spatial and temporal boundaries for the assessment;
- identifying the influence of Indigenous Knowledge, local knowledge, and engagement on the assessment (see Section 4);
- describing the existing environment for each VC;
- determining which Project components and/or activities interact with the VCs;
- determining potential Project effects and applicable mitigation measures (e.g., design features) and operational methods that will be used to avoid or limit adverse effects resulting from the Construction, Operation, Decommissioning, and Post-Decommissioning activities of the Project;
- completing a residual effects evaluation (e.g., characterizing anticipated adverse effects remaining after implementing appropriate mitigation);
- determining the significance, when applicable, of the identified adverse residual effects;
- identifying cumulative effects, i.e., the spatial and/or temporal overlapping of residual Project effects with the same residual effects resulting from other past, present, and reasonably foreseeable projects or activities (including characterization of cumulative effects and significance determination);
- describing monitoring and follow-up programs that will be completed; and
- summarizing, in plain language, the main points of the assessment, including potential residual and cumulative effects to the VC/KI from the Project and relevant mitigation, monitoring and follow-up.

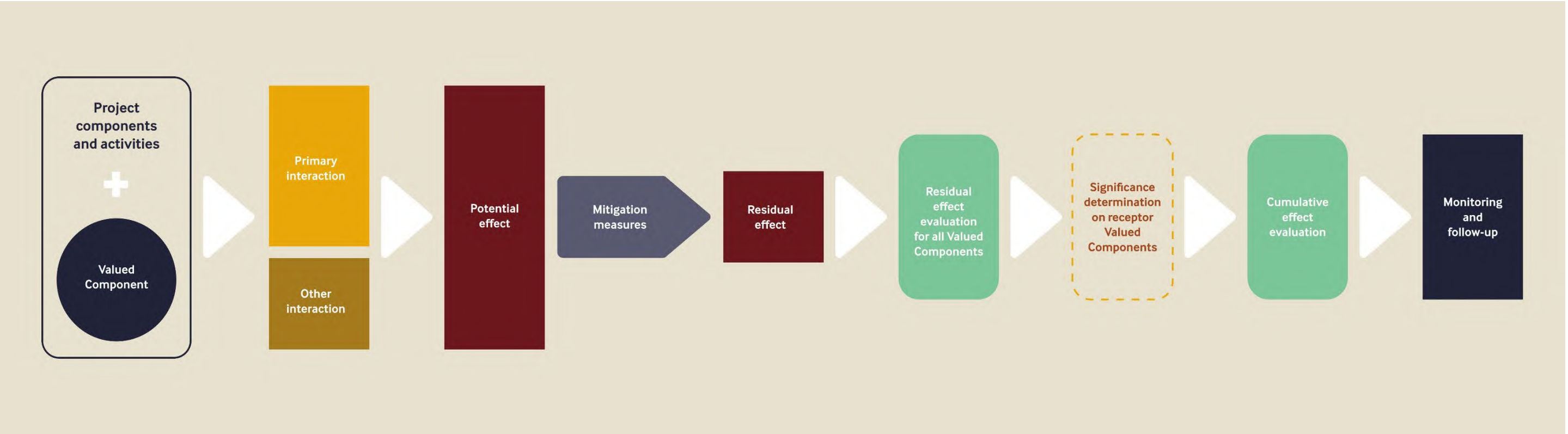


Figure 9: Steps to Completing the Environmental Assessment for the Project

### 5.1.1 Valued Components, Key Indicators and Measurable Parameters

The VCs are aspects of the biophysical and human environments that will likely be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local and Indigenous Knowledge, and community interests regarding the Project and its potential effects. Initial direction and input into VC selection were obtained through discussions with Indigenous groups, government agencies and the public. Denison reviewed and considered this input to develop a VC list to focus the detailed assessment for the EA.

A KI is an important component or aspect of the VC that is expected to be affected (changed) as a result of the Project. A MP is parameter or metric associated with the KI that can be used to detect and measure Project-related changes.

### 5.1.2 Spatial Boundaries

Spatial boundaries for the EA were defined for each VC, based on the extent of the anticipated Project-related effects (i.e., direct and indirect) on the VC. When determining the spatial boundaries, the following information was considered, as appropriate and available:

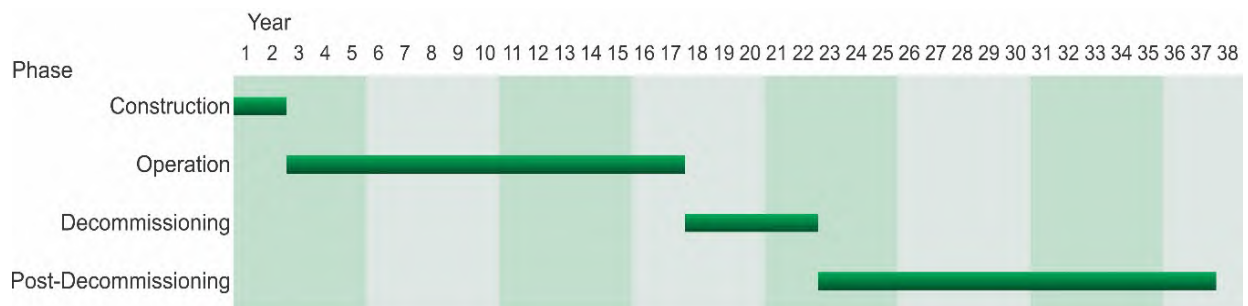
- Indigenous and local knowledge and engagement;
- information on current land and resource use by Indigenous communities;
- other pertinent ecological, technical, social, and cultural considerations (e.g., watersheds, ecozones);
- input from federal and provincial regulators and the public; and
- professional expertise of Denison and qualified third-party expert consultants.

The study areas for this EA were identified for each VC according to the following definitions:

- **Project Area** (see Figure 2): the area within which the Project and all components/activities are located (i.e., the Project footprint; the area of maximum physical disturbance). This area is not VC-specific, but consistent throughout the EA.
- **Local Study Area (LSA) – specific for each VC:** the area that surrounds the Project Area where both direct and indirect effects resulting from Project activities can be reasonably measured. The LSA is established to assess the potential, largely direct effects of the Project and represents the extent to which there is a reasonable potential for the Project or Project-related activities to interact with and potentially adversely effect the VC.
- **Regional Study Area (RSA) – specific for each VC:** the area that surrounds and includes the LSA, established to assess the potential, largely indirect, effects of the Project in a regional context. The RSA is large enough to capture the extent of potential effects (i.e., zone of influence) on a VC and defines the area within which cumulative effects may occur (i.e., cumulative effects assessment boundary).

### 5.1.3 Temporal Boundaries

The Project has four primary temporal boundaries or phases to be considered in the EA (Figure 10).



**Figure 10: Four Temporal Boundaries/Phases for the Project**

Additionally, a “future centuries” scenario is considered to assess the potential effects post-restoration (i.e., beyond the Project timeline of 0 to 38 years) and to reflect the time period over which the highest constituents concentrations in groundwater are predicted to migrate towards and interact with surface water.

For a list of activities associated with each phase of the Project, please see Table 1.

## 5.2 Atmospheric and Acoustic Environment

### 5.2.1 Air Quality

The existing air quality environment in the Project Area is typical of a remote northern setting. The baseline monitoring program for the Project indicated low existing levels of dust, nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide, and radon. The Project is expected to introduce new emission sources to the area, which in turn are expected to change the ambient air environment. Predictions of air quality concentrations were completed as part of the assessment using dispersion modelling to evaluate how the anticipated Project activities may change the existing air quality environment, and what the potential effects of those changes may be.

Air emission sources associated with the Project include site clearing and construction activities, dust from use of unpaved road surfaces, fuel combustion (e.g., power generators, diesel-powered mobile equipment), drilling in the wellfield, and process operations at the ISR plant. Potential effects related to Air Quality were identified pertaining to the predicted concentrations in air of various air quality indicators, including particulate matter, combustion products, and radon.

Several mitigation measures were identified to minimize the residual effects of the Project on Air Quality. These include regular watering of unpaved roads and surfaces to suppress dust emissions, limiting vehicle speeds, equipping the process exhausts with scrubbers, and making sure stack heights are sufficiently high to prevent building downwash effects.

Results of the air quality modelling were compared to thresholds set by federal and provincial authorities pertaining to the predicted concentrations in air of various air quality indicators. Residual effects were predicted at receptors located beyond the Property Boundary for 24-hour concentrations of total suspended particulate (TSP), particulate matter (PM<sub>10</sub>), and uranium, and 1-hour concentrations of NO<sub>2</sub> during at least one Project phase. Overall, residual effects were predicted to be limited in geographic extent and mostly infrequent. The 24-hour TSP and PM<sub>10</sub> exceedances for Construction and Operation were predicted to be sporadic. Residual effects were predicted to be short-term for Construction and unlikely for Operation. For Decommissioning, 24-hour TSP exceedances were predicted to be infrequent. Exceedances of the 24-hour uranium criterion for Operation and the 1-hour NO<sub>2</sub> criterion in all three Project phases were predicted to be infrequent. There is no significance determination for the Air Quality VC, as the results for Air Quality are carried through to Aquatic, Terrestrial and Human Health assessments, where effect significance has been evaluated.

Air emissions from other reasonably foreseeable projects in the area are not expected to combine with those from the Project and increase ambient air concentrations. However, there is potential for a cumulative effect at sensitive locations near Highway 914 due to Project-related traffic and traffic from Cameco's McArthur River and Key Lake operations. A 5-km portion of Highway 914 from the Project access road and south towards Key Lake was included in the air model and emissions from Project traffic were assessed. While traffic associated with Cameco's operations was not modelled, conservative regional background concentrations were added to the air model predictions. Air emissions from Cameco-related traffic are adequately captured by the conservative background concentrations and thus considered in the assessment of Project-related effects.

To confirm the residual effects of the Project on Air Quality, and to demonstrate compliance with provincial ambient air quality standards, an adaptive air emissions monitoring plan will be implemented at the permitting and licensing stage. The air emissions monitoring plan will evaluate the effectiveness of the dust management plan.

### 5.2.2 Noise

The Project Area is currently characterized by low ambient sound levels that are primarily attributable to sounds of nature, as would be expected for a remote location. The Project is expected to introduce new sound sources of an industrial nature into this environment, which is expected to change the nature of the existing environment and result in localized increases in sound levels. Any change to the existing sound environment in the vicinity of the Project has the potential to affect Indigenous groups and the public in terms of creating nuisance noise that may affect human health and change animal behaviours as related to hunting activity.

Noise sources associated with the Project include site clearing activities, construction of facilities, power generators, diesel-powered mobile equipment, drilling in the wellfield, on-site traffic and air



traffic, chilling equipment associated with the freeze plant, and various equipment associated with the ISR process (e.g., pumps).

The assessment of Noise included a baseline monitoring program to characterize existing sound levels, and the use of predictive models to assess how the Project may affect the existing sound environment. The predicted changes to the sound environment were assessed against federal and provincial guidelines to evaluate the resulting change.

Mitigation measures included limiting the use of equipment during night-time hours where possible, planning the site layout such that significant noise sources are as far as possible from sensitive locations, and making sure generator air discharges are directed away from sensitive locations. A noise monitoring program has been recommended to evaluate the effectiveness of mitigation measures and predictions made in the assessment.

The predicted sound levels were below the threshold values from the federal and provincial guidelines at all receptor locations; however, the increase in noise from baseline conditions was predicted to be noticeable at the nearest cabin. As a conservative approach, this was carried forward as a residual effect and follow-up monitoring will be conducted. As with the Air Quality VC, the Noise VC has not been evaluated for significance. The Noise VC was carried through the Terrestrial and Land and Resource Use assessments, where a significance determination has been completed.

Noise emissions from other reasonably foreseeable projects in the area are not expected to combine with those from the Project and increase ambient noise levels. However, there is potential for a cumulative effect at sensitive locations near Highway 914 resulting from Project-related traffic and Cameco's McArthur River and Key Lake operations. A model was prepared that estimated the contributing sound levels of this amount of traffic on Highway 914 at each of the sensitive receptors. The predicted sound levels due to combined truck traffic along Highway 914 did not change the acoustic assessment results based on the federal or provincial guidelines.

## 5.3 Geology and Groundwater

### 5.3.1 Geology

Geology includes bedrock, soils, and geomorphology (i.e., the study of physical features on the earth and their relationship to underlying geological structures). Geology was recognized as an important component of the environment that may be affected by the Project, and changes to Geology could in turn lead to effects on other VCs selected for assessment. For example, terrain morphology dictates landscape function, such as surface drainage patterns, and reflects the underlying surficial (geological) materials.

Geology was considered to be an intermediate VC (i.e., does not have an assessment endpoint). Changes to this intermediate VC were evaluated to facilitate the assessment of Project

interactions, with links to other disciplines for inclusion in their assessments, including Terrestrial Environment, and Land and Resource Use.

The geological conditions are well understood based on Project-specific and regional information. The Project Area and operations have been designed to limit disturbance to the natural geological environment. One component of the geologic assessment focused on subsidence at ground surface associated with extraction of rock mass (ore) at significant depth (approximately 400 m) below ground, from within the mining area. The assessment predicted a very minor change in ground elevation in the range of 2.4 to 2.8 mm within a discrete and localized area of the Project Area. This minor change may not be measurable and is likely within the bounds of other routine operational surface disturbances. Subsidence, should it occur, will be limited in terms of vertical displacement, and localized to a small portion of the Project Area.

As assessment was completed to understand the potential cumulative effects of the Project with existing and future developments on the physical aspects of the Geology VC. No cumulative effects on the Geology VC are expected. Subsidence is expected to be limited in terms of vertical displacement, if detectable, and localized to a small portion of the Project Area that does not spatially overlap with other project footprints and their potential effects on geology.

As part of the mining operations, detailed monitoring activities will be completed to assess the performance of various components of the Project associated with engineering mining designs, subsidence, performance, and infrastructure designs to protect the Geology VC. Subsidence at ground surface within the wellfield will be evaluated from Construction through to Decommissioning, by monitoring the elevation of collars (top of pipe) for wells within the wellfield. Contingency plans, including measures for adaptive management and emergency preparedness plans, will be designed to safeguard the local environment.

### 5.3.2 Groundwater

Groundwater is an integral component of the hydrologic cycle and is considered an important component and pathway (intermediate VC) to the Surface Water VC. Groundwater was selected as a VC for assessment because it is important in maintaining ecological habitats through its influence on the hydrology and water quality of surface water bodies, including wetlands. Indigenous Knowledge and engagement activities clearly identified the importance Interested Parties place on groundwater as a pathway to surface water, and the associated potential for changes in groundwater inputs to surface water to influence Fish and Fish Habitat, Sediment Quality, Vegetation, Wildlife, Human Health, and Indigenous Land and Resource Use.

The groundwater assessment focused on predicting changes in groundwater flow patterns and groundwater table elevations (Groundwater Quantity), and concentrations of chemical constituents in groundwater that may affect local surface water environments (Groundwater Quality).

The primary potential effects from the Project on groundwater included changes to Groundwater Quantity and Groundwater Quality during Operation as a result of surface facilities (ponds, landfills, laydown and wash areas) and mining, as well as the migration of chemical constituents in groundwater from the remediated mining area as natural groundwater flow conditions are re-established in Post-Decommissioning.

The overall Project Area and Operation have been designed to limit disturbance to the natural groundwater environment outside of the immediate mining area. To minimize residual effects of the Project on Groundwater Quantity and Quality, and protect discharges to local surface water bodies, specific and established engineering design features and mitigation measures will be employed, such as liners, leak detection systems, leachate collection systems at landfills, pads, and ponds, as well as impermeable cover designs during decommissioning. The freeze wall will be established as tertiary containment before mining operations commence to create hydraulically isolated mining area. Groundwater will be remediated during Decommissioning to acceptable standards, which are referred to as mining area decommissioning objectives. These objectives reflect concentrations of mining-associated groundwater constituents that are protective of the surface water environment after giving consideration to the removal of the hydraulic isolation of the freeze wall following the decommissioning stage.

To carefully evaluate how constituents dissolved in the remediated groundwater within the mining area may migrate away from and interact with the environment, a rigorous numerical model of groundwater flow and chemical constituent behaviour along the groundwater flow path was used as a predictive tool. The model was founded on proven scientific principles and processes (e.g., groundwater flow, contaminant transport, and geochemical reaction processes) and allowed future conditions to be evaluated. A determination of significance is not defined for the Groundwater VC; however, the results of the numerical model support the conclusion that, with the implementation of appropriate mitigation, the residual effects of the Project on the Groundwater VC will not result in a significant adverse effect to surface water. Migration of dissolved constituent concentrations along the groundwater flow path from the mining area to Whitefish Lake (the local surface water receptor) is predicted to take hundreds to thousands of years, with concentrations in groundwater reaching Whitefish Lake remaining below values that would result in an environmental risk.

As assessment was completed to understand the potential cumulative effects of the Project with existing and future developments on the Groundwater Quantity and Quality. No cumulative effects are expected since changes in Groundwater Quantity and Quality are localized and not anticipated to overall spatially or temporally with changes in groundwater associated with existing or reasonably foreseeable developments. Results of cumulative effects assessments for VCs in the aquatic environment are discussed in the next section.

Groundwater Quantity and Quality will be monitored from pre-Construction through Operation to assess the performance of the engineering mining designs and performance and infrastructure designs put in place to protect the Groundwater VC. During Decommissioning, monitoring will focus on demonstrating that groundwater remediation within the ISR mining zone meets decommissioning objectives. In Post-Decommissioning, the primary objectives of monitoring will be to demonstrate that natural flow conditions are re-established, and that chemical stability has been achieved with respect to groundwater quality. Chemical stability will be demonstrated by verifying groundwater reactive transport of constituents of potential concern in remediated groundwater aligns with the predictive model. A groundwater monitoring plan including an excursion contingency plan and measures for adaptive management will be implemented for the Project.

## 5.4 Aquatic Environment

### 5.4.1 Surface Water Quantity

The Surface Water Quantity VC considers hydrological parameters of interest, including flow regimes and water levels in watercourses and waterbodies within defined study areas. Key considerations of the assessment are associated with how Project activities, including but not limited to water-taking activities, treated water release, and changes to drainage patterns, may change hydrological conditions.

Denison initiated baseline hydrological monitoring for the Project in 2011, which has continued to the present. The extensive hydrological records for the area were utilized to establish a site-specific hydrological flow model to support the effects assessment for the Project.

Project interactions with the Surface Water Quantity VC are generally associated with changes in watershed areas as a result of mine construction and implementation of the water management plan, water-taking activities, and treated effluent discharge. The full measure of change in watershed areas will be realized during Construction, whereas water-taking activities and treated effluent discharge will occur through Operation and Decommissioning.

To mitigate the residual effects of the Project on Surface Water Quantity, Denison will minimize water taking activities by maximizing recycling of contact and process water for re-use. Denison will also limit and stage construction of the Project Area, maintain existing drainage patterns with the use of culverts, where applicable, and maintain access roads by periodically regrading and/or ditching to improve water flow, reduce erosion, and manage vegetation growth.

Flows and water levels in lakes and rivers within the LSA for the Surface Water Quantity VC are expected to experience some adverse change (i.e., reduction) as a result of altering the drainage areas reporting specifically to Whitefish Lake and water taking from this same waterbody. However, under all scenarios, including under low flow (5<sup>th</sup> percentile), the reduction in flow is

expected to be less than 3% and, therefore, below the criterion for magnitude of 5% - which is the level that would be considered a low effect to existing environmental flows. Effects to surface water flows and levels are also predicted to be localized to the sub-watersheds within proximity to the Project and specifically Whitefish Lake. The effects are predicted to be fully reversible following Decommissioning as natural drainage patterns will be restored. Following mitigation through design and water management, the residual effects on Surface Water Quantity from the Project are predicted to be not significant.

As the interactions of the Project with the Surface Water Quantity VC is of small magnitude, highly localized to Whitefish Lake and not further propagated downstream of this immediate area, interaction with other existing or reasonably foreseeable activities are not expected to occur over the Project timeline. Therefore, no cumulative effects are expected for the Surface Water Quality VC.

Monitoring programs will be established for confirming the predictions made in the assessment. The programs should remain consistent with the historical long-term monitoring study to facilitate continued establishment of long-term streamflow trends at the site through relationships to long-term, government-operated hydrometric gauging stations in the same watersheds.

#### 5.4.2 Surface Water Quality

The Project is located in a primarily undisturbed area of the boreal forest and the existing water quality in the lakes and rivers is indicative of a low level of disturbance. Water quality parameters during baseline were generally below guidelines for the protection of aquatic life; however, several constituents had concentrations above the guidelines, including aluminum, lead, copper, iron, and cadmium. In these cases, the maximum concentration was only marginally above the guideline value. The waters within the LSA and RSA sustain aquatic life and support activities that are important to local users and Indigenous peoples. Changes to Surface Water Quality have the potential to influence (i) biodiversity and biological function through direct exposure and indirect food chain influence (i.e., aquatic sediments, fish and fish habitat, and benthic invertebrates), and (ii) the cultural values of Indigenous peoples and communities, the general public, and other Interested Parties.

Project activities may interact with Surface Water Quality during all Project phases. In general, the interactions were characterized as being primarily associated with routine controlled discharges from the site. During site preparation and construction, the primary effect pathway related to the mobilization of suspended material into natural surface water features is as a result of land disturbance and clearing. During Operation and Decommissioning, water from the treated effluent monitoring ponds will be released to the environment and directed to Whitefish Lake only. Direct discharge of treated effluent to the natural environment has the potential to change surface water constituent concentrations and temperature. Potential effects to Surface Water Quality as a result

of Project discharges (surface drainage and effluent release) to local receiving environments were assessed by way of conservative numerical modeling.

To mitigate effects of the Project on Surface Water Quality, Denison will develop and implement a site-wide water management plan that includes an integrated framework to manage water quality and establish water management practices for each of the primary site aspects and areas of the site where contact water is expected. Water management will include maximizing the recycle and reuse of contact and process water to reduce freshwater intake and release of treated effluent to Whitefish Lake. Denison will design the treated effluent discharge diffuser/outfall to provide effective mixing and dilution such that discharge flows do not detrimentally affect water quality in a localized area of Whitefish Lake. Denison will also develop site-specific effluent treatment protocols to meet release limits in accordance with provincial standards and licence/permit conditions.

Residual adverse effects are expected on Surface Water Quality due to the mobilization of solids and treated effluent discharge to Whitefish Lake; however, with the implementation of appropriate design criteria for site water management and the effluent discharge pipeline and diffuser, in addition to meeting provincial and federal criteria for discharge criteria and mine water treatment (as needed), the residual effects of the Project on Surface Water Quality are anticipated to be not significant.

The residual effects of the Project are expected to temporally interact with the residual effects of other projects and activities in the surface water quality RSA. The primary Project activity potentially contributing to cumulative effects on surface water quality is the discharge of treated effluent to the aquatic environment during Operation and Decommissioning which may interact with other projects' releases to drainages which ultimately report to Russell Lake. Temporal overlap of foreseeable projects and the Project will also occur during "future centuries" as there is potential for increased contaminant transport via groundwater to surface water during this period. During all phases ("Future Centuries" included) the changes in surface water quality due to effluent discharge or groundwater interaction from foreseeable projects and activities are not anticipated to spatially overlap with those from the Project and therefore a cumulative effect is not expected.

Monitoring programs will confirm the effectiveness of mitigation measures and predictions made in the assessment and will include measurement of radiological and non-radiological water quality parameters to meet regulatory criteria. Monitoring will occur within the collection ponds and the receiving water (i.e., Whitefish Lake). In consultation with Indigenous communities, relevant federal and provincial agencies, and other Interested Parties, in the development and implementation of this VC-specific program, specific monitoring and follow-up plans will be prepared to refine and finalize the monitoring approach.



### 5.4.3 Sediment Quality and Benthic Invertebrates

The Sediment Quality and Benthic Invertebrate VCs were selected for inclusion because Project activities have the potential to affect them via erosion-driven mobilization of suspended sediment, groundwater interactions with surface water features, and treated effluent discharge to the natural environment throughout all phases of development.

Baseline sediment quality surveys confirmed that the waterbodies in the LSA (i.e., McGowan Lake, Whitefish Lake North, and Whitefish Lake South) were dominated by clay substrates, with silt and sand being present in lesser proportions. For parameters where sediment quality guidelines are available, sediment metal concentrations in these waterbodies were at or below their respective reference criteria or guidelines for the protection of aquatic life.

Benthic invertebrate communities were characteristic of depositional lake habitats (i.e., chironomids, midges, water fleas, and worms) in McGowan Lake and Whitefish Lake. Overall, the diversity of benthic invertebrate communities was highest in McGowan Lake followed by Whitefish Lake South and then Whitefish Lake North.

The physical and chemical attributes of aquatic sediments directly influence benthic invertebrate community distribution, diversity, abundance, and health. Potential changes to water quantity and quality are key considerations in the assessment process and draw a high level of concern from interested parties. Changes to Surface Water Quality have the potential to influence sediment particle size, chemistry, and distribution within the aquatic environment, and in turn influence biodiversity and biological function. Such effects are of interest with respect to the cultural values of Indigenous communities.

Project activities may interact with Sediment Quality and Benthic Invertebrates during all Project phases. In general, the interactions were characterized as being primarily associated with (i) routine controlled discharges from the site and (ii) mobilization of suspended material into natural surface water features as a result of land disturbance and clearing. During Operation and Decommissioning, water from the effluent monitoring ponds will be tested prior to release to the environment. Routine discharge of this sort will be directed to Whitefish Lake only. Additionally, a reduction in surface drainage reporting to Whitefish Lake, due to Project development activities, may change water levels and flows in the receiving water, thereby influencing the depositional properties of the lake and the benthic invertebrate community. The installation of the pipeline and diffuser structure will result in the overprinting of a small proportion of the Whitefish Lake (LA-5) benthic substrate (less than 0.05% of LA-5).

To mitigate effects of the Project on Sediment Quality and Benthic Invertebrates, Denison will develop and implement a site-wide water management plan that includes an integrated framework to manage water quality and establish water management practices for each of the primary site aspects and areas of the site where contact water is expected. This plan will include the collection

and monitoring of contact water to determine whether treatment is required prior to release to the environment, which will inform optimal levels of treatment. This plan will also include the monitoring and management of effluent, including contingency for effluent treatment as may be required so that water discharge objectives are achieved as defined by applicable provincial and federal regulatory instruments. These measures are expected to mitigate effects associated with mobilization of solids and changes to Sediment Quality that may affect Benthic Invertebrates. Denison will design the discharge diffuser/outfall to have the smallest footprint possible while still providing effective mixing and dilution such that discharge flows do not detrimentally affect sediments.

The assessment predicted residual effects to Sediment Quality and Benthic Invertebrates due to change in sediment quantity and physical quality (particle size), change in sediment quality (chemical composition), change in aquatic habitat (area), and change in water level or flow; however, with the implementation of appropriate mitigation measures and the predicted effects being assessed as low magnitude, localized, and fully reversible, the residual effects on Sediment Quality and Benthic Invertebrates are anticipated to be not significant.

The residual effects of the Project are expected to temporally interact with the residual effects of other projects and activities in the Sediment Quality and Benthic Invertebrate VCs RSA. The primary Project activity potentially contributing to cumulative effects on sediment quality and benthic invertebrates is via the surface water quality pathway and specifically through the discharge of treated effluent to the aquatic environment during Operation and Decommissioning which may interact with other projects' releases to drainages which ultimately report to Russell Lake. Temporal overlap of foreseeable projects and the Project will also occur during "future centuries" as there is potential for increased contaminant transport via groundwater to surface water during this period. During all phases ("Future Centuries" included) the changes in surface water quality due to effluent discharge or groundwater interaction from foreseeable projects and activities are not anticipated to spatially overlap with those from the Project and therefore a cumulative effect on Sediment Quality and Benthic Invertebrates is not expected.

Monitoring and follow-up are recommended for the Sediment Quality and Benthic Invertebrate VCs to verify the accuracy of the predicted effects and effectiveness of proposed mitigation measures. The sediment quality and benthic invertebrate monitoring program will be considered in conjunction with the surface water quantity (hydrology) and surface water quality monitoring programs as they are specifically tied to these programs from the perspective of pathways of effects. Monitoring of total suspended solids in the effluent monitoring ponds and other catchment ponds, prior to discharge to the environment, will be important in providing context to further evaluate Project-related effects to Sediment Quality and Benthic Invertebrates in the receiving water environment (Whitefish Lake or LA-5).

#### 5.4.4 Fish and Fish Habitat

The Fish and Fish Habitat VC was selected for inclusion in the assessment as Project activities have the potential to cause erosion-driven mobilization of suspended sediment. Project activities are also expected to discharge treated effluent to the natural environment, overprint fish habitat, and locally increase access to fisheries resources with the addition of a new access road and temporary increase of employees to the site. Furthermore, inclusion of the Fish and Fish Habitat VC is vital due to its importance to Indigenous peoples from a cultural and subsistence perspective. Fish and Fish Habitat is inclusive of wetland features within the LSA, and for the purposes of this assessment the Fish and Fish Habitat VC should be considered in tandem with the Wetlands VC, which is further discussed in Section 9 of the EIS.

Fish and fish habitat surveys in the LSA and RSA identified river, stream, and lake features that support a variety of fish species, including Lake Trout, Lake Whitefish, Northern Pike, Walleye, Yellow Perch, Arctic Grayling, and several other sucker and forage fish species. With the help of Indigenous Knowledge, Local Knowledge, and in-field surveys, critical spawning and nursery habitats for keystone species were identified and summarized for the LSA, specifically for Whitefish Lake and Russell Lake. Baseline conditions for the Fish and Fish Habitat VC were assessed in conjunction with baseline information specific to the Surface Water Quantity and Surface Water Quality VCs due to the interconnected nature of these VCs.

Project activities may interact with Fish and Fish Habitat during all Project phases. In general, the interactions were characterized as being primarily associated with routine controlled discharges from the site and mobilization of suspended material into natural surface water features as a result of land disturbance and clearing. During Operation and Decommissioning, excess treated water from the effluent monitoring ponds will be released to the environment. Routine discharge of this sort will be directed to Whitefish Lake only. Changes in Surface Water Quality due to treated effluent discharge may affect the water chemistry and water temperatures of Whitefish Lake. The installation of the pipeline and diffuser structure (discussed above) will result in the overprinting of a small proportion of the Whitefish Lake (LA-5) substrate (less than 0.05% of LA-5). No other alteration, disruption, or destruction of aquatic habitat in the LSA is expected. Changes in fish populations resulting from increased fishing activity, which may occur following improved accessibility due to the development of access roads, are also possible.

To mitigate effects of the Project on Fish and Fish Habitat, Denison will develop and implement a site-wide water management plan that includes an integrated framework to manage water quality and establish water management practices (i.e., runoff control and silt fencing) for each of the primary site aspects and areas of the site where contact water is expected. This plan will include the collection and monitoring of contact water to determine whether treatment is required prior to release to the environment, which will inform optimal levels of treatment. This plan will also

include the monitoring and management of treated effluent, including contingency for effluent treatment as may be required so that water discharge objectives are achieved as defined by applicable provincial and federal regulatory instruments. These measures are expected to mitigate effects associated with mobilization of solids and changes to water and sediment quality that may affect Fish and Fish Habitat. Denison will design the discharge diffuser/outfall to have the smallest footprint possible while still providing effective mixing and dilution such that discharge flows do not detrimentally affect fish lifecycle processes.

Construction of the access road will involve the installation of two stream crossings. These stream crossings are located at the historical watercourse crossings along the proposed airstrip access road. These crossings will be constructed as clear-span bridges, and their mitigative design will provide for protection of Fish and Fish Habitat.

A lack of transportation to fishing areas will minimize the geographic extent of any workforce fishing, and a lack of facilities to store or cook fish will limit the quantity of harvest.

The assessment predicted residual effects on Fish and Fish Habitat due to change in water quality (including temperature), change in sediment quality, change in aquatic habitat (aerial extent), and change in fish harvest from increased site access. However, with the implementation of appropriate mitigation measures, the predicted residual effects were characterized as low magnitude, localized, and fully reversible, and are, therefore, anticipated to be not significant.

The residual effects of the Project are expected to temporally interact with the residual effects of other projects and activities in the Fish and Fish Habitat RSA. The primary Project activity potentially contributing to cumulative effects on Fish and Fish Habitat is via the surface water quality pathway and specifically through the discharge of treated effluent to the aquatic environment during Operation and Decommissioning which may interact with other projects' releases to drainages which ultimately report to Russell Lake. Temporal overlap of foreseeable projects and the Project will also occur during "future centuries" as there is potential for increased contaminant transport via groundwater to surface water during this period. During all phases ("Future Centuries" included) the changes in surface water quality due to effluent discharge or groundwater interaction from foreseeable projects and activities are not anticipated to spatially overlap with those from the Project and therefore a cumulative effect on Fish and Fish Habitat is not expected. Physical alteration or loss of fish habitat is expected to be localized and of small spatial extent. No interactions with existing and reasonably foreseeable activities are envisioned over the Project timeline in this regard; therefore, no cumulative effects are expected to Fish and Fish Habitat.

Monitoring for the Fish and Fish Habitat VC will occur to verify the accuracy of the predicted effects and the effectiveness of the proposed mitigation measures. Effluent and receiving water quality monitoring will be conducted as per federal and provincial regulations and will include radiological

and non-radiological parameters. Monitoring of the biological environment will be undertaken to meet federal and provincial regulations (e.g., Metal and Diamond Mining Effluent Regulations Environmental Effects Monitoring program) and will occur in consultation with Indigenous groups. Monitoring of worker habits in relation to fisheries resources may be applicable to allow for adaptive management of the Fish and Fish Habitat VC.

#### 5.4.5 Fish Health

The Fish Health VC was selected for inclusion as treated effluent discharge to the natural environment has the potential to change chemical and radiological exposure. Furthermore, inclusion of the Fish Health VC is vital due to its importance to Indigenous peoples from a cultural and subsistence perspective. Generally, constituents of potential concern in fish may include heavy metals, including mercury. Concentrations of mercury and selenium in fish tissues collected during baseline studies were below guidelines that are protective of human health and freshwater aquatic life.

The main Project activity that may affect Fish Health is the release of treated effluent to Whitefish Lake. Changes in surface water quality and sediment quality have the potential to affect Fish Health in the receiving environment.

To mitigate effects of the Project on Fish Health, Denison will develop and implement a site-wide water management plan that includes an integrated framework to manage surface water quality and establish water management practices for each of the primary site aspects and areas of the site where contact water is expected. This plan will include the collection and monitoring of contact water to determine whether treatment is required prior to release to the environment, which will inform optimal levels of treatment. This plan will also include the monitoring and management of treated effluent, including contingency for effluent treatment as may be required so that water discharge objectives are achieved as defined by applicable provincial and federal regulatory instruments. These measures are expected to mitigate effects associated with changes in Surface Water Quality and Sediment Quality that may affect Fish Health.

The assessment predicted residual effects on Fish Health due to treated effluent discharge. Identified residual effects are expected to be associated with changes in Surface Water Quality and Sediment Quality; however, the changes are expected to remain well below levels that may affect Fish Health. Considering this, and with the implementation of appropriate mitigation measures, the predicted residual effects of the Project on Fish Health are expected to be not significant.

The residual effects of the Project are expected to temporally interact with the residual effects of other projects and activities in the Fish Health RSA. The primary Project activity potentially contributing to cumulative effects on fish health is via the surface water quality pathway and specifically through the discharge of treated effluent to the aquatic environment during Operation and Decommissioning which may interact with other projects' releases to drainages which

ultimately report to Russell Lake. Temporal overlap of foreseeable projects and the Project will also occur during “future centuries” as there is potential for increased contaminant transport via groundwater to surface water during this period. Changes to fish tissue concentrations in the LSA are also predicted to remain within or near existing levels and are not predicted to be associated with effects on Fish Health, nor propagated further downstream (i.e., to Russell Lake). During all phases (“Future Centuries” included) the changes in surface water quality due to effluent discharge or groundwater interaction from foreseeable projects and activities are not anticipated to spatially overlap with those from the Project and therefore a cumulative effect on Fish Health is not expected.

A monitoring program for Fish Health is recommended to confirm the effectiveness of mitigation measures and predications made in the assessment. The program will involve the collection of multiple fish species to assess changes in fish tissue concentration of constituents of interest.

## 5.5 Terrestrial Environment

### 5.5.1 Terrain, Soil, and Organic Matter/Peat

The Project Area is primarily located on undeveloped forested land (with some discrete anthropogenic disturbance) within gently rolling terrain characterized by eskers and drumlins. The Project has mostly been sited on stable terrain designated as upland and/or anthropogenically disturbed land (>99% of the Project Area), and (to the extent possible) avoids lowland, lakes, and waterbodies. The soil erosion potential and susceptibility to compaction will likely vary depending on slope class and slope position and other site-specific characteristics (e.g., cover vegetation and exposure).

Primary Project activities with the potential to cause adverse effects on Terrain, Soil, and Organic Matter/Peat including surface land clearing, major earthworks, surface/grading preparations, and/or associated mobilization of equipment, assets, and personnel that will occur during Construction, Operation, and Decommissioning. Denison will rely on a variety of mitigation measures to minimize potential effects on Terrain, Soil, and Organic Matter/Peat, including Project design measures to optimize the Project Area, development of an erosion and sediment control plan, and a commitment to progressive and final reclamation to achieve a safe, stable, and self-sustaining landscape.

Following implementation of these Project-specific mitigations, the assessment predicted residual effects on Terrain (morphology and stability), Soil (quantity and quality), and Organic Matter/Peat (quantity). Changes in Terrain, Soil, and Organic Matter/Peat are anticipated to be within the range of natural variation; therefore, the residual effects are predicted to be not significant. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in potential cumulative effects on Terrain, Soil and Organic Matter/Peat. With the implementation of appropriate Project mitigation measures and best



management practices (i.e., applicable to all projects within the Terrestrial RSA), the cumulative effects are also predicted to be not significant.

Monitoring programs are recommended for confirming the effectiveness of mitigation measures and predictions made in the assessment, and then implementing adaptive management (if/where applicable) to reduce effects during the lifetime of the Project. These include monitoring during Construction to verify that the Project is built to design specifications, soil salvage monitoring during any land clearing activities, and soil quality monitoring during Operation.

### 5.5.2 Vegetation and Ecosystems

The Project Area is in an area of the boreal forest with minimal existing anthropogenic and some past wildfire disturbances. The area is dominated by upland jack pine and black spruce forests in various stages of post-fire regeneration, with smaller areas of wetland ecosystems along streams and seepage areas and associated with shallow lakes. One listed plant species was observed during vegetation surveys (i.e., Alaskan clubmoss).

The main Project activities that may affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands are clearing activities during Construction, water management and use, vehicle and aircraft traffic, and the use of equipment during all Project phases. Effects on Vegetation and Ecosystems, Listed Plant Species, and Wetlands include direct disturbance through vegetation clearing and soil disturbance, and indirect effects such as introduction and/or proliferation of invasive plants, edge effects, change to water quantity and quality, and dust deposition.

To mitigate effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands, the Project Area is located mostly within previously disturbed areas, minimizing direct and indirect disturbance on vegetation. Denison will clearly delineate the boundaries of the Project to reduce accidental encroachment, conduct appropriate soil salvage and soil management, maintain surface water drainage, implement sediment and erosion control measures and suppress dust (as warranted), and monitor for the introduction and proliferation of invasive plants.

The assessment predicted residual effects on Vegetation and Ecosystems, Listed Plant Species, and Wetlands due to changes in the extent of habitat types, changes in the constituent concentrations of potential concern in plant tissue, changes in the number of listed plants, and changes in the area of wetland ecosystems. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in cumulative effects on Vegetation and Ecosystems. The residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) on Vegetation and Ecosystems, Listed Plant Species, and Wetlands are predicted to be not significant.

Monitoring programs are recommended for confirming the effectiveness of mitigation measures and predictions made in the assessment, and then implementing adaptive management (if/where

applicable) to reduce effects during the lifetime of the Project. Vegetation and invasive plants will be routinely monitored throughout the life of the Project, soil monitoring during salvaging and stockpiling activities will be undertaken, and progressive reclamation and revegetation of disturbed areas will be monitored. Monitoring will also be employed to understand uptake of constituents of potential concern in plants (if any). Pre-construction surveys for listed plant species will also be undertaken within previously unsurveyed locations in the Project Area.

### 5.5.3 Ungulates, Furbearers, and Woodland Caribou

The Project is in an area characterized by relatively low human use and provides suitable habitat for a variety of terrestrial wildlife species, including moose, furbearers (such as wolverine, pine marten, mink, and muskrat), and woodland caribou.

The main Project activities that may affect wildlife habitat and mortality are clearing activities during Construction, vehicle and aircraft traffic, and the use of equipment during all Project phases.

To mitigate effects of the Project on wildlife habitat and mortality, the Project Area is mostly within previously disturbed areas, minimizing direct and indirect habitat loss and/or alteration. Denison will conduct site clearing activities outside of the sensitive time periods for wildlife, conduct pre-clearing wildlife sweeps to identify sensitive wildlife habitat or presence of species at risk, minimize noise from Project activities, and optimize transportation and equipment use.

The assessment predicted residual effects on wildlife via direct loss of habitat through vegetation clearing, changes in how wildlife may use their preferred habitats due to sensory disturbance, direct mortality through wildlife-vehicle collisions, and indirect mortality due to the potential for increased harvest and/or predation. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in cumulative effects on wildlife. The residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) on terrestrial wildlife are predicted to be not significant.

Monitoring programs are designed to meet regulatory requirements and/or to demonstrate compliance with environmental commitments made in the EIS. Examples include pre-clearing wildlife sweeps and monitoring the success of reclamation and revegetation of disturbed areas. Based on the results of the assessment, no specific follow-up monitoring (to address any uncertainties identified during the assessment process) is required for terrestrial wildlife.

### 5.5.4 Raptors, Migratory Breeding Birds, and Bird Species at Risk

The Project location, characterized by relatively low human use, provides suitable habitat for a variety of year-round resident and migratory bird species, including Bald Eagle, Osprey, waterbirds, waterfowl, upland game birds, and bird species at risk (such as Common Nighthawk, Short-eared Owl, Yellow Rail, Rusty Blackbird, and Olive-sided Flycatcher).

The main Project activities that may affect bird habitat and mortality are clearing activities during construction, vehicle and aircraft traffic, and the use of equipment during all Project phases.

To mitigate effects of the Project on bird habitat and mortality, Denison will conduct site clearing activities outside of the nesting period, conduct pre-clearing wildlife sweeps to identify the presence of occupied nests or the presence of species at risk, implement no-disturbance setback buffers around active or suspected nests as per guidelines and regulations, minimize noise from Project activities, and optimize transportation and equipment use.

The assessment predicted residual effects on birds via direct loss of habitat, changes in how birds use their preferred habitats due to sensory disturbance, and direct mortality mainly through the possibility for incidental take (i.e., the inadvertent destruction of birds and/or their nests and eggs) and vehicle collisions. The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Terrestrial RSA resulting in cumulative effects on birds. The residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) on birds are predicted to be not significant.

Monitoring programs are designed to meet regulatory requirements and/or to demonstrate compliance with environmental commitments made in the EIS. Examples include pre-construction nest surveys and monitoring the success of reclamation and revegetation of disturbed areas. Based on the results of the assessment, no specific follow-up monitoring (to address any uncertainties identified during the assessment process) is required for birds.

## 5.6 Human Health

### 5.6.1 Human Health

The Project is located at a remote site, with no populated communities in proximity. However, Indigenous Knowledge and Local Knowledge indicate the presence of local cabins and the practice of traditional activities (e.g., hunting, fishing, and gathering) within the RSA for the Human Health VC. The Human Health VC and associated key indicator were evaluated via an environmental risk assessment that included a human health risk assessment and an ecological risk assessment. The selection of human receptors (camp worker, seasonal resident, recreational fisher/hunter, fisher/trapper, and future permanent resident) for evaluation of the Human Health VC was informed by Indigenous Knowledge, Local Knowledge, information from baseline studies, and professional judgement. The assumptions made for the traditional foods diet (i.e., amounts consumed and food types) were informed by an existing English River First Nations' country foods study and through engagement with a local fisher/trapper.

The main Project activities that may affect Human Health are air emissions during Construction, Operation, and Decommissioning, and the release of treated effluent to Whitefish Lake during

Operation and Decommissioning. Long-term transport of groundwater constituents to Whitefish Lake in future centuries may also affect Human Health far into the future.

To mitigate effects of the Project on Human Health, Denison will develop and implement a site-wide water management plan, develop site-specific effluent treatment to treat constituents of potential concern to appropriate release limits, monitor and manage effluent, and create and implement a dust management plan.

The assessment of Human Health through the human health risk assessment predicted residual effects on the fisher/trapper receptor (one of six human receptors evaluated) from eating a relatively significant amount of fish near the inlet at Russell Lake. The assessment predicted that the fisher/trapper could ingest an elevated amount of selenium over the Project phases if 183 kg (402 lbs) of fish was consumed annually. Comparatively, a traditional user's annual fish consumption was predicted to be 27 kg/year from the English River First Nation's Country Food Study (CanNorth 2017) and 88 kg/year for the high consumer for the boreal shield in the First Nations Food, Nutrition and Environment Study for Saskatchewan. The surface water and fish tissue concentrations at Russell Lake remained within an acceptable range. The fisher/trapper receptor is representative of one person who consumes a unique composition and quantity of traditional foods and the residual effect on the fisher/trapper receptor is not predicted to be significant. No residual effects were predicted for all other human receptors due to exposure to radionuclides and non-radionuclides throughout the food chain during the Project phases and far into the future during the future centuries.

For cumulative effects, existing, as well as reasonably foreseeable projects within the Wheeler River system have been considered for potential to interact with the Human Health VC due to air emissions and waterborne effluent. Air emissions from the Project are expected to be localized and unlikely to overlap with the existing or predicted emissions from existing and reasonably foreseeable projects. Potential residual effects from releases of treated mine water from existing and reasonably foreseeable projects are expected to be spatially limited in proximity to the mine site and are not anticipated to extend to the Wheeler River; therefore, no cumulative effects on human health from water and related aquatic pathways are expected.

Monitoring programs are outlined to confirm the effectiveness of mitigation measures and verifying and improving model predictions made in the assessment. Environmental monitoring would follow requirements and guidance in CSA N288.4-19 and would be informed by the results of engagement activities. Examples of monitoring include surface water, sediment, and soil samples, as well as fish tissue, benthic invertebrate tissue, and country food samples such as blueberries from Whitefish Lake, McGowan Lake, Russell Lake, and reference locations, as applicable.

### 5.6.2 Worker Health and Safety

Workers within the Project Area will be exposed to radiation from uranium-bearing materials, as well as to other workplace hazards typical of mining operations. The existing environment in the Project Area is characterized by background levels of radiation exposure from radioactive elements in the U-238 decay chain, as well as cosmic radiation. Background radiation doses are on the order of 2 millisieverts per annum (mSv/yr). Dose limits are defined in terms of incremental (above background) doses.

The Project will interact with the Worker Health and Safety VC through worker exposure to radiation from uranium-bearing materials in the wellfield and processing plant, mainly during Operation and Decommissioning. These materials include ore cuttings from well drilling, the uranium-bearing solution that carries uranium to the processing plant, precipitates removed from the processed solution, and uranium concentrate (i.e., yellowcake), which is the final product from the processing plant. Radon, a radioactive gas, is released from process materials to workplace air, and uranium concentrate dust is released to air during the dry parts of the process. Expected radiation doses to workers in different job categories were calculated for comparison to the worker dose limit of 20 mSv/yr (averaged over a 5-year period).

Mitigation measures that are part of Project design include a berm around the ore cuttings waste storage area, which provides shielding from radiation exposure, and worker use of powered air purifying respirators in the drying and packaging areas of the process plant. These mitigations were factored in during calculation of worker doses. Other mitigations include monitoring of exposure levels in work areas, personal dose monitoring of every worker, and work planning to manage time in proximity to radiation sources, all in accordance with a radiation protection plan. These mitigations are expected to keep worker radiation doses below the worker dose limit and as low as reasonably achievable. In addition, a health and safety plan will address management of non-radiological work hazards in accordance with federal and provincial regulations.

Radiation doses for all workers were calculated to be lower than the worker dose limit. Based on this result, and considering the use of monitoring and safe work practices under a radiation protection plan and health and safety plan, no residual effects on worker health are anticipated.

Cumulative effects for Worker Health and Safety were not considered since no residual adverse effects were identified.

Monitoring activities during all phases of the Project will include measuring the levels of exposure to radiation, radon, and radioactive dust in the workplace. Administrative (warning) levels and action levels will be defined for these measurements to facilitate work planning, corrective actions, and a safe working environment.

## 5.7 Land and Resource Use

Two broad categories of land and resource use were assessed relative to the Project: Indigenous Land and Resource Use (ILRU) and Other Land and Resource Use (OLRU). ILRU considered traditional or subsistence practices by Indigenous people including hunting and fishing for domestic purposes, as well as non-commercial trapping of furbearers for food or fur, gathering of natural items for ceremonial practices, herbs, roots, berries, plant medicines, food, and firewood. OLRU considered both recreational and commercial use of resources, including hunting and fishing, commercial trapping, commercial fishing, lodge and outfitting services, ecotourism, forestry, and mining, which may be conducted by either Indigenous or non-Indigenous peoples under the authority of provincial licenses or by resource allocations. It is acknowledged that certain activities in each of these categories are pursued by the same individuals, as resource harvesters often pursue both traditional and commercial harvests simultaneously.

### 5.7.1 Indigenous Land and Resource Use

The Project is within the Nuhtsiye-kwi Benéne of ERFN, the traditional territory of Kineepik Metis Local #9, and the Nuhenéné of the Athabasca Denesųliné communities. Much of the documented shared use of land and resources by Indigenous communities occurs close to their primary populated communities, although some uses are documented in proximity to the Project footprint and surrounding areas such as Russell Lake and along the Wheeler River. Recorded uses include hunting sites (moose and woodland caribou), the gathering of plants for food or subsistence purposes, trapping of aquatic furbearers (including beaver and muskrat), and fishing (including Walleye, Northern Pike, Lake Trout, Lake Whitefish, and Arctic Grayling). Proximal to the Project, many of the most recent uses were by an ERFN Trapper who passed away prior to the filing of the EIS. These uses are considered as representative of future land use by the ERFN. Other Indigenous groups have documented uses on Russell Lake, proximal to the Fox Lake Road, and areas south of the Key Lake Gate.

The Key Lake gate on Highway 914 limits access to areas close to the Project site to lease holders (e.g., cabin owners) and some Indigenous communities. The closest areas of more intensive community use are ERFN's cultural camp at kilometre 160 and Kineepik Métis Local #9/Northern Village of Pinehouse's cultural camp at kilometre 67, which are south of the gate along Highway 914.

The various phases of the Project have the potential to induce different effects on ILRU and its KIs: resource availability for harvesting subsistence resources (terrestrial and aquatic resource availability and health of resources), land and waters available for traditional practices, and perceived suitability of land and resources (aesthetic experience, perceived suitability of resources for safe use, and quality of resources of consumption).



The KIs of resource availability, land and waters available for traditional practices, and perceived suitability of land and resources for aesthetics were not carried forward to residual effects assessment and can be eliminated, reduced, or controlled through mitigation measures. Mitigation for these effects is well understood. It is expected that wildlife and fish will still be available and abundant enough to support traditional harvesting practices, the health of the resources is not expected to be affected, and the lands and waters affected by the Project are minimized, in part by the small Project Area, which is 1.69 square kilometres.

The Project is expected to have an adverse effect on the perceived suitability of the lands and resources therein for some resource users in the area closest to the Project Area and on either side of local access roads and the haul road for the Key Lake operation – McArthur River operation. The effects are a result of the Project's presence, the introduction of a different uranium mining method in the region, noise, dust, increased competition for resources, and concern about personal exposure to contaminated water and soils. This effect is anticipated to vary by individual; some may continue activities and others may avoid areas close to the Project.

To mitigate effects of the Project on the perceived suitability of lands and the resources therein, Denison will develop management plans, implement emergency response programs, and minimize the amount of land disturbed by the Project to the greatest extent practicable. Mitigation will reduce risks associated with increased traffic, noise, air quality, the potential for constituents of potential concern to enter the environment, waste management, the introduction of a different mining method, and human health. The mitigation strategies that have been proposed have been successful in similar contexts, such as management of noise, traffic, dust, and competition for resources.

Denison acknowledges that Indigenous communities continue to have an interest in obtaining a greater understanding about the ISR mining method, and will continue to engage meaningfully with them through the life of the Project. Overall, given the extent of the ILRU LSA, adverse effects are low in magnitude, the geographic extent of effects are limited, and the effects are reversible, the residual effects on ILRU are anticipated to be not significant.

The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the ILRU RSA, resulting in potential cumulative effects to Indigenous land use activity in the area. This is largely due to the proposed Highway 914 extension project.

With mitigation measures, the residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) may result in increased competition as additional resource users may access the area from locations further north, as well as from the south as the Key Lake gate would be bypassed. These cumulative changes could exacerbate perceptions of the areas suitability for continued Indigenous land and resource use.

Monitoring or follow-up activities proposed for ILRU relate largely to those programs associated with the biophysical environment.

### 5.7.2 Other Land and Resource Use

OLRU activities include commercial and recreational activities, which tend to occur in the OLRU LSA and consist of trapping, commercial fishing, and leaseholders and cabin owners. Trapping and commercial fishing take place in the OLRU LSA and was known to be conducted exclusively by the ERFN Trapper who passed away prior to the time of filing the EIS. It is anticipated that the ERFN trapline allocations may be passed to another individual in the future. Lease holders and cabin owners with land tenures can also be found near the Project. The current extent of commercial and recreational uses is limited due to access restrictions at the Key Lake gate, which limit access to those with a lease, commercial license, those who operate outfitting businesses, and members from select Indigenous communities.

The various phases of the Project will have different effects on OLRU and its KIs: change to resource availability (including terrestrial and aquatic resource availability and the health of resources); land available to conduct recreational and commercial harvests (including the availability and accessibility of land and waterways); and changes to the perceived suitability of land and resources (including aesthetics of resource use and perceived suitability of resources for safe use). The KIs of resource availability and land available to conduct recreational and commercial harvests were not carried forward to residual effects assessment as these effects can be eliminated, reduced, or controlled through mitigation measures.

The Project is predicted to have an adverse effect on the perceived suitability of the lands and resources therein for some resource users in the area closest to the Project Area and on either side of local access roads and the haul road for the Key Lake mill operation – McArthur River operation. The perceived suitability of lands and resources for safe use may be affected by the Project's presence, traffic, noise, dust dispersion, air emissions, and the potential for constituents of potential concern to enter to the environment. The introduction of a different uranium mining method in the region may further cause concern for some resource users. This effect is anticipated to vary by individual; some may continue activities and others may avoid areas close to the Project. Typically, the magnitude of perceived effects declines with increasing distance from the Project and Project activities.

To mitigate effects of the Project on the perceived suitability of lands and the resources therein, Denison will develop management plans, implement emergency response programs, and minimize the amount of land disturbed by the Project. Mitigation will reduce risks associated with increased traffic, noise, air quality, the potential for constituents of potential concern to enter the environment, waste management, the introduction of a different mining method, and human

health. The mitigation strategies that have been proposed have been successful in similar contexts, such as management of noise, traffic, dust, and competition for resources.

Denison had established a relationship with the ERFN Trapper who recently passed away. If another trapper is interested in taking over the late ERFN Trapper's trapline in the future, Denison will enter into a relationship with them similar to what was contemplated previously with the ERFN Trapper. Given the low magnitude and limited geographic extent of residual effects along with the context that resource users have exhibited resiliency to changing conditions, the overall residual effects of the Project on OLRU are predicted to be not significant.

The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the OLRU RSA, namely the Highway 914 extension project, resulting in potential cumulative effects to commercial and recreational resource users. This is largely due to the Highway 914 extension project.

With mitigation measures, the residual effects of the Project and the cumulative effects (interacting with residual effects from other projects and activities) may result in increased competition as additional resource users may access the area from locations further north, as well as from the south as the Key Lake gate would be bypassed. As most other land and resource use activities are regulated by the Province, it is not expected that direct competition for uses would be affected, however the presence of additional people may reduce the wilderness experience for some users. These cumulative changes could exacerbate perceptions of the area's suitability for continued use.

Monitoring or follow-up activities proposed for OLRU relate largely to those programs associated with the biophysical environment, such as for wildlife and water quality. No additional monitoring or follow-up activities are proposed for OLRU.

### 5.7.3 Heritage Resources

The Project includes areas that the Government of Saskatchewan's Heritage Conservation Branch classify as being sensitive (i.e., areas that have the potential to contain heritage resources as they are in undisturbed terrain near significant waterbodies, rivers, or streams). Heritage resources consist of physical and cultural heritage sites. Archaeological sites were considered in the Heritage Resources assessment. Denison completed two Heritage Resources assessments during baseline studies, and two archaeological sites were identified in the Project Area. Since each archaeological site included only a single artifact, the Heritage Conservation Branch determined that the sites were of low interpretive value and work could continue as planned.

Despite the completion of two Heritage Resources assessments during baseline studies, it is possible that additional archaeological sites may be identified during the life of the Project. Project activities that may disturb the ground, including clearing and levelling activities, drilling of holes,

infrastructure construction, reclamation, and traffic throughout the life of the Project, may affect archaeological sites.

To mitigate effects on archaeological sites, Denison has developed and implemented a Heritage Resources Management Plan (HRMP). The HRMP outlines the steps that Denison will take if an additional archaeological site is identified during the life of the Project. These steps include having the archaeological site assessed by a qualified archaeologist, holding discussions with local Indigenous leadership, and implementing mitigation measures as directed by the Heritage Conservation Branch. The mitigation measures may include avoidance of the site, systematic testing of the site, an archaeological excavation, and/or construction monitoring.

Residual effects on archaeological sites may involve a decrease in the number of archaeological sites. The assessment predicted that given the low number of archaeological sites identified in the Project Area, and considering measures outlined in the HRMP to make sure any additional archaeological sites are assessed properly, the likelihood of residual effects on Heritage Resources is considered low with a low frequency of occurrence. This resulted in the overall conclusion that residual effects of the Project on Heritage Resources are anticipated to be not significant.

## 5.8 Quality of Life

### 5.8.1 Cultural Expression

Cultural Expression provides an understanding of the activities that Indigenous people in the LSA, which is reflective of the same spatial boundaries as Indigenous Land and Resource Use, which are considered as the activities that support Indigenous communities' cultural continuity. The Cultural Expression VC considers changes to the KIs of knowledge transmission and the traditional diet. Knowledge transmission encompasses cultural activities and practices that provide an opportunity for knowledge sharing among family and community members with measurable parameters including changes to cultural practices that support knowledge transmission and changes in the location of cultural practices that support knowledge transmission. The traditional diet includes species such as moose, woodland caribou, fish, and berries, and is of cultural and traditional importance to Indigenous communities. Traditional diet considered the measurable parameters of changes in the availability of country foods included in a traditional diet and changes in the perceived suitability and safety of foods in a traditional diet.

The Project and its activities may change the location of cultural practices that support knowledge transmission and the participation in cultural practices and subsequent knowledge transmission. Indigenous Land and Resource Use changes are expected to persist in proximity to the Project and in the LSA; however, knowledge transmission is often site-specific. For example, cultural camps support the transmission of knowledge on the land. Cultural camps near the Project Area are located south of the Key Lake gate, with the ERFN cultural camp located at kilometre 160 of Highway 914, and cultural camps hosted by Pinehouse Lake held at Gordon Lake, Muskeg Lake, and

at kilometre 67 of Highway 914. Participants in the *Métis Knowledge Study* noted overlap with other Indigenous cultural camps, such as Kilometer 160 of the Key Lake Road, demonstrating the kinship ties that the Métis maintain with their “extended First Nations relations” (MN-S and Two Worlds Consulting 2023). These locations are not expected to be affected by the Project. The anticipated lack of effect to cultural camps, a small Project footprint, and likely persistence of the undertaking ILRU activities throughout the LSA are expected to minimize potential effects of the Project to knowledge transmission. Further to this, participation in the worker rotation system is not expected to substantially change opportunities for Project employees to participate the traditional land use activities that support cultural activities and associated knowledge transmission.

For traditional diet, the Project may reduce the availability of country foods because of changes to the abundance of harvested resources, restricted access, and avoidance of areas where the Project is located, including areas where hunting, fishing, trapping, and gathering occur. For Indigenous peoples, the traditional diet is often preferred, and it is considered healthy. The Project’s potential effects on the availability and abundance of species that are important to a traditional diet (e.g., moose, Walleye) are expected to be low; however, the perceived suitability of country foods was still considered as having potential to be adversely affected by the Project.

The Project may adversely affect traditional diet for residents of the LSA through perceived changes in the suitability and safety of resources that support a traditional diet, particularly for activities that occur in proximity to the Project. As a result, some resource users may change their behaviour and limit the amount of traditional foods in their diet. The availability and abundance of those resources is not expected to substantially change; therefore, such changes may be limited to a small number of users proximal to the Project site. The residual effect to the traditional diet overall is expected to be low in magnitude.

To mitigate effects of the Project on the traditional diet, mitigation measures associated with the Project include adopting culturally sensitive employment policies to reduce the potential effects of Project employment on cultural activities; working with Indigenous communities to understand culturally important periods; reducing the Project footprint to the extent practicable; reducing risks associated to increased traffic, noise, air quality, and the potential for constituents of potential concern to enter the environment; and implementing an environmental monitoring program consistent with Canadian Standards Association for nuclear facilities and mines.

The residual effects of the Project are expected to interact with the residual effects of other projects and activities in the Cultural Expression RSA resulting in potential cumulative effects. This is largely due to the Highway 914 extension project. As the effects of the Highway 914 extension project on harvested resources are not tied to perceived changes in the suitability of harvested resources, no overlap occurs between the effects of the projects on the traditional diet key

indicator, specifically changes in the perceived suitability and safety of country foods in a traditional diet. Therefore, no cumulative effect is anticipated for Cultural Expression.

No monitoring or follow-up activities are proposed specific to Cultural Expression. Monitoring and follow-up activities proposed for ILRU will focus on the biophysical environment and the resources that support cultural expression.

### 5.8.2 Community Well-being

Community well-being can be defined in multiple ways, depending on the community or the people being considered. The assessment focused on ways in which the Project could interact with Community Well-being, and included the KIs of population and demographics, employment and associated income for local workers, and community cohesion. Individuals and families may have experiences associated with the Project that vary in different ways, with the possibility of both positive and negative outcomes.

The Project is not expected to substantially change the population and demographics of communities in the LSA because 1) the Project will rely on a fly-in/fly-out worker rotation system with pick-up points in the LSA and outside of the LSA, thus minimizing any requirement to relocate to access employment and 2) the definition of Residents of Saskatchewan's North currently requires an extended period of residency in order to qualify. These factors limit the potential for immigration to the LSA.

Project employment and business opportunities could provide additional income to individuals and households. Additional income could be beneficial as increased income is associated with improved health outcomes, or if used to support traditional harvesting activities (e.g., buying a new quad, repairing a boat) or purchasing healthier foods. Increased income has also been shown in various studies to have certain negative impacts on community cohesion, such as potential for increased use of substances, spending time away from family during worker rotation, with resulting potential increases in household stress levels.

To mitigate effects of the Project on community cohesion, Denison will work with communities to develop culturally sensitive hiring practices and provide supports to individual workers and their families. Supports could include (i) providing multiple centrally located pick-up points for fly-in/fly-out workers to minimize the potential for migration and time spent away from families; (ii) establishing health and wellness programming, life skills and financial literacy programming, an Employee and Family Assistance Program, a no drug and alcohol policy on site; and (iii) implementing culturally sensitive employment policies (e.g., having an Elder on site for counselling). After mitigation, and given the small size of the operation (180 employees during operation), Project residual effects related to income and community cohesion are expected to result in positive and some potentially adverse outcomes. The communities overall are resilient and expected to accommodate the anticipated changes as there is already considerable experience



with other similar fly-in/fly-out operations in the region. Overall, the conclusion for changes to income and community cohesion relative to Community Well-being is that the residual effects are expected to be not significant.

The cumulative effects assessment considered the Highway 914 extension project; however, the two projects (the Project and the Highway 914 extension project) have distinct local and regional study areas, meaning the geographic boundaries for each project are unique. Potential changes to community cohesion resulting from employment are unlikely to result in any discernable changes, particularly as the opportunities associated with the all-weather road may involve a broader labour pool. Accordingly, the cumulative effects conclusions are predicted to be not significant.

Monitoring and follow-up would be used to monitor progress on achieving employment and contracting targets and identify opportunities to improve employment and procurement, continue and maintain communication with communities, and contribute to the overall and continual improvement of the Project.

### 5.8.3 Infrastructure and Services

Infrastructure and services play an important function to the communities in the LSA and beyond. The assessment considered the potential for the various phases of the Project to affect KIs related to Infrastructure and Services VC that were identified as important through Project-related engagement – including traffic, community infrastructure and services, and emergency services capacity. Changes could be caused by increased traffic volumes and potential increases in collisions on roadways requiring the use of emergency services, increased demand on community infrastructure and services (e.g., support for family members of workers participating in the worker rotation system), and increased demand for emergency services as in the event of an accident or malfunction at the mine site or along Highway 914.

Project related traffic volumes are expected to be similar during Construction and Operation and are anticipated to be similar or less during Decommissioning. During Construction, the truck average annual daily traffic (TAADT) and average annual daily traffic (AADT) volumes are predicted to increase by 14 and 22 vehicles, respectively. During Operation, both the TAADT and AADT are predicted to increase by 18 vehicles to 32 and 40 vehicles, respectively. This increased truck traffic is considered low in magnitude.

As the LSA communities are located away from the Project site, most physical Project activities, except for vehicular traffic to move equipment, supplies and personnel, are not predicted to affect Infrastructure and Services in the LSA. The Project site and associated camp will be fully equipped to meet the needs of the Project and its workforce and will operate independently. The extent to which community infrastructure and services and health and emergency services will be affected would vary by community and individual and depend on the capacity of existing facilities and

services. Supports provided to employees on site, inclusive of an Employee and Family Assistance Program, are expected to minimize potential effects to community services.

Accidents and malfunctions are the key factor that could increase pressure on emergency services; however, they were determined to be highly unlikely to unlikely in probability (EcoMetrix 2022), as they would be mitigated by various preventative operational protocols and the emergency response plans Denison will implement. Vehicular accidents are the only potential effects pathway for the Infrastructure and Services VC, that could not be effectively addressed on site and may, therefore, require emergency services from communities in the LSA.

Mitigation for Infrastructure and Services broadly includes the use of designated pick-up and drop-off points; appropriate driver training; an Emergency Response Plan in case of a spill; on-site and accessible services and programs for workers and families; ongoing communication between Denison, LSA communities, and relevant authorities; an on-site primary care paramedic; a health and safety management plan; services and programs provided on-site and accessible to workers (including health and wellness programming, health promotion, immunization programs, life skills programming, and workforce education); and an Employee and Family Assistance Program.

The communities are generally resilient and are expected to accommodate the anticipated changes associated with the Project as they have considerable experience with other similar uranium operations in the region. The overall conclusion relative to changes to Infrastructure and Services is not significant.

The cumulative effects assessment considered the Highway 914 extension project, which has the potential to increase traffic volumes along the existing Highway 914. Although estimates of traffic volume increases were not provided in the Highway 914 extension project EIS, it is safe to assume that the cumulative effects could be an increased requirement for maintenance and increased potential for collisions that could result in injury or death to people and wildlife. The Highway 914 extension project implemented the following mitigations:

- reducing project-related traffic during construction;
- implementing speed limits in specific areas of concern;
- installing and maintaining signage along the highway; and
- conducting regular inspection and maintenance activities on the highway and associated components.

Although the cumulative changes to traffic may be discernable to users of the highway, it is anticipated that the overall increases in traffic can be effectively managed.

With respect to community infrastructure and services, both projects (the Project and the Highway 914 extension project) are removed from communities, and thus the potential for changes

in demand could stem from (a) employment and (b) emergency response. With respect to employment, the Highway 914 extension project may involve a broader labour pool, and as such cumulative effects are not anticipated. For emergency response, the Highway 914 extension project would allow for connections to community-based emergency services beyond the LSA, thus potentially reducing capacity constraints on any one community. Accordingly, the cumulative effects conclusions are predicted to be not significant for Infrastructure and Services.

With the application of mitigation measures, the assessment of cumulative effects and determination of significance for community emergency services capacity does not change with consideration of the Highway 914 extension project. For monitoring and follow-up, vehicular accidents will be monitored on Highways 165 and 914 for noticeable increases. Denison will also continue to liaise with communities, service providers, mine/mill operators, and emergency response providers for the duration of the Project.

## 5.9 Economics

The various phases of the Project will have different effects on Economy and its KIs: employment and training, income, the traditional economy, government revenues, and business opportunities.

The Project is expected to create employment and business opportunities and increase income for workers and businesses in the LSA. Opportunities include an estimated workforce during the Construction period of approximately 300 people and during the Operations phase of 180 people. Mining positions are higher paying than many other industrial positions. Residents and communities in the LSA will be given first priority for employment and training and business opportunities, followed by Indigenous and/or other communities in the RSA. The Project is also anticipated to positively affect the governments of Saskatchewan and Canada through payments (e.g., uranium royalties, corporation income tax, personal income tax) that are directly and indirectly linked to the Project activities. Because the Project is expected to positively affect employment and training, income, business opportunities, and government revenues, these effects were not carried through the residual effects evaluation.

Changes associated with Project employment may also affect the traditional economy of residents in the LSA through: (1) the physical presence of the Project and its associated activities and how these may interact with traditional activities and (2) participation in the wage economy and how this can contribute to an individual's ability to partake in traditional activities, including that the commuter-rotation system may result in some individuals having less time to participate in the traditional economy. The Project is not expected to have a significant effect on Indigenous and other land and resource use close to the Project site; these types of land and resource use activities near existing uranium operations have persisted in proximity to these sites. With respect to traditional resource users in the LSA, there is less certainty regarding the extent to which participation in the workforce may affect individual traditional resource use behaviours. It is likely

to vary by individual, and in many instances traditional resource use may be positively supported by the income gained through employment.

To maximize potential positive effects of the Project for the Economy VC, mitigation includes the implementation of a workforce development plan to initially prioritize Indigenous and non-Indigenous Communities of Interest in the LSA for employment and training opportunities; establishment of a procurement approach through all phases of the Project with a focus on businesses based within the LSA communities, followed by Indigenous and/or businesses in the Regional Study Area; and development of the Project's Surface Lease Agreement and Human Resource Development Agreement.

Generally, the mitigation measures designed to protect Indigenous land and resource use measures are expected to be protective of participation in the traditional economy. For certain specific cases, there may be a need for one-off arrangements (i.e., a trapper compensation agreement if/when an existing trapline is passed to another individual), to be responsive to other considerations potentially brought forward by select Indigenous communities.

For the most part, effects of the Project are expected to be positive to the Economy VC and have the potential to contribute to both the LSA and RSA and beyond. The only potential residual adverse effects relate to the traditional economy, which can be mitigated in large part by measures related to potential changes to land and resources use. Any residual adverse effects will occur in the LSA, and are expected to be potentially frequently occurring (due to the daily nature of work) but negligible to low in magnitude, medium-term in duration, and reversible after Decommissioning.

The cumulative effects assessment, which involved the Highway 914 extension project, considered the same factors as changes to ILRU. Cumulatively, the magnitude of changes to traditional economy are associated largely with changes resulting from the Highway 914 road extension project, as easing access would result in an increase of users in the area potentially putting pressure on the items harvested as part of the traditional economy, particularly relative to existing conditions in which access restrictions are currently in place.

Monitoring would be used to assess progress on achieving employment and contracting outcomes. Follow-up items will be focussed on the continuation and maintenance of communication about topics of importance with Indigenous and non-Indigenous communities. Monitoring relative to the traditional economy includes those activities associated with ILRU.

## 5.10 Accidents and Malfunctions

An assessment of potential accident and malfunction was carried out in alignment with federal (CNSC 2020) and provincial (Government of Saskatchewan 2014a, 2014b) guidance, as well as

recent EA practice in consideration of proposed uranium mining developments in the Athabasca Basin.

The objective of the assessment was to evaluate the potential human health or biophysical environmental effects resulting from radiological and conventional accidents and malfunctions in consideration of proposed environmental protection measures. The assessment considered all mine-life phases focusing on the Project site, the Project site access road and specific off-site locations along the mine-related transportation route (i.e., provincial highway system) of interest to local Indigenous peoples.

The assessment followed a risk-based approach, whereby hazards were identified, design features and mitigation measures were considered, likelihood and consequence were evaluated, and an overall risk rating based on likelihood and consequence was assigned using a risk matrix.

A total of 70 potential Project-related hazard scenarios were identified and evaluated through the initial screening process as described above.

Seven scenarios were considered moderate or high risk and were advanced for more detailed quantitative assessment. The results of the quantitative assessment of the seven accident and malfunction scenarios are summarized below:

- Loss of freeze capacity – The scenario whereby a loss of containment of mining solution would occur due to loss of freeze capacity was deemed “highly unlikely”. The freeze wall provides tertiary containment, and the postulated excursion could only occur under the highly unlikely scenario where the multi-barrier containment system was compromised by independent events, over a prolonged period of time. In this highly unlikely event, migration of lixiviant (mining solution) is likely to be slow and localized and mitigation could be implemented. The consequence was deemed to be “major”. The overall risk rating for this bounding scenario in consideration of probability and consequence was determined as “moderate”.
- Loss of integrity of the freeze wall – The scenario whereby there would be a loss of freeze wall integrity due to an external seismic event was deemed “highly unlikely”. The Project area has a very low level of seismicity—there have been no recorded earthquakes with a magnitude greater than 3 within 200 km of the site (NRCAN 2021b). In this highly unlikely event, and assuming the seismic activity does result in a loss of freeze wall containment, migration of lixiviant (mining solution) is likely to be slow and localized and mitigation could be implemented. The consequence was deemed to be “major”, given the potential impact to the underlying freeze wall infrastructure, which could take a significant amount of time to repair/replace. The overall risk rating, however, for this bounding scenario in consideration of probability, consequence and mitigation measures, was determined as “moderate”.

- Vessel or pipe leak inside the processing building – Based on data from the Center for Chemical Process Safety of the American Institute of Chemical Engineers on the average probabilities of failures for different components in processing plant, the probability of this scenario was assessed as “likely”. The severity of the consequences of this scenario was predicted to be “minor”, given control measures within the processing plant and emergency response measures. The overall risk rating for this bounding scenario in consideration of probability and consequence was given as “low”.
- A terrestrial release (to ground) of radioactivity, fuels or chemicals – Based on traffic and accident statistics it was determined that the probability that this scenario would occur was “unlikely”. The severity of the consequences of this scenario was predicted to be “minor” given control measures, the likely limited spatial extent of potential effects, and emergency response measures. The overall risk rating for this bounding scenario in consideration of probability and consequence was given as “low”.
- Aquatic release of uranium concentrate (radioactivity) – Based on traffic and accident statistics it was determined that the probability that this scenario would occur was “highly unlikely”. The severity of the consequences of this scenario was predicted to be “moderate” given control measures, the likely limited spatial extent of potential effects and their transience, and emergency response measures. The overall risk rating for this bounding scenario in consideration of probability and consequence was given as “low”.
- Aquatic (to water) release of fuels or chemicals – Based on traffic and accident statistics it was determined that the probability that this scenario would occur was “unlikely”. The severity of the consequences of this scenario was predicted to be “moderate” given control measures, the likely limited spatial extent of potential effects and their transience, and emergency response measures. The overall risk rating for this bounding scenario in consideration of probability and consequence was given as “low”.
- Fire and/or explosion within the processing plant – Based on data from the Center for Chemical Process Safety of the American Institute of Chemical Engineers on the probability that this accident and malfunction scenario may occur, the probability of this scenario was predicted to be “highly unlikely”. The severity of the consequences of this scenario was predicted to be “moderate”, given control measures, emergency response measures and the expected level of exposure to radioactivity for workers and the public. The overall risk rating for this bounding scenario in consideration of probability and consequence was given as “low”.

Overall, based on the assessment of accidents and malfunctions presented herein, it is anticipated that potential effects could be addressed through engineering design and compliance with industry best practices that reduce risks associated with the hazard scenarios to ALARP. Based on this assessment, the risks may be characterized as tolerable.



## 5.11 Effects of the Environment on the Project

Both the *Canadian Environmental Assessment Act, 2012* and the Canadian Nuclear Safety Commission's *Generic Guidelines for the Preparation of an Environmental Impact Statement – Pursuant to the Canadian Environmental Assessment Act, 2012* require an environmental assessment to account for changes to the Project that may be caused by the environment. The environmental setting of the Project has affected its design and will affect its management over the life of the Project.

Environmental components that have influenced the Project design (e.g., site selection, layout, and engineering) include the following:

- Geology and terrain have influenced the mine location and layout.
- Indigenous Knowledge of land and resource use was incorporated into the design of baseline programs and selection of valued components for the environmental assessment. It was also integral to informing Project design, influencing selection of access road alignments, mining methods, and proposed treated effluent discharge locations.
- Vegetation communities and wetlands influenced the size of the Project Area, which has been reduced to the extent practicable.
- Consideration of potential effects to fish and fish habitat led Denison to design the Project to recycle process water to the greatest extent possible, thereby reducing the demand for fresh water supply. As a result of the focus on water recycling, the volume of treated effluent requiring discharge is expected to be low.

Set within this context, the focus of Effects of the Environment on the Project is on the potential effects of natural hazards on the Project (i.e., seismic events, forest fires, extreme weather, and climate change). In terms of seismic events, the potential effect on the Project is low because northern Saskatchewan, where the Project is located, is one of the least earthquake-prone areas in Canada, ranking as a low seismic hazard zone (NRC 2021 a,b).

Forest fires are common throughout most of northern Saskatchewan, and are an important natural disturbance of northern boreal forest ecosystems (Parisien et al. 2004). It is expected that Denison will enter into a fire control agreement with the Province of Saskatchewan, as other northern uranium mine and mill facilities have done, which will allow for fire fighting support from the province should a fire develop near the Project. Denison's Forest Protection Program will include information on how to prevent and suppress forest fires near the Project. Fire guards (i.e., buffer zones of 30 m) will be established and maintained between specific Project facilities (e.g., main camp, processing plant) and forested areas to minimize potential risks from forest fires. On-site emergency response equipment will be available for fire suppression and setting up fire

suppression systems, and staff on site will be trained in the operation of this equipment and in fire-fighting readiness and techniques.

Various mitigation measures and management plans will be put in place at the Project to minimize the effects of extreme weather events (i.e., major precipitation events, drought, extreme high and low temperatures, extremely high winds) on the Project, including, but not limited to, the following examples:

- Suitable equipment and design systems will be selected for the Project to enable operation under extreme weather events.
- Denison's emergency preparedness and response plan for the Project will include information on planning for and responding to severe weather events.
- Weather forecasts will be monitored, which will provide advanced warning and time to prepare for extreme events.
- Health and safety policies will be implemented, and risk assessments will be undertaken, before working in adverse weather conditions.
- Employees will be required to wear appropriate personal protective equipment (e.g., rain gear) while working outside in extreme weather. Radio communication will be maintained with anyone working away from the mine site under these conditions.
- Diesel generators will be available on site at strategic locations, outside of site runoff areas, to provide back-up power in the case of a power outage. Generators will be used to maintain power to the processing plant and the accommodations facility, as well as to maintain other essential services, when required.

Climate change can be defined as a long-term change in average weather patterns, particularly since the early 20<sup>th</sup> century, that are largely attributed to increased levels of atmospheric greenhouse gases produced by human activities (NASA 2021). In general, research suggests increased warming over the coming decades due to climate change is likely to cause changes in the frequency, severity, and/or nature of weather extremes in the northern portions of North America (IPCC 2021). Climate models are used to depict how the climate is likely to change in the future at particular locations. Climatic projections for the Project were derived from an interactive, online climate modelling tool (i.e., Climate Atlas; PCC 2019).

The Project will be developed with consideration of the predicted changes in climate conditions that could occur during its lifecycle from pre-construction design through to monitoring during Post-Decommissioning. Denison has incorporated design features, mitigation measures, and management plans related to forest fires and extreme weather into the Project, which are also applicable to environmental changes due to climate change. The Project has also been designed using engineering best practices and will meet current regulations and building codes. Additional

growing days due to predicted increased temperatures may be beneficial to the Project during Decommissioning, allowing for accelerated revegetation and reclamation of natural vegetation communities.

## 6 Monitoring and Follow-up Programs

Monitoring programs are designed to meet regulatory requirements (e.g., permit or license conditions), and/or to demonstrate compliance with environmental commitments made in the EIS. Follow-up programs are those that are proposed to address any uncertainties identified during the EA process (e.g., to verify predictions made during the EA; determine the effectiveness of proposed and implemented mitigation measures) and to determine when to implement adaptive management measures.

Information on monitoring and follow-up programs presented within the EIS is conceptual in nature and provides a preliminary description of the activities proposed for the Project. Detailed programs will be developed as Project designs are finalized, which may influence the nature, frequency, and locations of monitoring activities. Input from regulatory agencies, the public, and Indigenous Peoples will be considered. Monitoring and follow-up programs will be finalized as the Project advances into and through the licensing process.

Monitoring and follow-up programs for the Project will be integrated within Denison's overall EMS framework (see Section 3.4.4) and implemented through the various programs, plans, and procedures that would be developed therein. Generally, Denison is anticipating establishing monitoring and follow-up programs in relation to the following VCs (as outlined in the various subsections of Section 5):

- Air Quality and Noise;
- Groundwater;
- Surface Water Quantity and Quality;
- Fish Habitat and Health;
- Terrain and Soil;
- Vegetation and Ecosystems, Listed Plant Species, and Wetlands;
- Ungulates, Furbearers, and Woodland Caribou;
- Raptors and Migratory Breeding Birds;
- Human Health and Worker Health and Safety;
- Indigenous Land and Resource Use, Other Land and Resource Use, and Heritage Resources; and
- Economy.

## 7 Conclusions

On the basis of the Project information and related evaluation and assessment of effects, Denison believes that the Project can be constructed, operated, and decommissioned in a manner that is not likely to cause significant adverse effects to the biophysical or human environments.

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